



UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

**An Assessment of the Teacher's ICT Attributes and the Learning Environment
Effects on Computer 'Literacy' Instruction in Secondary Schools**

BY

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ANNETTE MWANGI

SUPERVISOR

DR. ROBERT OBOKO

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Declaration

I declare that this project work as presented in this report is my own original work and has not been presented anywhere else for any award

Signature Date

Annette Mwangi

P56/61523/2011

This work has been submitted as part of the fulfillment of the requirements for the award of Master of Science in Information Systems degree at the University of Nairobi with my approval as the Supervisor.

Signed Date

Dr. Robert Oboko

School of Computing and Informatics

University of Nairobi

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Dedication

I dedicate this research to my wonderful mum and dad for their unconditional love and support.

ABSTRACT

The intrigues of learning computers in this century, has become imperative to our daily functioning as a people in a society. The need for IT competent people begins from the class room where this computer literacy is provided by the teachers.

Factors that assess the impact of ICT on education and their effect on computer literacy have been studied, with the students being the object of focus. Not much has been done to assess the teacher' role in the effectiveness of computer literacy instructions offered in schools.

In an effort to shift focus to the teacher, this study sought to look at the teacher's attributes and the learning environment and how these affect the learning outcomes.

The objectives of the study identified, were achieved by looking at three frameworks and adapted to test the Teachers' ICT Attributes including the gender aspect and teaching experience and the Learning environment where the teaching takes place and the pedagogy applied.

The research methodology used for the study was mainly survey where questionnaires were administered to a sample of respondents from secondary schools in Nairobi and Kiambu Counties. SPSS and Microsoft Statistical functions were employed in carrying out the data analysis that helped provide conclusions of the research. Multiple Regression analysis was used to test the direct effect of the two independent variables on the dependent variable. Moderated regression was used to test the moderation effect of the moderating variables of School Policy, School Culture and Student attitude.

The research study conclusion demonstrated that the Teacher's ICT attributes and the Learning environment actually have a direct positive effect on the learning outcomes. School policy did not have a significant effect.

Further research can be carried out to give supplementary insight on how the proposed framework can be used in a different scenario and also find out why the school policy does not have a significant effect.

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List of Abbreviations

ICT	Information and Communications Technology
IT	Information Technology
KCSE	Kenya Certificate of Secondary Education
MRA	Moderate Multiple Regression Analysis
SPSS	Statistical Package for the Social Sciences

Definitions:

SPSS - Statistical Package for the Social Sciences - It is a computer program used for survey authoring and deployment, data, text analytics, statistical analysis, and collaboration and deployment (batch and automated scoring services).

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CHAPTER ONE: INTRODUCTION

1.1. Background

It is difficult or maybe even impossible to imagine future learning environments that are not supported in one way or another by information and Communication Technologies (ICT), this was affirmed by Punie et al (2000). ICT is the driving force of the new emerging technologies.

Different countries have different needs for computer literate people due to their society standards and level of technology. The world's digital divide is now uneven, there are those who are way ahead in technology and the hardware are easily available and affordable; on the other hand we have those affording a basic computer desktop is a pipe dream beyond reach.

Whereas news reports indicate that ICT has penetrated many sectors including banking, transportation, communications, and medical services, the Kenyan educational system seems to lag behind.

Many African countries, including our country Kenya, continue to lag behind in ICT implementation and that continues to widen the digital and knowledge divide between us and the Western and Asian countries.

In Kiptalam et al (2010), their study showed that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries.

Further, a report by the National Council for Science and Technology (2010) indicated that computer use in Kenyan classrooms is still in its early phases. It was also concluded that the perceptions and experiences of teachers and administrators do play an important role in the use of computers in Kenyan classrooms.

Researches have been conducted of how ICT's can be used to improve learning and teaching of students. ICT use has been used to support innovation and lifelong learning for all.

The demand for ICT learning has been tremendous and the number of teachers who are trained to teach ICT cannot meet the demand. There are more students willing to be taught computing skills than there are competent teachers to transfer the skills. Many students who attend community colleges or the many mushrooming colleges' in house estates, you will find that the teachers are most likely to be a recent graduate of University who know how to use computers. These graduates have no formal training in teaching thus approach the teaching of computer literacy to more or of a step by step instructions of 'click here', 'go to' and 'enter' there. The teaching becomes some sort of rote memorization of steps.

The need for ICT competent teachers stems from the need for ICT competent students and for ICT-rich learning environments that enhance students' learning across the curriculum.

It is from this observation that I see the need to recognize the role the teachers plays in computer literacy instruction being provided in schools.

1.2.Problem Statement

Several researches have been conducted of how ICT's can be used to improve learning and training of students. From the research carried out by Kiptalam et al (2010), it was clear that in Kenya, being a developing nation, there are challenges in teaching computer literacy in schools. Lack of trained teachers, affordability of computers, reliable electricity and use of obsolete computers among other factors are the main challenges.

These challenges have been addressed by many initiatives by the public sector and private sector working together to ensure that many students can access ICT's. The Government has worked determinedly to provide the necessary infrastructure required; for example provision of electricity and fast connectivity as a goal in their Vision 2030. Many Non-Governmental bodies and private companies have bought computers for schools. These initiatives are good efforts towards ensuring that many schools in Kenya have the necessary tools and equipment to provide computer courses.

The modern approach to teaching is that the teaching approach has changed to teachers being required to keep abreast with what is happening in the world. The twenty first century student is not one who will wait and get it first from the teacher, not with the presence of Google and Wikipedia which have become synonymous with acquiring information at the finger tips.

The teacher's approach and methodology of teaching are important and significant factors in providing computer literacy instruction. The attitude of the teachers, their level and use of technology as teaching aids, for example, have created new thinking about the ways of using the computers in the educational systems. There are many prospective uses for computers in the learning process. In some circumstances changes in relevant industries makes computer use in schools imperative.

The main stakeholders in learning are the students and the teachers. Several studies conducted on the effectiveness of computer literacy instruction offer the perspective of the students. Chenbin et al (2010) and Ibrahim (2011) are among those who have carried out the research from the students' viewpoint.

It is on this backdrop that the research intended to assess the effect of teacher's ICT attributes and the learning environment on the computer literacy instructions offered in secondary schools. The effectiveness of the learning outcome of computer literacy instructions was also tested from the perspective of the teacher.

1.3. Justification of the Study

Although use of ICT in learning and providing computer literacy has an important place in the process of education, the perspective and role of the teacher is equally of the same importance.

The role of the teacher is paramount in any system of education. Whatever be the scheme that is under implementation, it is ultimately the teacher who makes or mars the scheme.

It was therefore equally important to assess the teacher's professional attributes, in terms of their capabilities and gender, and learning environment if it has effect on the computer literacy of secondary students. The concerns of the study was whether the teachers, both sexes, are competent, well equipped and prepared to provide computer literacy courses to students and whether the learning environment was conducive for effective computer literacy instruction.

The study intended to find out from the teacher's perspective the effectiveness of the computer literacy instructions and the influence of the learning environment in provision of computer literacy of students.

The study addresses itself to several audiences:

- i. For the teachers who teach computer lessons in schools, the research will assist them rethink their approach and methodology of disseminating knowledge to their students.
- ii. For students, it will provide an understanding of methodology that would be most beneficial in acquiring computer literacy.
- iii. For the general public, especially stakeholders in the education sector and sponsors of computer literacy programmes in schools, will help assure them that the computer literacy instructions being provided in schools is not a waste of time and resources.

1.4. Research Objectives

- i) To identify the key measure of computer literacy instruction in schools.
- ii) To identify the key measures of Teachers Professional ICT Attributes and Learning environment attribute
- iii) To assess effect of the teachers attributes and gender on learning outcome of computer literacy instruction in schools.
- iv) To assess the effect of the learning environment on learning outcome of computer literacy instructions.

1.5. Research Questions

- i) How is computer literacy assessed?
- ii) How is Teachers Professional ICT Attribute assessed?
- iii) How is Learning Environment attribute assessed?
- iv) What is the effect of teachers ICT attributes on the learning outcome of computer literacy instructions?
- v) Does the teacher's experience and gender affect the learning outcome of computer literacy instructions?
- vi) Does gender affect the teacher's capability to teach computer literacy instructions?
- vii) What is the effect of the learning environment attribute on the learning outcome of computer literacy instructions?

1.6. Assumptions of the Research

The following are the assumptions of the study.

- i. It is assumed that the respondents to any of the research tools used will be truthful and knowledgeable enough to field questions posed.
- ii. It is further assumed that the all sampled schools and teachers will voluntarily participate in the study.

1.7.Chapter Summaries

Chapter one which is the introduction, provides a broad overview on the background of the research study. The problem of the study, the assessment of the Teacher's Attributes and the Learning Environment Attributers on whether they affect compute literacy in secondary schools students, was outlines with the research objectives and research questions clearly formulated. Before the chapter was concluded, assumptions of the study were mentioned.

The second Chapter, which is the literature review delivers arguments and scholarly work by other researchers in the area of ICT Learning, Its effects and the role of the teachers. Of notice, is the work by Dr. Paul Newhouse whose framework was used to develop the conceptual framework that concluded chapter two.

Chapter three identifies the research approach that will be espoused to assist answer the research questions and consequently meet the objectives of the research. A research survey methodology where questionnaires were administered to teachers and students was used. The respondents came from Public secondary schools where computer studies is offered as an examinable subject in the KCSE exams and also where schools that have computer lessons as part of extracurricular activities.

The fourth chapter highlights the results and interpretation of the data collected. Data was collected and analyzed using SPSS and simple excel statistical functions.

The last chapter is on the conclusion and recommendations of the study. The chapter pursues to draw conclusions from the data results interpreted in chapter four in line of the research objectives and questions identified in chapter one. It also offers the limitations of the study and recommends areas of further research.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

According to Kombo and Tromp (2006), literature review gives an account of what has already been published on a topic by other researchers. In light of this, several previous works, relevant to the area of my research have been reviewed so as to appreciate what other scholars have been able to do in the field of assessing effect of Information Communication technologies on teaching and learning. There are those works which have been considered to be more relevant to the field of my study and they are discussed below. A conceptual framework is finally proposed at the end of the chapter.

2.1 Computer literacy

Computer literacy instructions are meant to introduce students to the use of the computer and some basic applications. There is no consensus among scholars on the definition and measurement of computer literacy. Some researchers define and measure computer literacy in terms of computer courses completed, the amount of time spent on the computer, and having computers at home while others consider the familiarity with computer terms, experience, and ability, (Ezziane Z, 2007).

