FACTORS INFLUENCING THE USE OF COMPUTER-BASED INSTRUCTION IN TEACHING SECONDARY SCHOOL AGRICULTURE IN BOMET COUNTY, KENYA

Justus Kiplangat Rutto

A Thesis Submitted to the Graduate School in Partial Fulfillment for the Requirements for the Award of the Degree of Master of Science in Agricultural Education of Egerton University

EGERTON UNIVERSITY

SEPTEMBER, 2014

DECLARATION AND RECOMMENDATION

DECLARATION

This thesis is my original work and it has not been presented for an award of a degree in any university.

Signature………………………………………… Date ……………………………..

Justus Kiplangat Rutto
Reg. No. EM12/2168/08

RECOMMENDATION

This thesis has been submitted with our approval as university supervisors.

Signature………………………………………… Date ……………………………..

Prof. Fredrick. U. Ngesa
Department of Agricultural Education and Extension
Egerton University.

Signature………………………………………… Date ……………………………..

Dr. Justus. M. Ombati
Department of Agricultural Education and Extension
Egerton University.

COPYRIGHT

DEDICATION

This work is dedicated to my dear parents Wilfred and Irene Bor

ACKNOWLEDGEMENT

The successful completion of this thesis is due lots of efforts and contributions from a number of individuals and institutions. Foremost among them were my very able supervisors, Prof. Fredrick U. Ngesa and Dr. Justus M. Ombati both of the Department of Agricultural Education and Extension of Egerton University for their consistent technical input, encouragement and mentoring, guidance and availability throughout the research process. I am particularly grateful for their patience, understanding and their readiness to review my numerous drafts. This was a great source of encouragement for me to continue with this study. God bless them abundantly for their support and guidance.

I would also like to thank the National Council of Science and Technology that granted me permission to conduct the study in Bomet District, the Bomet District Education office for facilitating my access to agriculture teachers in the study were also very helpful. I would also like to thank the members of the Department of Agricultural Education and Extension and faculty of Education and community studies defense teams for their constructive comments which further shaped this study. Others who deserve special mention are all the respondents who never hesitated to complete the research instrument timely. Without their responses, this study could not have been realized. Finally I would also like to humbly acknowledge my wife Beatrice, and children Nehemiah, Lydia and Abigael who gave me moral support and accepted my frequent absence from home during this study. To my students in the numerous schools I have worked in for their understanding during the course of this study. May God reward you. To all other persons whom in one way or another contributed towards the success of this work, I say a big thank you.

ABSTRACT

Information and communication technology (ICT) is increasingly playing an important role in the economies of all nations. Educationists are advocating for the use of ICT in teaching and learning due to its potential to overcome many education problems such as, low learning achievement, and motivation. The performance of agriculture students in the Kenya Certificate of Secondary Education examinations has not been satisfactory. Computer based-instruction has been shown to positively contribute to learning outcomes. Schools in Kenya have focused their attention on acquisition of computers but there has been limited use in actual teaching and learning. The purpose of this study was to examine the factors influencing the use of computer-based instruction in the teaching of secondary school agriculture in Bomet District. The study was based on the technology acceptance model. Cross-sectional research design was adopted in the study. The population of study was 162 teachers of agriculture in Bomet District from which a sample size of 118 was selected using purposive sampling technique. A questionnaire was used to collect data from the agriculture teachers. Validity of the instrument was enhanced by subjecting the instrument to examination by three experts in the Department of Agricultural Education and Extension of Egerton University. Analysis of piloting results using Cronbatch's coefficient alpha method yielded a reliability index of 0.896 indicating the instrument was reliable. The collected data were analyzed using both descriptive and inferential statistics. Regression analysis and t-test were used to test the hypotheses. Statistical Package for Social Sciences version seventeen was used in data analysis. The hypotheses were tested at a significance level of 0.05. The study revealed statistically significant relationship between, adequacy of computers, teacher preparedness, and practical teaching, on the use of computer-based instruction (CBI) in teaching agriculture. There was no statistically significant difference by gender on the use of computers in teaching agriculture, while teaching experience had a statistically significant influence on the use of CBI in teaching agriculture. It was recommended that computers be availed in sufficient quantities to schools and agriculture teachers be trained in computer-based instruction in agriculture.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