The dictionary.com website defines it as familiarity with computers and how they work especially non-technical microcomputers and of the role computers play in modern society. This implies that it is the knowledge and ability to use computers and related technology efficiently, with a range of skills covering levels from elementary use to programming and advanced problem solving.

The technological fluency institute refers to computer literacy as the knowledge and ability to use computers and technology efficiently.

ETS (2007) define computer literacy as using technology, communications tools and /or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society.

For the purpose of this study, computer literacy is defined as understanding computer characteristics, capabilities and applications as well as the ability to implement this knowledge in the skillful, productive use of computer applications to individual role in society.

It is clear from these definitions that one of the most important tasks the school system has to fulfill is to train students for effective use of technological tools in their future and present daily work, (Ezziane Z, 2007). It is therefore clear that teachers have a great role to play in impacting computer literacy in students. As teachers are the best person to prepare students to be IT competent citizens, their readiness in using IT is a crucial factor in narrowing down the digital divide and information gap (Norizan and Mohamed, 2004).

Erlichvika et al, (2009) reminds us that Computer literacy has been a subject of educational research ever since computers were introduced as teaching aids and tools for self- study. Since computer literacy is an integral part of society, whether at home or on the job, it's imperative that students should be given the opportunity to learn computer skills. The problem is that the role of the teacher in developing countries in providing computer literacy instruction has not been researched on to see whether such instructions have actually been helpful to students in equipping them with skills previously not had and whether learning has improved.

The fear that some educators today have is that computer training in schools will serve only to train data entry clerks of the next generation; low level workers of knowledge economy. On the other hand, some hope that enhanced computer literacy will enable a new generation of cultural production, where focus is more on how to use computers to develop applications that provide solutions and not just capturing of data.

Students learn and use the acquired knowledge or it simply remains about acquiring basic computer skills where many rely on list or rote memorization of steps.

2.2 Measures of computer literacy

Norizan and Mohamed (2004) in their study identified 8 categories of computer literacy that are summarized below:

Table 1: Measures of computer literacy

Category	Description
Knowledge of computers and social impacts	Basic knowledge of computer concepts, characteristics and terminologies, knowledge of applications of network communications and knowledge of effects of computer-based instructions in education and society.
Operational Basics	Ability to run the operating systems, install computer programs, print and use application soft wares e.g. word processor, spreadsheet and presentation programs
Basic Internet	Ability to use internet browser, navigational tools, and search engine to conduct information search, downloading materials and communicating online
Computer Assisted Learning and Teaching	Ability to integrate applications software into teaching as well as apply instructional programs.
Web based learning and teaching	Ability to guide students to use internet browser, search engine and for teachers to utilize and develop web based material
Computer Mediated Communication (CMC)	Ability to guide students to use asynchronous and synchronous communication tools and for teachers to use CMC to conduct consultation and teaching online, subscribe to and participate in discussion groups and forums

Category	Description
Computer Assisted Management	Ability to use computers to support classroom management, monitor students' use of computer and plan computer use in the school
Assessment and Evaluation	Ability to evaluate software and effectiveness of computer use in schools as well as use of computers as a testing tool.

Source : Norizan and Mohamed (2004)

Lingard et al (2002) identified the measures of computer literacy as general computer concepts, web page creation, presentation creation, spreadsheets and word processing. In their study, they identified 8 measures of computer literacy as word applications, spreadsheet applications, database applications, presentation applications, multimedia applications, web design applications, web search engine and communication applications.

2.3 The Curriculum and Syllabus

The curriculum is concerned with what is learned and taught. It prescribes what is to be taught and how this learning and teaching occurs. What is learned or taught includes objectives, content, and learning outcomes (the knowledge, skills and attitudes that students are intended to demonstrate). The syllabus on the other hand is descriptive in that, it provides an outline of the topics and concepts to be taught to achieve the curriculum objective.

In Kenya, the Ministry of education in conjunction with the Kenya institute of Education provides a syllabus for the computer studies offered as an optional subject in secondary schools. This is an examinable subject at the Kenya Certificate of Secondary Education (KCSE) exams.

In the National Computer Studies Teachers conference held in 2010, it brought together teachers from across the country to discuss the best practices in teaching computer studies in schools.

The curriculum's objective is to enable learners apply skills acquired to develop themselves mentally, morally, socially and spiritually. It also provides the learner with a firm foundation and opportunity for appreciation of career in computing.

2.4 Computer use in Education

In a case study carried out by UNESCO on ICT in Teacher education, (the use of computer technology in education can be classified into three categories.

1. Computers considered as an “object” which students learn about (hardware and software).
2. Computer technologies as an “aspect”, which means using them as tools in subjects, such as computer-aided design courses, or as general tools in educational settings, such as the use of graphic design software to create web pages for a school.
3. Computer technologies are a “medium” for instruction. In this category, computer technologies can be used for teaching and learning.

Computer literacy therefore must have a balance of the categories; where students learn computers as objects, aspect of computers as tools and also as a medium for instruction. As a medium for instructions, there is a whole lot of literature and research done on how it can aid learning and teaching. Currently, the Ministry of Education has deployed the use of computers via videos and interesting narrations to teach some courses to make them fascinating and clear.

2.5 Learning outcomes

The outcomes of assessing the impact on the learning process, in this case computer literacy as suggested by Fisher et al (2006), focus should be directed on the use of ICT by teachers to train the students and the teachers level of competency in use of ICT.

The impact of ICT can be approached in several ways. According to UNESCO, there is no single concept of learning through the use of ICT. Many types have been envisaged, for example computer classes, computer assisted learning, web based learning, on line training, distance education, e-learning, virtual learning and digital training.

All these approaches require input from the teachers. As much as online training or web based learning has been on the increase or has been hyped, the role the teacher plays whether in terms of curriculum development; assessment remains paramount in the performance of the students and acquisition of skills.

2.6 Pedagogy

A strict dictionary definition would state that pedagogy concerns the science of teaching children. It concerns what teachers do when they interact with children to support their learning. Most educators would consider that pedagogy encompasses the beliefs and actions of teachers including their teaching strategies, the organization of learning experiences and of the learning environment generally.

When people use computers to help themselves complete tasks which they regard as problems, then they are likely to have a more positive attitude towards the use of computers, and are likely to look for further tasks which can be completed using a computer. If, however, people use a computer to complete what they regard to be an unnecessary task or in using the computer, the task is made more difficult or less satisfying, then they are less likely to use computers in the future.

The twenty-first century teacher needs to incorporate in their teaching a methodology that ensures that their students are positively impacted on the use of ICT's that leads to better grades and improved performance. Helios (2006) discussed at the length how it is becoming increasingly difficult to isolate the specific educational use of ICT to determine a concrete impact.

2.7 Teacher/Student Roles

The emphasis is on learning rather than instruction with the student-computer interaction central but with the student in control. The structure is provided by the teacher and software and typically there is also interaction between students and teacher and between the students themselves. The students' focus should be on the problem, concept or task, not on the use of the computer.

Information and communication technologies (ICT) have become commonplace entities in all aspects of life. In his paper, the role of ICT in higher education in the 21st Century, Ron Oliver (Oliver 2005) agreed that the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavors, that within education, ICT has begun to have a presence but the impact has not been as extensive as in other fields.

The research also agrees with Ron, that education is a very socially oriented activity and quality education has traditionally been associated with strong teachers having high degrees of personal contact with learners. The use of ICT in education lends itself to more student-centered learning settings and often this creates some tensions for some teachers and students. But with the world moving rapidly into digital media and information, the role of ICT in education is becoming more and more important and this importance will continue to grow and develop in the 21st century.

Since the dominant role is played by the students they need to develop a strong sense of responsibility for their own learning and develop skills associated with the management of time, concentration, self-discipline, attention to task and ability to follow instructions. They need to develop skills in reflecting on learning experiences and selecting and using learning (problem-solving) strategies.

While the focus is not on the teacher's role, it is nonetheless very important as a manager of students, learning resources and to some degree of learning itself. The teacher will need to set broad learning objectives and task descriptions for students, and provide feedback and monitor progress.

The teacher will need to provide students with access to hardware and software and ensure they know how to use them. The teacher needs to be seen as both a supporter of and model of 'learning'. That is on one hand the teacher motivates, coordinates, sets the guidelines and helps students develop learning strategies while on the other hand he models learning by being involved in the students learning not as an expert but as a fellow learner. This frees teachers to set problems or tasks that are not necessarily centered on their areas of expertise but this may unsettle teachers by placing them in the vulnerable position of 'not knowing'.

2.8 Theoretical Frameworks

Theories help explain phenomenon and makes generalizations about observations. Theoretical frameworks thus are a theory that serves as basis for conducting research.

The theoretical framework provides a structure that can hold or support the theory of research work. According to OECD (2009), a framework serves as the basis for modeling an appropriate assessment approach and design of methodologies and instruments. It should be flexible and adaptable to the purpose of the study to be carried out.

To understand the teachers' role and the influence of the learning environment in providing computer literacy instructions in schools, three frameworks were considered:

- i) OECD (2009) Assessing the effects of ICT in education
- ii) Impact of ICT on Learning Framework
- iii) Norizan and Mohamed (2004) Framework of IT Competency

2.8.1 Assessing the effects of ICT in education framework

OECD (2009) noted that learning practices and teaching need to be assessed in different ways. "New tools and instruments are required to monitor both achievements and progress made in the context of ICT, but there is no clear position yet on adequate indicators, instruments and scale for measurements" (OECD, 2009 pp. 77)

This framework was developed to fill the gap that existed in the literature. It facilitate the construction of models to explain ICT effects in education, and for the adaptation on instruments and data sources that are further analyzed and reported.

The framework identified six domains as reflected in *Table 2*. The domain represents the relevant areas of study.

Table 2: Six domains in assessing effects of ICT in education

Domain	Description
Policies	Type of strategies relating to the implementation of ICT and their effective use.
Resources	ICT infrastructure in terms of hardware, software, network capacities and any type of digital resources used for teaching and learning
Curriculum	The level of ICT integration in the curriculum, including courses on how to use ICT effectively
Organization	Organizational measures to implement ICT and its use
Teaching practices	Use of ICT for teaching activities, pedagogical practices and many others.
Learning	Use of ICT by the learner

Source : OECD (2009)

Indicator as reflected in *Table 2*, describes the state of the domain and vary from context to context and case to case. The specific indicators to look at would be determined partially by the level of analysis (Macro, Meso or Micro). Macro level focuses on the broad national context, Meso on smaller context like school level while the focus of micro is at individual level.

The framework also identifies ICT maturity stages. Each of the different indicators identified would have certain stages of ICT maturity from emerging to Applying to Integrating to Transforming.

The author concludes by stating that the framework permits the review of the analysis in light of the greater scenery of ICT within a given setting. This therefore facilitates the consideration of aspects not specifically accounted for in the original level of analysis, but which might play a great role in understanding the results.

2.8.2 Impact of ICT on learning in schools Framework

“It is not possible to provide a meaningful framework to describe or measure the direct impact of ICT on a student learning per se”, these are the sentiments of Newman (2002) in his paper, The Impact of ICT on learning and teaching.

The framework has five dimensions with possible components given in brackets.

- 1) **Students** (ICT Capability, Engagement, Achievement of Learning Outcomes)
- 2) **Learning Environments Attributes** (Learner-centered, Knowledge-centered, Assessment-centered, Community-centered)
- 3) **Teacher Professional ICT Attributes** (Vision & Contribution, Integration & Use, Capabilities & Feelings)
- 4) **School ICT Capacity** (Hardware, Connectivity, Software, Technical Support, Digital Resource Materials)
- 5) **School Environment** (Leadership & Planning, Curriculum Organization, Curriculum Support, Community Connections, Accountability)

By knowing the impact dimensions, then we can approach a framework that will align the computer literacy instructions that would have the greatest positive impact.

Figure 1 provides a representation of the various relationships that should be considered when looking at the impact of ICT in schools.

Impact of ICT in Schools

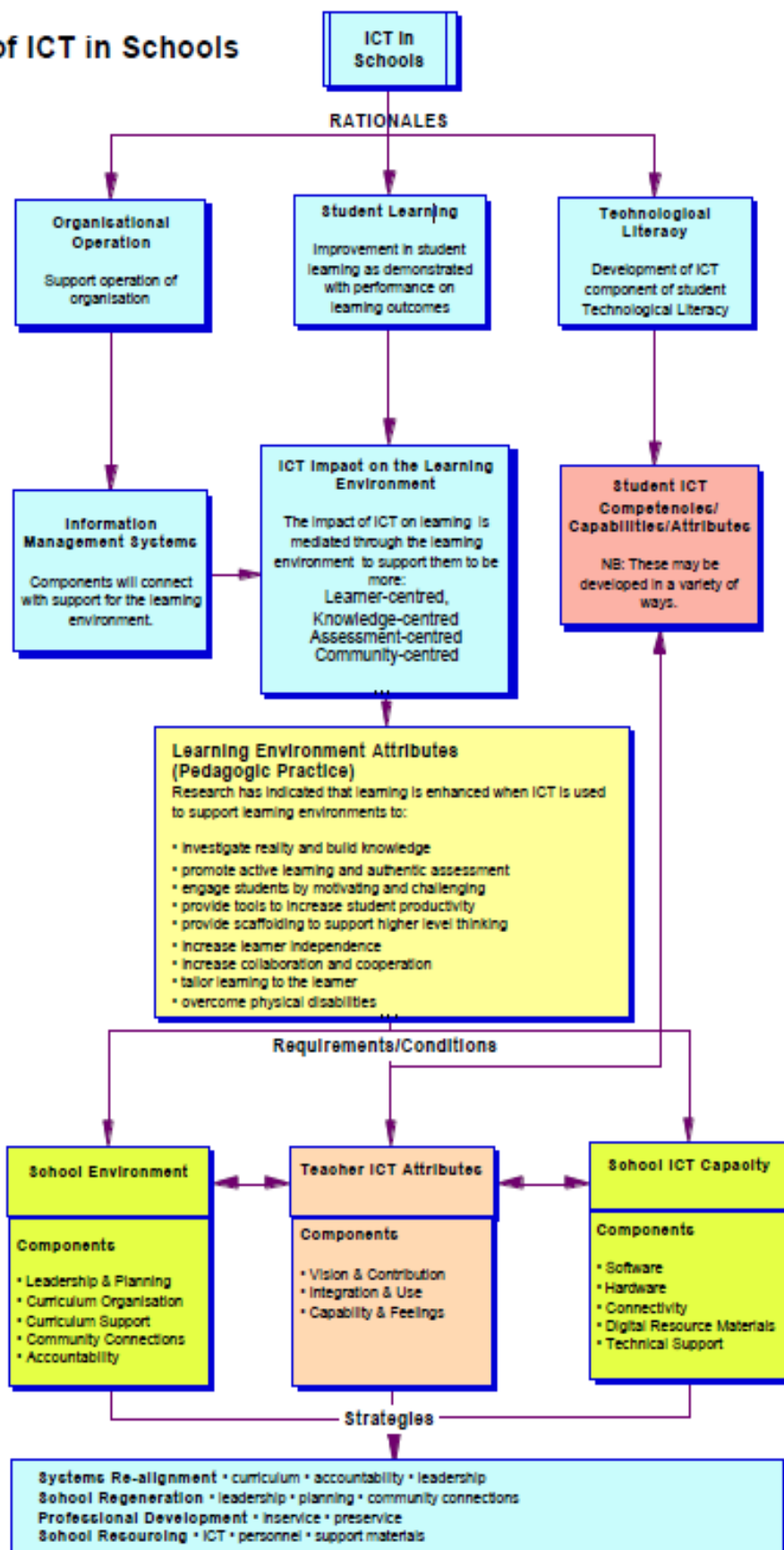


Figure 1: Schematic diagram representing the relationships between the dimensions of impact of ICT in schools

Each dimension may be represented by an outcome as described below:

- i. **Students** - Through the use of ICT students develop an appropriate level of capability, become more engaged with their own learning, and achieve learning outcomes across the curriculum at a higher level.
- ii. **Learning Environments Attributes** - ICT is used to support pedagogical practices that provide learning environments that are more Learner-centered, Knowledge-centered, Assessment-centered and Community-centered.
- iii. **Teacher Professional ICT Attributes** - The teacher exploits the characteristics of ICT to support the learning of students by, effectively integrating their use, wherever appropriate, into constructivist learning environments, and contributing to relevant learning communities.
- iv. **School ICT Capacity** The school provides ICT capacity to ensure that all teachers and students have immediate access to all software that is required to support the curriculum and adequate support to implement its use.
- v. **School Environment** That school environment is supportive of teachers and students use of ICT built on a shared, community-based vision that prepares students to learn, work and live successfully in a knowledge-based, global society.

The Impact on learning, framework, which was formulated by Newhouse, Trinidad and Clarkson in (2002), also centers attention on teacher's competency and characteristics of the teacher. The focus of this study is the learning environment and the teacher's ICT attributes. By way of mentioning, the framework would ultimately provide an extent of the effect of the attributes that impact on computer literacy, in essence learning.

The Teacher Professional ICT attributes is the focus of the research study. The framework explains that it should not be used to describe good teaching but that emphasizes that good teachers will always find better ways of teaching and thus use technology to support that.

Further, it should be placed in a broader framework when being implemented for ICT in schools.

The other main focus of the research is the effect on the learning as far as computer literacy is concerned. The focal point is on the Teacher; that is the Teacher professional attributes, sex and the learning environment attributes. The study seeks to explore the relationship between these dimensions and their relationship rationale on the effects of computer literacy in schools.

2.8.3 Norizan and Mohamed (2004) Framework of IT Competency

This framework aimed at assisting teachers with different background and years of teaching experience and with different computing abilities to achieve a common understanding on what constitute an IT literacy teacher. It was also designed to help teachers equip themselves with appropriate computing skills.

After reviewing previous models, the researchers identified 98 measures of IT literacy which they grouped into 4 categories (Dimensions) which they said can be used to measure the effectiveness of a teacher to teach computer literacy as shown in Table 3, below.

Table 3: Four Dimensions of measuring teacher's effectiveness

Dimensions	Description
1. Basic Computer knowledge and operational Skills	-Foundation for other computer skills -Skills to run the Operating Systems, install computer programs, print documents and use applications software, for example MS Word
2. Teaching and Learning Skills	-Ability to use and integrate application software and instructional programs in teaching and learning process, and the ability to use internet facilities and search engines for searching and delivering web based teaching and learning materials. -Ability to guide students to use internet facilities and facilitate online activities and communication.

Dimensions	Description
3. Planning and Managing Computer based Environment Skills	-Ability to support an effective computer based environment e.g. Plan and integrate computer- assisted instructions into curriculum, manage student data online and monitor student's use of computers for self-assessment work
4. Assessment and Evaluation	-Ability to evaluate software, web-based materials and online information for their suitability in classroom. -Ability to gauge the students' needs and achievements with the applications of computer based instructions. -Ability to handle computerized testing

2.9 The Conceptual Framework

The theoretical framework identified provided the basis for the study and the development of a conceptual framework and operationalization of the theories discussed.

This research looks at the teacher in the whole framework of assessing computer at literacy instructions provided in schools and the influence of the learning environment in aiding learning.

A scan of literature reveals that there are four major stakeholders in schools: school administrators, teachers, parents, and students (Noeth and Volkov, 2004 and OECD, 2007). Amongst this the teacher plays a great role of providing computer literacy instructions.

Because of the time and financial constraints and because of the strategic nature of teachers in impacting computer literacy instructions to students, this study will be limited to the teachers ICT attributes and the learning environment attributes.

According to Kaffash et al, (2010) the role of teacher should change from disseminator of information to learning facilitator, helping students as they actively engage with information and materials to construct their own understandings. That is, students learn how to find out not just what to learn.

The proposed framework borrows heavily from Newman, (2002) Framework for Articulating the Impact of ICT on Learning in Schools and OECD, (2007), Conceptual Framework for studying ICT effects.

2.10 Framework Development

Newman, (2002) identified five domains for assessing computer literacy namely: Students, Learning Environments Attributes, Teacher Professional ICT Attributes, School ICT Capacity, School Environment. These dimensions are related to those identified by OECD, (2007).