AUC	-	Actual usage of Computers
CBE	-	Curriculum based establishment
CBI	-	Computer- based instruction
ICT	-	Information and Communication Technology
KCSE	-	Kenya Certificate of Secondary Education
KNEC	-	Kenya National Examinations Council
LAMS	-	Learning Activity Management System
LMS	-	Learning Management Systems
P.C	-	Personal Computer
RLO	-	Reusable learning objects
TAM	-	Technology Acceptance Model
TRA	-	Theory of Reasoned Action
TSC	-	Teachers Service Commission
UNDP	-	United Nations Development Programme
UNESCO	-	United Nations Education, Scientific and Cultural Organization

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Information and communication technologies (ICTs) are playing an important role in shaping of the 21stcentury global economy and making rapid changes in the society. Within the past decade, ICT tools have fundamentally changed the way people communicate and do business (Hussein & Safa 2009, Alonge, 2005). In addition, information and communication technologies are affecting teaching and learning. They have the potential to transform the nature of education, where and how learning takes place, and the role of teachers and students in the learning process. Hussein and Safa further note that Using ICT in the teaching environment provides a wide range of learning climate, attracts the interests of teachers and students and support their motivation.

The world is under increasing pressure to use ICT to teach student's knowledge and skills they need to function in the 21st century (Alonge, 2005). In the highly competitive knowledge economy of the 21st century, a nation's stock of technology infrastructure and human capital to manage it is now generally regarded as a new competitive edge in the global trade in the same way as endowment in natural resources and labour dominated the industrial economy of 19th and 20th centuries (Alonge, 2005).

Alonge, (2005) further points that, national policy makers and educational leaders the world over see a great potential in instructional technology. It cannot only enhance students' achievements and prepare the future stock of technology competent workforce, but also revolutionize the very nature of public education (Alonge, 2005). Hence, the integration of ICT into the education system has become the focus of policy makers and educators. Technology is increasingly seen not only as a tool for addressing the challenges in teaching and learning, or as a change agent in the education enterprise, but also as a central force in economic competitiveness. Given the high hopes being placed in technology to revolutionize public school system, over the past decade, the USA has committed billions of dollars into upgrading public schools technology infrastructure (Alonge, 2005).

Recognizing the value of ICT in education Jonassen and Land, (2000), Yusuf & Afolabi, (2010), advocate for application of technologies as cognitive learning tools. They advocate that the tools should be taken away from instructional designers and give them to the learners as tools for knowledge construction, rather than as media of conveyance and knowledge acquisition. The process of building knowledge bases using these tools will engage the learners more and result in meaningful and transferable knowledge. In cognitive tools, information and intelligence is not encoded in the educational communication which is designed to efficiently transmit knowledge to the learners. Rather than using technologies by education communication specialists, the technologies are taken away and given to the learner to represent and express what they know to others. Cognitive tools and environments activate cognitive learning strategies, critical thinking and generative processing of information (Jonassen & Land 2000; Bereiter, 2002; Serin, 2011). In generative processing, deeper information processing result from activating appropriate mental models, light of newly interpreted information. Bransford, Brawn and Cocking, (2000), note that for a long time schools have made sporadic efforts to give students concrete experiences. These have seldom been at the heart of academic instruction and they have not been easily incorporated into schools because of logistical constraints and subject material to be covered.

The philosophical case for offering agriculture in schools revolves around the centrality of food in life and the technological requirements of modern agriculture (Ngesa, 2002). Since its introduction in Kenyan schools, agriculture has registered popularity (Mwiria, 2002). However, data from the Kenya National Examinations Council (KNEC) indicate that the performance in the subject has been satisfactory as shown in Table 1. The KNEC has attributed the poor performance in the subject to poor teaching strategies. To reverse the poor performance and to ensure that the secondary school agriculture graduates are equipped with the right agricultural skills, KNEC has continually recommended that agriculture teachers use teaching approaches that engage students in the learning process. One of the approaches that research has shown to result in improvement in achievement is computer based-instruction.

Table 1

Trends in Student's Performance in KCSE Agriculture

		2006	2007	2008	2009	2010
All	Entry	106,163	116,751	130,630	137,217	140,237
	Mean	38.52	43.30	33.31	38.83	33.99
Female	Entry	47,275	50,350	57,447	60,770	60,708
	Mean	35.96	40.54	30.76	35.71	31.25
Male	Entry	58,888	66,401	73,533	76,447	79,529
	Mean	41.09	46.06	35.86	41.32	36.08

Source: Kenya National Examinations Council: Annual Reports, 2008, 2010. Page 235, 245.