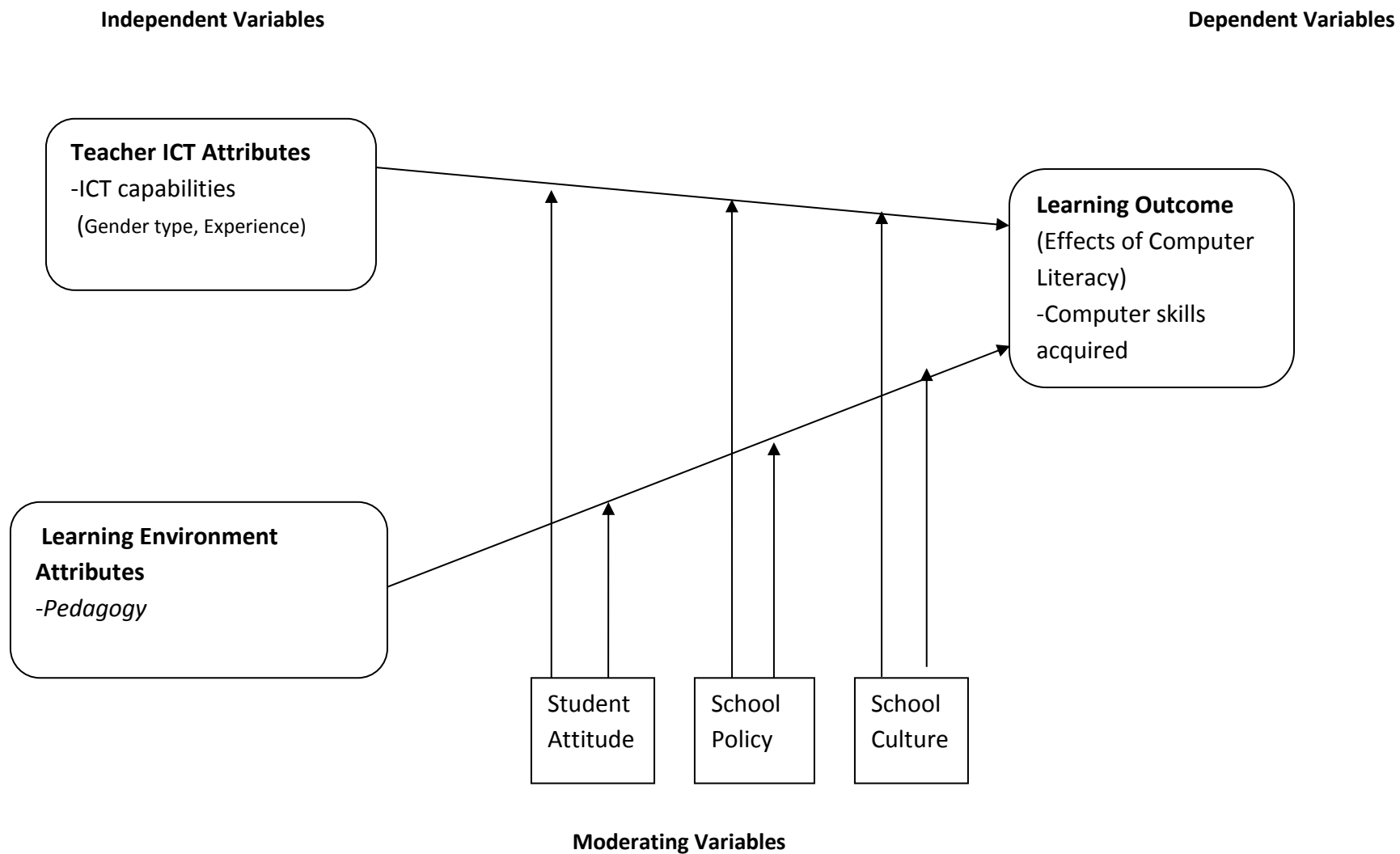
According to OECD, (2007), the framework identified two criteria for evaluating the appropriateness of a domain: the domains should cover the complete range of analytical constructs to be studied and that each domain should be exclusive and not overlap with other domains. Based on this criterion, this study adopted the domains as stated by OECD (2007). However the scope of the study is limited to the role of the teacher on computer literacy instructions in school, so the study narrowed down to those domains that a teacher has a great influence.

Two domains, Teacher Professional ICT Attributes and Learning Environments Attributes were as a result identified.

The Conceptual framework is adapted from the Newman et al (2002) - Impact of ICT on Learning Framework and the Norizan and Mohamed (2004) Framework of IT Competency

The Conceptual framework is as shown in figure 2.

Figure 2: Conceptual Framework



Source: Adapted from the Dr. C. Paul Newhouse framework on the Impact of ICT in Learning

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the methodology applied in carrying out the research. The major areas it addresses are; the research design chosen, sources of data for the study, tools and procedure for collecting data the study, sampling methodology, sample size and its justification, methodology of data analysis and finally the approximate duration the study will take in form of a project schedule.

3.1 Research Design

Kombo and Tromp (2006) iterated that a Research design is used to come up with the structure of the research in which the major parts of the research project work in harmony in addressing the central research questions, Survey design, in which information is gathered through interviews and administration of questionnaires to a sample of respondents used in the study.

Survey research design, which is a systematic method for gathering information through interviews and administering of questionnaires to a sample of members of the population, was used in the study. Main purpose of the design is to describe the attributes of the larger population, from the sample.

Survey method has certain features which are deemed useful during the research.

- i. Information is gathered by asking people questions: - this is accomplished by either conducting one on one interviews or administering questionnaires to sampled respondents. This feature blended well in this research; this is because to gain meaningful knowledge on the current factors affecting computer literacy instructions, in Kenyan schools, it was necessary to talk to teachers of computer studies in the sampled schools. This was accomplished by administering questionnaires.

- ii. Another feature of survey method is collection of data from a subset of the population. This subset is referred as a sample. This feature was handy in this research because it was difficult to collect data in the whole population of all teachers in secondary schools that provide computer literacy classes in Kenya. Therefore a sample of schools that provide computer literacy instructions and the teachers was surveyed and data collected which is deemed to represent the population which in this case is all teachers and schools that provide computer literacy instructions in Kenya.

This study relied heavily on survey method. According to Gable (1994), survey approach is the group of methods which emphasizes quantitative analysis, where data are collected, from many organizations through methods such as questionnaire, interview, or from published statistics, and these data are analyzed through statistical techniques.

Survey approach, by studying a representative sample of organizations, aims at discovering relationships that are common across organizations, and hence to provide generalizable statements about the object of study (Gable, 1994).

3.2 Sources of Data

The data was collected directly from respondents through questionnaires that were administered to respondents identified in sampled schools and teachers in Nairobi and Kiambu County. This source was significant for the research because questions asked were to find out the teachers capabilities in teaching computer literacy and the effects of computer literacy on the students.

Secondary data was also collected to construe the content of the course in terms of what is taught in a computer studies class. The data collected from the various schools and teachers was used in confidence without revealing the identity of the teachers or school.

3.3 Tools, Procedures and Methods for Data Collection

This research largely made use of quantitative data collection method. This method was opted for because of the following reasons.

- That the data collected be as accurate and precise as possible. This would not be very easy to achieve with qualitative method of data collection.
- The questions posed were largely closed-ended questions. This would help in timely analysis of data and inference thereof given time limitation of the research.

In the study, self-administered questionnaires, with largely closed-ended and short questions, were used. The questionnaires were distributed to selected teachers in the identified sample schools of the population. The questions were designed in such a way that they have no ambiguity; they are relevant and have consistency in logic. Also where necessary, to ensure that the respondents answer the questions well, the questions were followed by short explanations.

The use of a questionnaire was chosen for the research to provide the primary data because they tend to give accurate and precise data and also they are more suited especially where sampling is employed as it is in this study.

3.4 Procedure of Data Collection

After random selection of the schools to participate using Microsoft Excel RAND was done, the teachers who teach computer studies were asked to participate in the study. These are the teacher to whom questionnaires were administered to.

A pre-test of questionnaires was done before the survey was rolled out. This ensured that the tool was well developed and that it was acceptable to the respondents. The projected time period for this exercise was one week.

After the pre-test of survey tools and identification of respondents, the tools developed for the purpose of data collection was administered i.e. questionnaires were distributed.

Constrained by time, the exercise took two weeks where data coding and cleaning was done as questionnaires were collected

3.5 Testing the measuring Instruments

Reliability and validity tests were used as the key determinants for soundness of the research instrument.

(a) Validity testing

According to Kothari C. R (2004), validity shows the extent to which an instrument measures what it is supposed to measure. This study addressed construct validity, content validity and face validity.

- Construct validity is the degree to which scores on a test can be accounted for by the explanatory constructs of a sound theory (Kothari C. R, 2004).
- Content validity is the extent to which a measuring instrument provides adequate coverage of the topic under study (Kothari C. R, 2004).
- Face validity is a non-statistical validation method used to get opinions on whether an instrument ‘looks like’ it is going to measure what it is supposed to measure.

(b) Reliability Test

Reliability is a measure of the degree to which a measuring instrument provides consistent results. Cronbach alpha coefficient was used to measure reliability.

3.6 Sampling

Our populations of study are the public secondary schools in Nairobi County and Kiambu County that provide computer literacy. Given that there are many schools, the research will employ both probability and non-probability sampling designs.

Stratified random sampling, where the population of study is divided in related subgroups – in our case; the schools that offer computer literacy instructions - will be used. In either category, a simple random sample will be chosen.

The sample included teachers in both public and private schools. After the sample has been identified, the particular respondents from each school were identified who participated in the study.

3.7 Data Analysis Methods and their Justification

Data analysis is said to be the examination of the data that has been collected in a research and making deductions and inferences; Kombo and Tromp (2006). It involves the scrutiny of collected information and making inferences.

The received questionnaires were checked against the distribution list to determine the response rate. The returned questionnaires were checked to establish whether they were correctly filled. Editing (examining raw data to detect error, omissions etc.) was done where necessary. The questionnaires were thereafter coded, classified and tabulated.

The SPSS version 16 was used to analyze the data. Data from the respondents was analysed using a combination of statistical methods including frequencies, measure of central tendency and measures of dispersion.

Moderated multiple regression analysis was used to test the relationship the variables.

This study intends to use confirmatory data analysis method which makes use of probability theory in the effort to answer particular questions.

This method was considered because our study is largely quantitative in nature. In quantitative data analysis, numerical values are measured and descriptions such as mean and standard deviations are made.

Upon collecting data, statistical data analysis software such as SPSS will be utilized to help in our data analysis.

CHAPTER 4: DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter presents analysis, presentation and interpretation of the data collected from the survey which was explored in two parts; the first part demographics and descriptive statistics of the data and the second part analysis of the data tested using Simple Regression analysis and the Moderate Multiple Regression Analysis.

The results obtained are explained and interpreted. A validated research framework is presented at the end of this chapter.

4.1 Data Editing and Coding

After collecting data, it was edited by checking and adjusting for errors, omissions, legibility and consistency in order to ensure completeness, consistency, and readability of the data. All the questionnaires were first examined as they were received with an aim of cleaning the data for analysis. This process resulted to elimination of 14 out of the 100 questionnaires returned, for either being incomplete or wrongly filled.

Data was coded by assigning alpha-numerical symbols, and edited before it was entered into SPSS. Each question or item in the questionnaire has a unique variable name.

4.2 Pilot Test

The first step in the data analysis was to test the reliability and validity of our data collection instruments using a pilot study involving 15 respondents.

a. Reliability

Reliability analysis was done using SPSS version 16. An overall Cronbach's alpha 0.799 was obtained as shown in Table 4.

Table 4: Questionnaire Reliability Statistics

Cronbach's Alpha	N of Items
.799	36

Source: Research

b. Validity

Content validity was achieved by borrowing from previous models (e.g. Newman, 2002) and seeking response from the respondents on the content of the measuring instruments. When producing the final version of the questionnaire, the remarks and recommendations of these respondents were taken into account where necessary.

Face validity was achieved by administering the questionnaire to two computer studies teachers, and two ICT experts with an aim of checking whether the questions were clear and in line with our research questions addressed by the research framework. Based on the reviewer's comments, necessary changes were made before the questionnaires were administered.

Construct validity was determined through correlation analysis. This was done in order to establish the degree to which two measures of the same concept correlated with each other. The results of correlation analysis for the item-total correlation for many items in most constructs were within the acceptable range (above 0.3) implying good validity of the instrument being tested.

4.3 Demographics and Descriptive Statistics

The demographics and descriptive statistics describe the characteristics of the data collected. It describes the respondents and their statistics of how they were distributed with respect to:

- gender
- the number of years in teaching experience
- the teacher's teaching capabilities
- the learning environment attributes
- the effects of computer literacy (learning outcome)

4.3.1 Respondents by Gender

86 properly filled questionnaires were received out of the 100 which were distributed. This translates to 86% response rate.

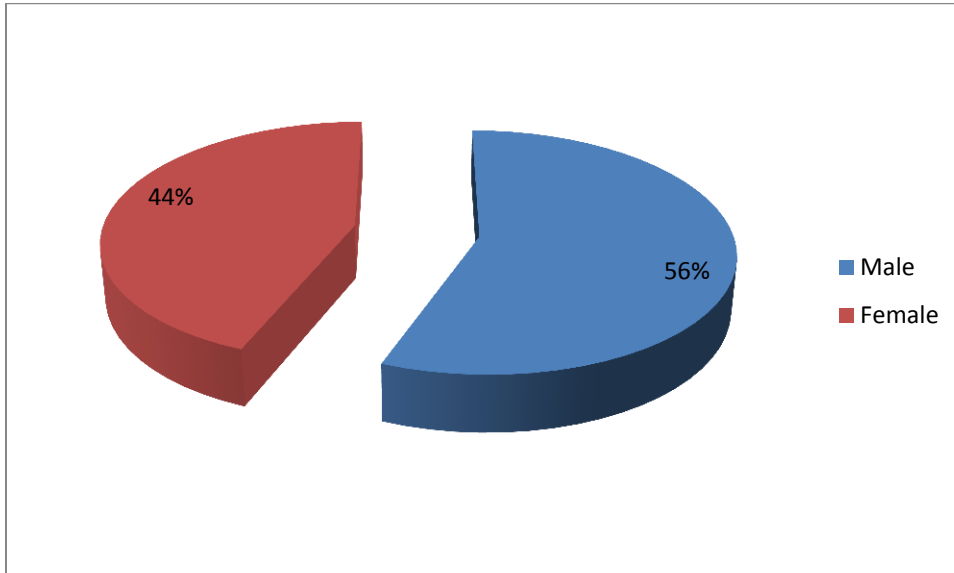
Majority (60%) of the respondents in this survey were male while the remaining 40% of them were female as shown in table 5 and figure 3 below.

Table 5: Respondents by Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	48	55.8	55.8	55.8
Female	38	44.2	44.2	100.0
Total	86	100.0	100.0	

These gender demographics can also be represented in the pie chart figure below

Figure 3: Respondents by gender



Source: Research

4.3.2 Respondents by Length of Teaching Experience

About 70% of those teachers who responded have taught computer lessons for more than 5 years as shown in Table 6. The results can therefore be said to be dependable as they come from experienced people.

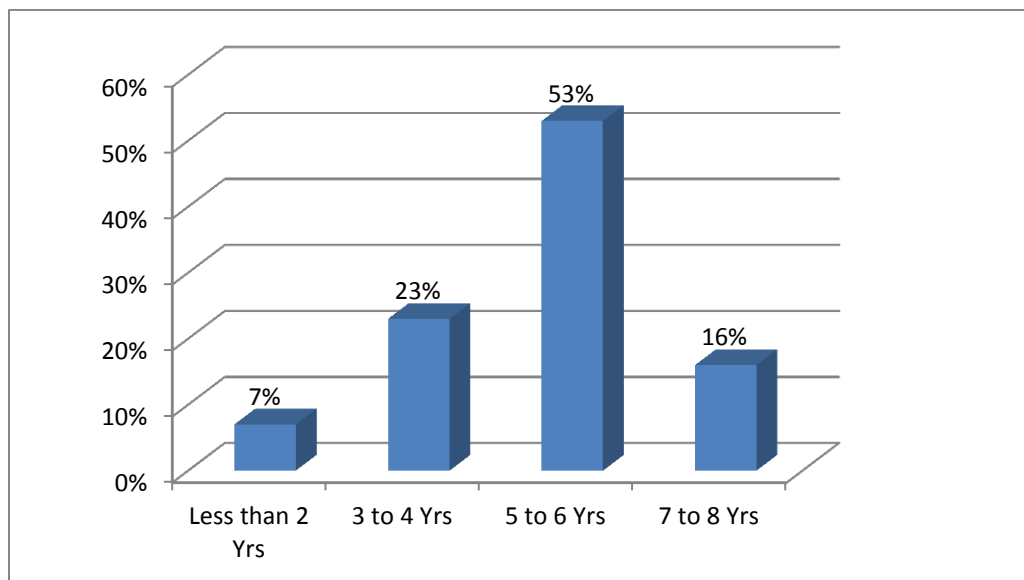
Table 6: Length of Teaching Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2 Yrs	6	7.0	7.0	7.0
	3 to 4 Yrs	20	23.3	23.3	30.2
	5 to 6 Yrs	46	53.5	53.5	83.7
	7 to 8 Yrs	14	16.3	16.3	100.0
	Total	86	100.0	100.0	

Source: Research

This information is also represented in the graph below:

Figure 4: Length of teacher's teaching experience



Source: Research

4.3.3 Teacher Professional ICT attributes Dimension

Majority of the respondents feel their ability to teach the computer literacy areas identified in the literature (i.e. introduction to comp, Operating Systems, word processing applications, spread sheet applications, database applications, presentation applications, multimedia applications, Internet applications and Security control) is above average or they are experts in these areas.

As shown in table 7, Operating Systems was the popular subject for most teachers with a mean of 4.40 followed by introduction to computers with a mean of 4.30.

The most unpopular subject was database applications and Multimedia applications each with a mean of 4.13. All the computer literacy lessons have a standard deviation of between 0.843 and 0.992.

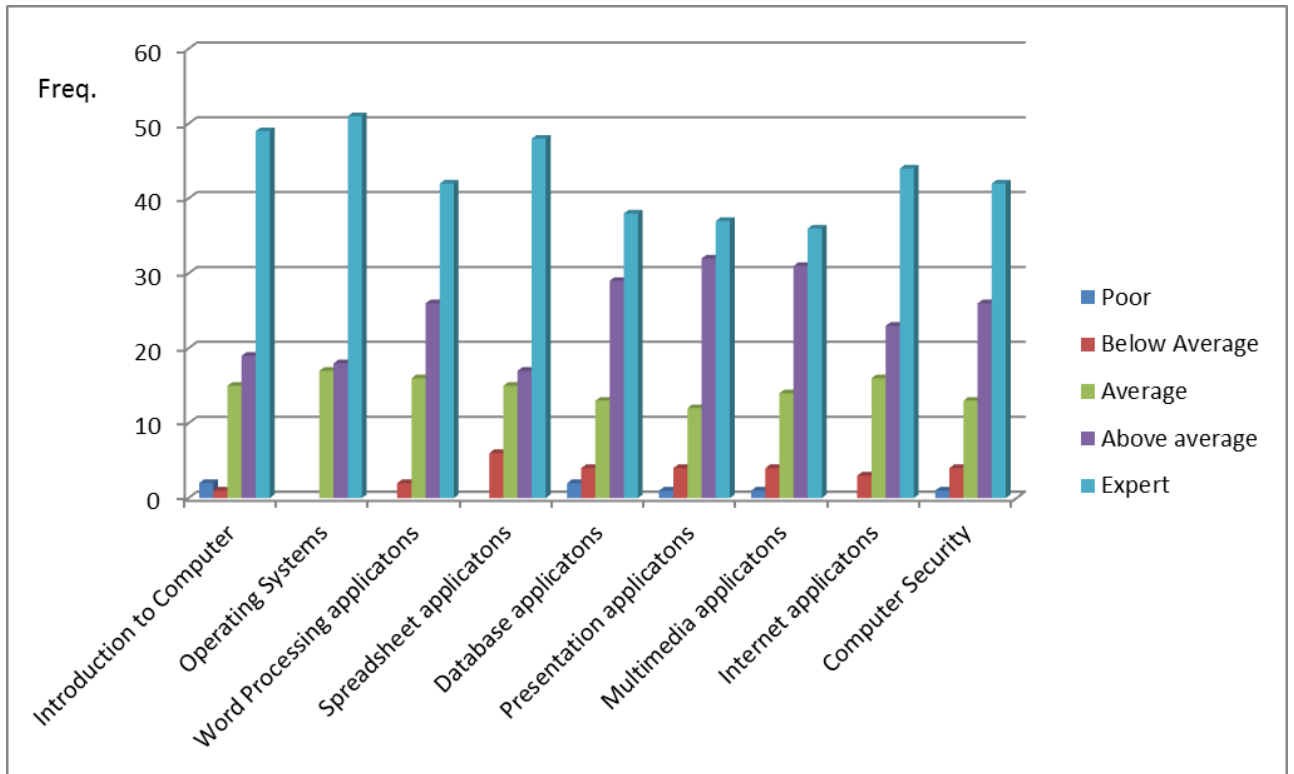
Table 7: Teacher's Capabilities

	Introduction	OS	Word Processing app	Spreadsheet app	Database app	Presentation app	Multimedia app	Desktop Publishing	Internet app	Security control
N Valid	86	86	86	86	86	86	86	86	86	86
Missing	0	0	0	0	0	0	0	0	0	0
Mean	4.30	4.40	4.26	4.24	4.13	4.16	4.13	4.21	4.26	4.21
Std. Deviation	.959	.801	.843	.981	.992	.919	.930	.883	.884	.947
Minimum	1	3	2	2	1	1	1	1	2	1
Maximum	5	5	5	5	5	5	5	5	5	5

Source: Research

The same information about the ability of teachers to teach computer literacy instructions is represented in the graph below.