Wheat and Byrd, (2003) established that the use of technology with traditional classroom teaching improved students' attitude towards learning, while animation aided in understanding and recall of course information. Firth, Jathfa, and Prince (2004) established that using computer tutorials as a teaching method was more effective in teaching concepts than traditional lecture. Dunn, Thomas, Green, and Mick (2006) found that incorporating new innovative technology like multimedia applications improved knowledge than traditional lecture. These findings are in agreement with Wekesa, (2005), Nyaema, (2008), and Serin, (2011) who found that the use of computer-based instruction increased student achievement, problem solving skills and attitude towards subject significantly.

Research done in Kenya reveal that use of computer-based instruction is limited in most schools (Gakuu, Kidombo, Ndiritu & Gikonyo, 2009). There is therefore limited information with regard to the adequacy of computers in secondary schools and whether the instructors of Agriculture were prepared to use them for instructional purposes. The limited research done in Kenya with regard to deployment of ICT in schools has highlighted some of the issues. However, little literature exists on the issues relating to the use of computer-based instruction in specific subject areas. The present study therefore aimed to fill this gap by examining the factors influencing the use of computer based-instruction in the teaching of secondary school agriculture in Bomet District.

1.2 Statement of the Problem

The number of students enrolling for the Kenya Certificate of Secondary Education in Agriculture has continued to increase. However, the performance in the subject has not been satisfactory. One approach that research has shown to result in improved performance, and to enhance students' critical thinking is computer-based instruction. A number of schools in Kenya have acquired computers for instructional purposes but little has been done to use them for actual teaching of various subjects. This study therefore aimed at examining the factors influencing the use of computer-based instruction in the teaching secondary school agriculture in Bomet District.

1.3 Purpose of the Study

The purpose of this study was to examine the factors influencing the use of computer-based instruction in the teaching of secondary school agriculture in Bomet District.

1.4 Objectives of the Study

The following were the study objectives:

i) To establish the influence of adequacy of computers in the use of computer-based instruction in teaching secondary school agriculture in Bomet District.

ii) To determine the preparedness of agriculture teachers to use computer based-instruction in teaching of agriculture in secondary schools in Bomet district.

iii) To determine the influence of practical teaching approach on the use of computer-based instruction in teaching of secondary school agriculture

iv) To determine the influence of agriculture teachers gender in the use of computer based-instruction in teaching of agriculture in secondary schools in Bomet District.

v) To establish the influence of agriculture teachers' experience in years of teaching on the use of computer based-instruction in teaching of secondary agriculture in Bomet District.

1.5 Hypotheses of the Study

Ho_1: There is no statistically significant relationship between the adequacy of computers and use of computer-based instruction in the teaching of agriculture in Bomet District.

Ho_2: There is no statistically significant relationship between agriculture teachers' preparedness in use of computers in teaching and the use of computer-based instruction in teaching of Agriculture in secondary schools.

H_{03}: Practical teaching approach has no statistically significant influence on the use of computer-based instruction in the teaching of agriculture in secondary schools.

Ho_4: There is no statistically significant difference by gender in use of computer based-instruction in the teaching of Agriculture in secondary schools in Bomet District.

Ho_5: Agriculture teachers' teaching experience has no statistically significant influence on the use of computers-based instruction in teaching of agriculture in secondary schools**.**

1.6 Significance of the Study

The study provides research information to stakeholders interested in the incorporation of computer based-instruction in the teaching of agriculture in secondary schools. Besides the provision of computers and other facilities, the ministry of education and other stakeholders may be able to formulate better strategies to ensure that computer-based instruction is fully used in teaching of agriculture and other subjects. The study yields information that could help school administrators to prepare teachers and learners to fully maximize the enormous benefits of computer based instruction as a tool for teaching and learning of agriculture. Universities, colleges training teachers of Agriculture may use data generated from this study to improve the teacher training curriculum. The findings of the study may be useful to other researchers in that recommendations for further research are presented on the basis of the findings.

1.7 Scope of the Study

The study was confined to the factors influencing the use of computer-based instruction in the teaching of Agriculture in secondary schools in Bomet District. The factors were, adequacy of computers, teacher preparedness, gender, practical teaching approach, and teaching experience of agriculture teachers.

1.8 Limitation of the Study

Not all secondary schools in the study area were equipped with computers. To overcome this limitation, the researcher purposively selected schools that met the criteria of computer availability. This was aimed at overcoming the limitation.

1.9 Assumptions of the Study

The following assumptions were made during the study.

i) The study assumes that the teachers' responses would reflect their true and accurate reflection on the questions posed to them.

ii) That, teachers of agriculture in secondary schools in Bomet District are trained and are adequately competent with regard to Agriculture subject content and pedagogy.

1.10 Definition of Terms

This section provides the definition of key terminology in the study. It provides the conventional definition as well as the definitions as applied in this study.

Adequacy of Computers: Adequacy means availability of an item or object in sufficient quantities. In this study the term adequacy of computers refers to the recommended pupil computer ratio.

Agriculture: Refers to the science and practice of farming including growing of crops, and rearing of animals. In the study, the term will be used to refer to the art and science of crop and livestock production as taught in secondary schools with systematically pre-determined curriculum which is implemented through in and out of class instructions within a specified time frame.

Agriculture teacher: Means trained agriculture teacher. In this study the term means an individual employed by the teachers service commission or the school Board of governors to teach agriculture in secondary schools.

Computer-based instruction: Refers to the application of computer for particular purposes. In this study the term is used to refer to the application of computer based instruction in the teaching and learning of agriculture in secondary schools.

Ease of use of computer: Refers to the usability and learn ability of a computer as an object. In the study it is used to refer to the ease of application of computer in teaching and learning situation.

Gender: The term refers to a set of characteristics distinguishing between Male and Female. In the study it will be used to refer to the agriculture teachers' sex.

Information and communication technology (ICT): Encyclopedia Britannica defines ICT as the merging of audio visual and telephone networks through a single cable link system. In the study the term will be used to mean computer related technological tools and resources used to communicate, to create, disseminate and manage information in a learning situation.

Practical teaching approach: The term practical is defined as an examination requiring demonstration of some practical skill. In this study the term practical teaching is used to refer to the application of teaching methods that offer agriculture students learning through direct experience.

Teaching experience: This term refers to teachers' knowledge and skills gained overtime through seeing and doing things related to teaching. In this study the term will be used to refer to teachers' years in active service leading to acquisition of knowledge in the teaching of agriculture in secondary schools.

Teacher preparedness: The term preparedness refers to a state of being ready for specific, unpredictable event or situation. Teacher preparedness in this study is used to refer to Agriculture teachers' possession of pedagogical and technical skills required to exploit the opportunities computer-based instruction offer in the teaching of agriculture.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this section the factors influencing the use of computer-based instruction in teaching are discussed. It is concerned with identifying and describing the factors through a review of related literature. The factors are derived from research work done both in developed and developing countries. The chapter is organized into sections. The first section deals with the uses of ICT to enhance learning. The second section deals with the influence of gender in the classroom use of ICT. The third section deals with the preparedness of the teachers of agriculture and how it could influence classroom use of Computer-based instruction. The subsequent sections deal with the influence of technological factors, teaching experience, and how they could influence the teachers' use of computers-based instruction in the teaching of agriculture.

2.2 ICT and Education

Information and communication technologies (ICTS) are information handling tools that are used to produce, store, and process, distribute and exchange information (Adenyika, Adedeji & Majekoduni, 2005). These different tools are now able to work together and combine to form a network worldwide which reaches into every corner of the globe (UNDP evaluation office, 2001). It is increasingly becoming a powerful technology for participating in global markets, promoting political accountability, improving delivery of basic services and enhancing local development opportunities (UNDP, 2001). According to Ogunsola (2005), ICTs are electronic based systems of information transmission, reception, processing and retrieval which have drastically changed the way people think, live, and the environment in which they live. It can be used to access global knowledge and communicate with others.