Figure 5: Teacher's teaching Capabilities



Source; Research

4.3.4 Learning Environment Attributes Dimension

Descriptive statistics for Learning Environment Attributes Dimension are presented in Table 8 below. The measurement scale consisted of 11 measures as shown. These measures explained the environment and the teaching approach used by the teachers.

Table 8: Learning Environment Attributes Dimension Descriptive Statistics

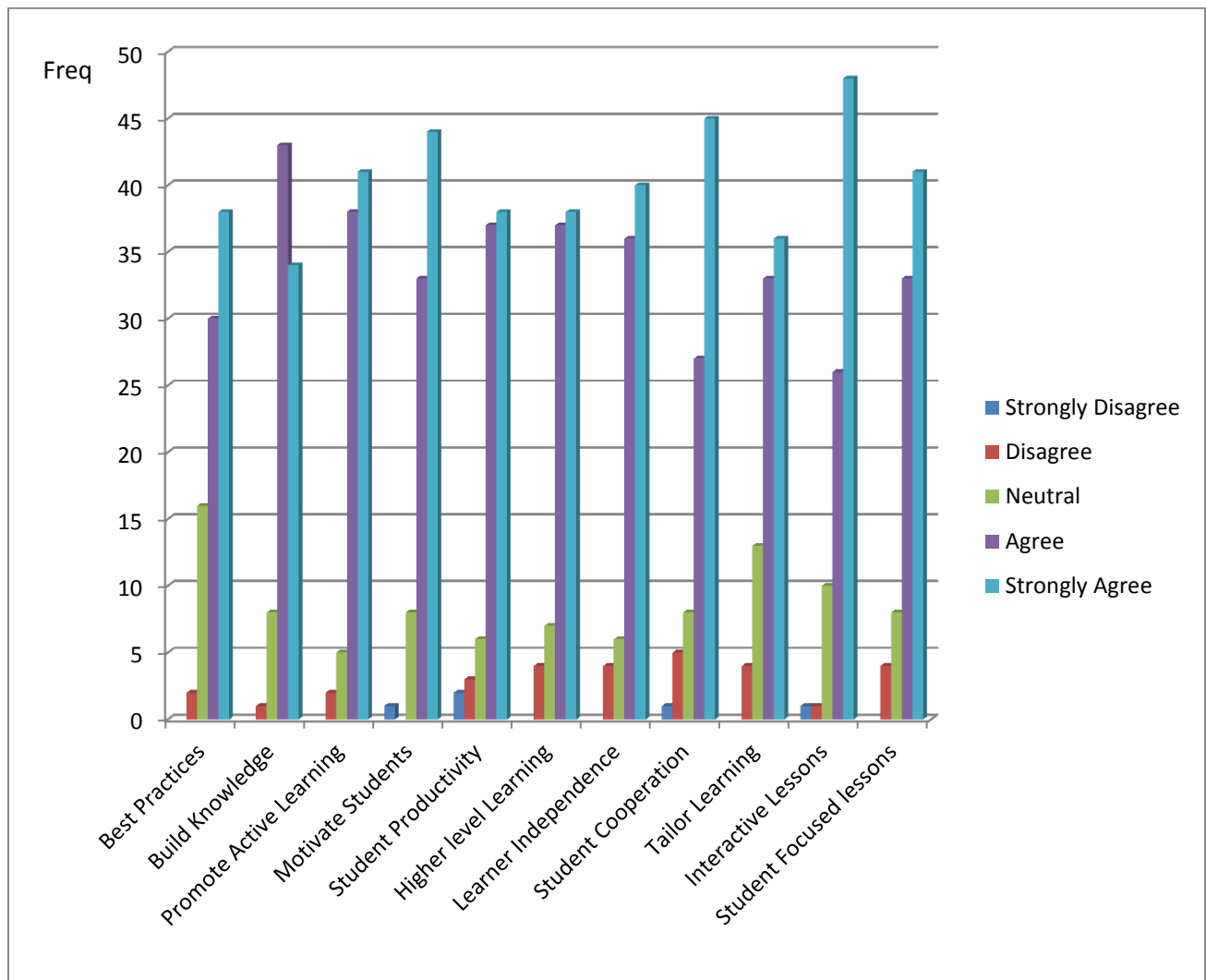
	N	Minimum	Maximum	Mean	Std. Deviation
Best Practices	86	2	5	4.21	.828
Build Knowledge	86	2	5	4.28	.680
Promote Active Learning	86	2	5	4.37	.704
Motivate Students	86	1	5	4.38	.754
Student Productivity	86	1	5	4.23	.903
Higher level Learning	86	2	5	4.27	.803
Learner Independence	86	2	5	4.30	.798
Student Cooperation	86	1	5	4.28	.941
Tailor Learning	86	2	5	4.17	.857
Interactive Lessons	86	1	5	4.38	.828
Student Focused lessons	86	2	5	4.29	.824
Valid N (list wise)	86				

Source: Research

As shown in Table 8, the mean scores of the measurement items were between 4.17 and 4.38 while the standard deviations were between 0.680 and 0.941. It can therefore be noted from mean that majority of the respondents were of the opinion that a conducive learning environment do have a positive effect on learning of computer literacy Instructions. Standard deviations of more than one imply that there was greater disparity in respondents' opinion while the standard deviations of less than one indicates that respondents' opinions were almost the same.

To complement the descriptive statistics on table 8 above, figure 6, below shows that majority of the respondents either strongly agreed or agreed with all the measures of Learning Environment Attributes.

Figure 6: Learning Environment attributes



Source: Research

4.3.5 Effect on Student Learning

The effect on student learning, also learning outcome, is as shown in Table 9, the mean scores of the measurement items were between 4.15 and 4.47 while the standard deviations were between 0.684 and 0.861. It can therefore be noted from mean that majority of the respondents were of the opinion that computer literacy instructions has an impact on learning in secondary schools.

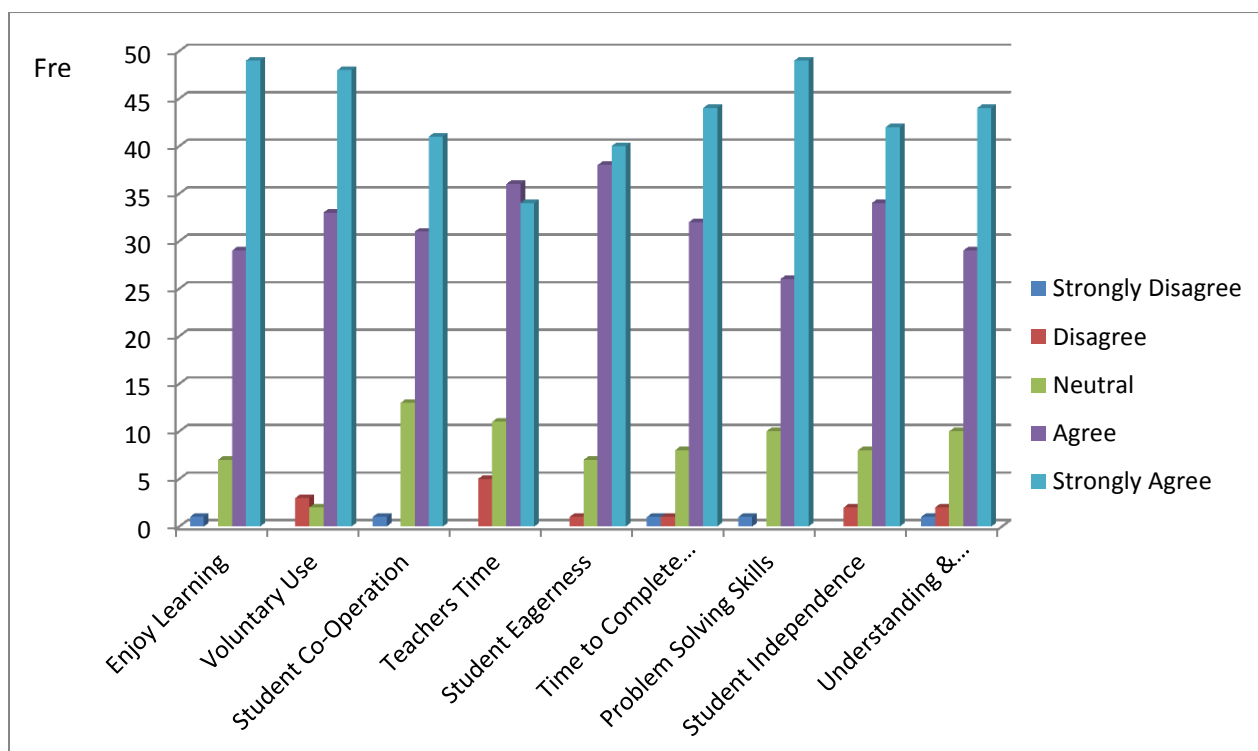
Table 9: Learning Outcome Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Enjoy Learning	86	1	5	4.45	.746
Voluntary Use	86	2	5	4.47	.715
Student Co-Operation	86	1	5	4.29	.810
Teachers Time	86	2	5	4.15	.861
Student Eagerness	86	2	5	4.36	.684
Time to Complete Tasks	86	1	5	4.36	.796
Problem Solving Skills	86	1	5	4.42	.789
Student Independence	86	2	5	4.35	.748
Understanding & reflection	86	1	5	4.31	.858
Valid N (list wise)	86				

Source: Research

It can be noted from the figure 7 below, that majority of the respondents; either strongly agreed or agreed that computer literacy instructions have affected learning in secondary school.

Figure 7: Learning Outcome graph



4.4 Regression Analysis

Regression analysis is a statistical technique used to investigate the relationships between a dependent variable and one or more independent variables. Simple linear and multiple linear regressions are the most common regression models applied.

In this study, multiple linear regression is used to investigate the direct relationship between learning and the two independent variables (Teachers professional attributes and Learning environment attribute) while moderated regression analysis was used to test the interaction effect.

Before regression was performed, the data was tested for Multi-collinearity using the Variance Inflation Factors (VIF) measure as shown in the co-efficient Table 13.

Multi-collinearity is a problem when the VIF measure exceeds 10. In this model, the VIF measure is 1.312, hence no Multi-collinearity problems.

4.4.1 Testing for Direct Effect

a) Simple regression analysis

At 1% level of significance, a positive relationship was found between Teachers Professional Attributes and Learning outcome with a positive Beta value of 0.520. This means Teachers Professional Attribute has a positive effect on Learning Outcome as shown in table 10 below:

Table 10: Relationship between Teacher's attributes and Learning Outcome

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.535	.330		7.682	.000
AT	.430	.077	.520	5.580	.000

a. Dependent Variable: AE

At 1% level of significance, a positive relationship was found between Learning Environment Attributes and Learning outcome with a positive Beta value of 0.762. This means Learning Environment Attribute has a positive effect on Learning Outcome as shown in table 11 below:

Table 11: Relationship between Learning Environment and Learning Outcome

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.141	.300		3.802	.000
AL	.749	.069	.762	10.792	.000

a. Dependent Variable: AE

b) Multiple Regression Analysis

The two independent variables (Teachers Professional Attributes and Learning Environment Attributes) were regressed against the dependent variable.

Table 12: Multiple Regression Co-efficient

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	.861	.313		2.755	.007		
AT	.161	.065	.195	2.478	.015	.762	1.312
AL	.655	.077	.667	8.497	.000	.762	1.312

a. Dependent Variable: AE

As shown in table 12 above, the two independent variables obtained positive beta weights (0.195 and 0.667 for teacher's attributes and Learning environment respectively) with the p-values of the all the t-tests significant at 5%, hence have a positive effect on Learning Outcome.

Between teachers professional attribute variable and learning attribute variables, learning Environment attribute variables has the most influential effect on learning ($\beta=0.667$) compared with teachers attribute variables ($\beta=0.195$).

Table 13: ANOVA^b test between Independent and Dependent Variables

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.179	2	8.589	64.868	.000 ^a
	Residual	10.990	83	.132		
	Total	28.169	85			

a. Predictors: (Constant), AL, AT

b. Dependent Variable: AE

The F statistic of 64.868 was significant at the 1 % level of significance (Table 13). Therefore, the independent variables have some power to predict Learning.

Table 14: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.781 ^a	.610	.600	.36389

a. Predictors: (Constant), AL, AT

In addition, the coefficient of determination (R^2) which indicates the model fit revealed that 61% of the variance in Learning can be explained by the regression model, table 14 above..

Key : AL=Learning Attributes

AT= Teacher's attributes

AE = Learning Outcome

4.4.2 Testing for Moderation Effects

The results of the hypothesized moderators are discussed in the following sections. The statistics that describe the moderating effect include the multiple R-square (R²), Significance levels and the Beta values. These values are presented for each product term that represents a moderating effect.

With respect to the properties of interaction constructs, R² measures the predictive power of the model on facilitating conditions. Beta values measures the strength of the relationship.

a. The Moderating Effects of Attitude

The two interaction terms (Teacher Attribute*Attitude and Learning Environ*Attitude) are significant (at 5% level of significance) as reflected in the coefficient Table 15 below.

Table15: Moderating Effect of Attitude

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.786	.303		2.598	.011
AT	.662	.191	.801	3.457	.001
AL	.195	.190	.198	1.022	.310
T_Att	-.341	.121	-1.288	-2.825	.006
L_Att	.320	.118	1.303	2.702	.008

a. Dependent Variable: AE

Where AT = Teacher ICT attributes

AL= Learning Environment Attributes

T Att= the moderating term Attitude on Teacher ICT Attributes

L Att = the moderating term Attitude on Learning Environment Attributes

AE = Learning outcome

Table 16: Model Summary-Attitude

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.804 ^a	.646	.629	.35081

a. Predictors: (Constant), L_Att, AT, AL, T_Att

The interaction terms have also contributed to the change of the explanatory power of the overall model (From 0.610 to 0.646) as seen on table 16 above.

This implies that attitude has a statistical significance interaction effect on the relationship between Teachers Attribute variable and Learning outcome and between the Learning environment variable and Learning Outcome.

b. The Moderating Effects of Policy

This study also found the two interaction terms (Teacher Attribute*Policy and Learning Environment *Policy) as not statistically significant (at 5% level of significance) as reflected in the coefficient table 17 below.

Table 17: Moderating Effect of Policy

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.842	.318		2.647	.010
	AT	.245	.197	.297	1.241	.218
	AL	.584	.192	.595	3.042	.003
	T_Policy	-.070	.152	-.252	-.460	.647
	L_Policy	.062	.147	.236	.426	.671

a. Dependent Variable: AE

Policy as a moderating effect contributed paltry to the explanatory power of the model (from 0.610 to 0.611) as reflected in the model summary table 18 below.

Table 18: Model Summary – School Policy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.782 ^a	.611	.592	.36777

a. Predictors: (Constant), L_Policy, AT, AL, T_Policy

c. The Moderating Effects of Culture

The t statistics associated with the β values for the two interaction terms (Teacher Attribute*Culture and Learning Environment*Culture) are significant at 5% level of significance as reflected in the coefficient table 19 below. This implies therefore implies that Culture do have a statistical significance interaction effect on the relationship between Teachers Attribute variable and Learning outcome and between the Learning environment variable and Learning Outcome.

Table 19: Moderating Effect of Culture

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.771	.306		2.518	.014
	AT	-.243	.185	-.294	-1.314	.193
	AL	1.041	.195	1.060	5.330	.000
	T_Cul	.277	.118	1.119	2.340	.022
	L_Cul	-.250	.117	-1.007	-2.135	.036

a. Dependent Variable: AE

The interaction terms have also contributed to the change of the explanatory power of the overall model (From 0.610 to 0.640) as reflected in the model summary table 20 below. This implies that Culture has a statistical significance interaction effect on the relationship between Teachers Attribute variable and Learning outcome and between the Learning environment variable and Learning Outcome.

Table 20: Model Summary – School Culture

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.800 ^a	.640	.623	.35368

a. Predictors: (Constant), L_Cul, AT, AL, T_Cul

4.5 ANOVA on whether experience and gender affects learning outcome

Teachers were asked to state their computer literacy teaching experience. The experience was grouped into 5 categories (i.e. below 2 years, 3-4, 5-6, 7-8, above 8 years). No respondent indicated that they have more than 8 years' experience so we conducted the ANOVA based on the first 4 groups.

A two way independent ANOVA was conducted to establish whether experience and gender do affect learning outcome.

Table 21: Gender and Experience Descriptive Statistics

Dependent Variable:AE

Gender	Experience	Mean	Std. Deviation	N
Male	Less than 2 Yrs.	4.5185	.35717	3
	2 to 4 Yrs	4.2460	.52872	14
	5 to 7 Yrs	4.3065	.73322	29
	8 to 10 Yrs	4.6667	.31427	2
	Total	4.3171	.64381	48
Female	Less than 2 Yrs	3.8148	.42066	3
	2 to 4 Yrs	4.3889	.50062	6
	5 to 7 Yrs	4.4444	.48908	17
	8 to 10 Yrs	4.4722	.42673	12
	Total	4.3947	.48100	38
Total	Less than 2 Yrs	4.1667	.51997	6
	2 to 4 Yrs	4.2889	.51159	20
	5 to 7 Yrs	4.3575	.65123	46
	8 to 10 Yrs	4.5000	.40825	14
	Total	4.3514	.57568	86

The descriptive statistic table 21 above shows that Male teachers who have taught for 8 to 10 years have the highest effect on learning outcome with a mean of 4.6667.

Table 22: ANOVA Test between Gender and Experience

Dependent Variable:AE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.691 ^a	7	.242	.712	.662
Intercept	768.361	1	768.361	2.263E3	.000
D001	.241	1	.241	.710	.402
D003	.565	3	.188	.555	.646
D001 * D003	1.071	3	.357	1.052	.375
Error	26.478	78	.339		
Total	1656.568	86			
Corrected Total	28.169	85			

a. R Squared = .060 (Adjusted R Squared = -.024)

A test of between-Subject Effects was done to test the effect between the gender and experience variables. As shown in table 21 above, the effect of the two independent variables (Gender and Experience) is not significant (at 5% level of significance).

This implies that Experience and Gender of teacher do not significantly affect learning Outcome.

4.6 Independent T test for Gender capability to teach computer instruction

An independent samples T test was used to establish whether there is any significant difference between the ability of the Male and the Female teachers to teach computer literacy instructions.

From the descriptive table 23 below Male Teachers have a mean of 4.1667 and a standard deviation of 0.70841, while Female Teachers have a mean of 4.3079 and a standard deviation of 0.11082.

Table 23: Descriptive Statistics on Gender

Gender		N	Mean	Std. Deviation	Std. Error Mean
AT	Male	48	4.1667	.70841	.10225
	Female	38	4.3079	.68315	.11082

This study first established whether there are significant differences between the variances of the two independent groups (Male and Female Teachers) using the Laverne's Test for equality of variances.

From table 24 below, The F statistic of 0.059 was not significant at the 5 % level of significance. This implies that the variances between the ability of the male and female teachers to teach computer literacy instructions is not significantly different.

Table 24: Gender comparison on teaching capability

		Laverne's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AT	Equal variances assumed	.059	.809	-.933	84	.354	-.14123	.15143	-.44237	.15991
	Equal variances not assumed			-.937	80.744	.352	-.14123	.15079	-.44126	.15880

Since equal variances are assumed, we proceed to compare the mean. The difference between the two mean is -0.14123. The value of t statistic at -0.933 was not statistically significant at 5% level of significance.

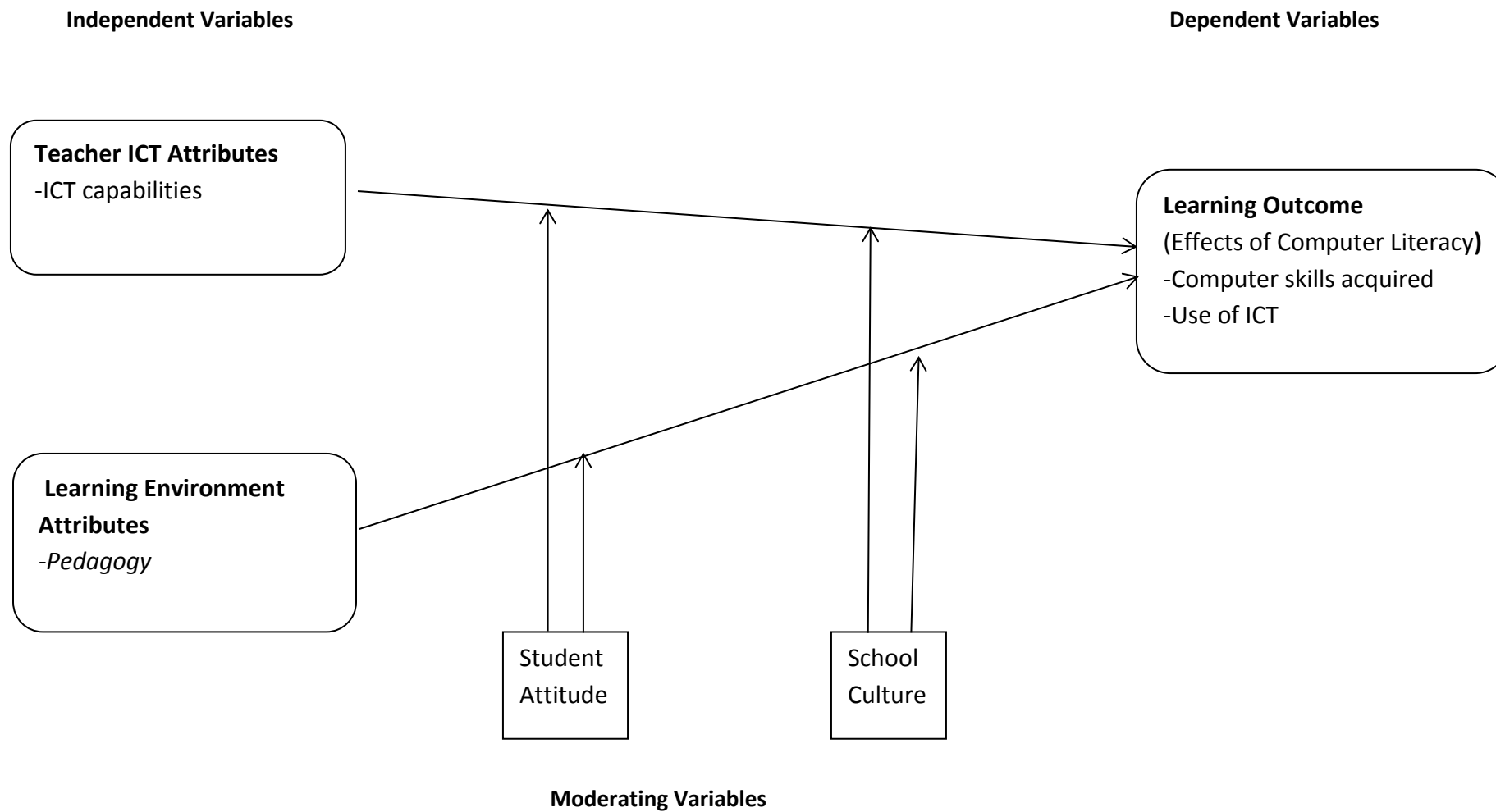
This implies that there is no difference between the ability of the male and female teachers to teach computer literacy instructions.

4.7 Proposed Framework

From data analysis above the two independent variables (Teachers Professional Attributes and Learning Environment) we confirmed to influence the learning outcome of computer literacy.

Two moderating variables (Attitude and culture) were found to affect the relationship between teacher's professional attribute and learning outcomes and also that between Learning environment variable and learning outcome. Policy was however not confirmed and was therefore dropped. The proposed framework is shown in figure 8 below.

Figure 8: Proposed Conceptual Framework



Source: Research

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This section presents how the current research objectives have been realized in light of the results. The research had been set out to establish whether the learning outcomes of Computer 'Literacy' Instruction in Secondary Schools students is affected by the ICT teacher's attributes and the Learning environment. Included in the teachers attributes are the issue of gender and teaching capabilities factors.

5.2 Evaluation of Research Objectives and Questions.

The study was strategized in a way to answer the research questions and above all realize the objectives identified. The research process and methodology was expected to yield result that would address these set objectives and research questions as discussed below.

5.2.1 Key measures

The Key measures of teacher's professional ICT attribute and Learning Environment attributes as a result of this study, indicates that teacher's professional ICT attribute can be measured by assessing the ability of the teacher to teach in the following areas:- Word processing applications, Spreadsheet applications, Database applications, Presentation applications, Multimedia applications, Web design applications and Internet applications.

Learning environment attributes assesses the methodology that is used by the teacher to teach computer literacy instructions. Some of the measures identified include whether the methodology used: - Promote active learning and authentic assessment, Engage students by motivation and challenge, Provide tools to increase student productivity, Provide framework to support higher level thinking, Increase learner independence, Increase collaboration and co-operation and Tailor learning to learner.

5.2.2 Effect of teachers attributes

On the Effect of teachers attributes on learning outcome of computer literacy instructions in schools, a direct relationship was found to exist between teacher's professional attributes and learning outcome. The more competence a teacher is on computer literacy, the more knowledge he/she impacts on the students. This indicates that for a school to achieve its objective of producing computer literate students, emphasis should be put in place to hire highly competent teachers. Continuous training should also be done to existing teachers so as to remain relevant.

5.2.3 Effect of learning environment

On Effect of learning environment on learning outcome of computer literacy instructions in schools, a direct relationship was found to exist between learning environment and learning outcome. This means that when the learning environment is conducive, student understanding of the concepts taught in class improves. This therefore might imply that the school management should provide a conducive learning environment for students to achieve better results.

5.2.4 Moderating effect of attitude and culture

The result of this study also indicates that student attitude toward computer lessons and school culture have a moderating effect on the relationship between teachers attribute and learning outcome and that between Learning environment and learning outcome.

This means that the school management should endeavor create a positive culture toward computer literacy. Effort should also be made to ensure that computer student develop a positive attitude toward the subject.

5.3 Limitations of the study

Mugenda and Mugenda (2003) defined limitation as an aspect of research that may influence the results negatively but over which the researcher has no control.

The major limitations of this study are:

- i. Our framework is tested using stakeholders from public schools in Kenya. Generalizing the results to other developing countries or to private schools might be misleading.
- ii. Due to time constraints, the duration of the study was projected to take approximately 24 weeks. If the time duration was longer, then a bigger sample size would have been considered, hence reduced sampling error.

5.4 Contributions of the Research

This study confirms the appropriateness of our framework for adoption in Kenya. Similarly, practitioners from other developing countries with similar environmental characteristics like Kenya may use our framework with or without modifications to assess computer literacy instructions in their schools.

Between Teachers ICT attributes and Learning environment attributes, the Learning environment attribute contributes more to learning outcome. This may imply that to achieve the objectives of introducing computer literacy instructions in school, the school management need to put more emphasis to the Learning environment attribute.

This study also provides a base from which future researchers wishing to assess the effect of computer Literacy Instructions in schools can benefit. This is especially so in developing countries.

5.5 Recommendation

This study was conducted in Kenya public secondary schools. The operating environments among different countries and between organizations in private and public schools may differ. We recommend a study to be done in a private schools setting and/or in a different country in order to confirm if our results are generalizable.

ICT policy was found not to have a moderating effect on the relationship between teachers attributes and learning outcome and that between Learning environment and learning outcome, we recommend future studies to inquire why this should be so.

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APPENDICES

APPENDIX

QUESTIONNAIRE

We are grateful for your participation and assistance in answering this questionnaire.

Please answer all questions as accurately as you can.

SECTION 1

Instructions

For each question, please mark your response with a tick (✓), unless otherwise indicated. For 'Other' responses, provide a brief response; do not omit any

1. Name (Optional)
2. Gender
 - ☐ Male
 - ☐ Female
3. Name of your school (Optional)
4. Is your school a public school?
 - ☐ Yes
 - ☐ No
5. How long have you been teaching computers studies in secondary schools?
 - ☐ 0 - 2 years
 - ☐ 3 - 4 years
 - ☐ 5 - 6 years
 - ☐ 7 - 8 years
 - ☐ 9 years and over
6. Does your school have computer literacy classes for students?
 - ☐ Yes
 - ☐ No

7. Do you teach computer classes in your school?

☐ Yes

☐ No

8. Do you teach other subjects other than computers?

☐ Yes

☐ No

If yes please specify

9. The general attitude of students towards learning computers is positive

☐ Yes

☐ No

10. The school has an ICT policy that is communicated and operational

☐ Yes

☐ No

11. The school encourage and promote the use of ICT by organising events such as
science congress, talks on computer technology

☐ Yes

☐ No

SECTION 2

Instructions

For each question, please mark your response with a tick (✓), unless otherwise indicated.

For 'Other' responses, provide a brief response. Kindly do not omit any questions.

1. How would you rate your capability to teach students in the following areas?

	Poor (1)	Below average (2)	Average (3)	Above average (4)	Expert (5)
i. Introduction to computer systems (definition, components, elements, peripherals)					
ii. Operating System (function, types, file management)					
iii. Word processing applications					
iv. Spreadsheet applications					
v. Database applications					
vi. Presentation applications					
vii. Multimedia applications					
viii. Desktop Publishing					
ix. Internet applications and Data Security Control					

Section 3

2. To what extent do you agree with the below statements?

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
Learning Environment					
a) The methodology I use to teach :					
i. Is in conformity with the best practices					
ii. Enables students to examine reality and build knowledge					
iii. Promote active learning and realistic assessment					
iv. Motivate students and challenge them					
v. Provide tools to increase student productivity					
vi. Provide platform to support higher level thinking					
vii. Increase learner independence					
viii. Increase student's teamwork and co-operation					
ix. Tailor learning to the learner					
b) Use of computer has made my lessons to be more interactive					
c) My computer lessons are more student focused					

SECTION 4

Instructions: *Please indicate the extent to which you agree or disagree with the following ideas.*

	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
a) Increased use of ICT by students :					
i. Motivates me to enjoy teaching					
ii. Enables voluntarily use of computers by students to do their work					
iii. Has led to students helping each other					
iv. Has led to better utilization of Teacher's time by students					
b) Students eagerness to learn more about computers increase with increase in its usage					
c) Students tend to complete more in less time when they use ICT					
d) Appropriate use of ICT by student results in new learning experiences requiring higher levels of thinking and problem-solving					
e) Students using the Computer application show significant improvement in independent thinking					
f) Students using the Computer application show gains on measures of depth of understanding and thinking					

Thank you for answering the questionnaire!