Many different types of technologies can be used to support and enhance learning. Everything from video content to digital movie making and handheld technologies has been used in classrooms. Adenyika *et al* (2005), note that different kinds of technologies deliver different kind of content and serve different purposes in the classroom. Word processing and e-mail for example promotes communication skills, data base and spread sheet programme promotes organizational skills, and modeling software promotes understanding of science and mathematics concepts. Presky (2005) posits that ICTs are those technologies that can be used to interlink information technology devices such as personal computer (PC) with communication technologies such as telephones and other telecommunication networks. The PC and laptop with e- mail and internet provides the best examples. The range of technologies is increasing all time and there is convergence between new technologies and conventional media (Prensky, 2005). This rapid convergence means that devices such as video cameras, digital video cameras and players, personal digital assistants, slide projectors and mobile telephones are also compatible with more traditional media such as radio and television. Thus, most devices can now be linked to others to share, exchange information and allow it to be used in such a way that they can also be categorized as ICT.

Lei and Zhao (2007) points, out that each technology is likely to play a different role in student learning. Students could learn from computers where technology can be used essentially as tutors and serve to increase student basic skills and knowledge. Students can also learn with computers where technology is used as a tool that can be applied in a variety of goals in the learning process and can serve as a resource to develop higher order thinking, creativity and research skills. Lei and Zhao (2007) further note that the primary form of student learning from computers is discrete educational software, integrated learning system and computer assisted instruction. These two software applications are also most widely available applications of educational technology in schools today along with word Processing software, and have assisted in the classroom for more than 20 years. Hennessy, Harrison and Wamakote (2010) point out that it has been established that the introduction of technologies in schools does not by itself improve the quality of education and raise achievement.

Jonassen (1994) provides the rationale for using technology as cognitive tools. Jonassen argues that the people who learn the most from the design and development of instructional materials are designers. According to Jonassen, students learn and retain the most from ‘‘mindfull’’ engagement. He affirms that, some of our best thinking results when students try to represent what they know. That is cognitive tools require students try to represent what they know. According to Jonassen students cannot work effectively at thinking without access to a set of intellectual tools to help them assemble knowledge. Students should therefore use technologies as tools, not as tutors or repositories of information but as designers (Jonassen, 1994).

In using technologies as cognitive tools students cognitive learning strategies and critical thinking are activated. They engage in generative processing of information, in which deeper information processing results from activating appropriate mental models, using them to interpret new information , assimilating new information back into those models in light of newly interpret newly information , and using those newly aggrandized models to explain, interpret or infer new knowledge. Knowledge acquisition and integration according to Jonassen is a constructive process, so when using cognitive tools, learners engage in knowledge construction rather than knowledge reproduction. In using technologies as cognitive tools, learners enter intellectual partnership with computer. It is a ‘‘mindful engagement of learners in the tasks afforded by these tools…’’ The possibility of qualitatively upgrading the performance of the joint system of the learner plus technology is enhanced. The results of an intellectual partnership with computer is that the whole of the learning process becomes greater than the sum of its parts (Jonassen, 1994). Herrington and Kervin (2007) while in agreement with Jonassens rationale of using technology as cognitive tools went further to suggest ten ways of incorporating technology to provide authentic learning. They described the characteristics of authentic learning environments as those that:

- provide authentic contexts that reflect the way knowledge will be used in real life.
- Those that provide authentic activities
- Provide access to expert performances and modeling of processes.
- Provide multiple roles and perspectives
- Support collaborative construction of knowledge.
- Promote reflection to enable abstractions to be formed.
- Promote articulation to enable tacit knowledge to be made explicit.
- Provide coaching by the teacher at critical times, by scaffolding and fading of the teacher support.
- Provide for authentic, integrated assessment of learning within the tasks.

2.3 Teachers' Gender and Technology Usage

For all their similarities, women and men may view technology differently. The literature on educational computing abounds with conflicting findings on the gender issue. While the differences do not appear to be as great as some stereotypes might suggest, they offer insights that will be useful as we consider technology. Men and women indicate equally that technology should be part of school curriculum (Fitzgerald, Meser, Nicolino & Morote, 2006). However, majority of the men and women felt that technological literacy should be integrated into other subject areas. Men and women were found to be in agreement on the importance of being able to understand and use the technology and on the need to include technological literacy as part of school curriculum. Hong and Koh (2002) in their study found no significant differences between male and female teachers in computer anxiety. However, for the domain of hardware anxiety, female teachers had significantly higher levels than male teachers. Fitzgerald *et al* (2006) found out that there were no differences between male and female teachers in overall attitudes towards computers.

Fitzgerald, Meser, Nicolino and Morote (2006) reported that other study has shown more striking differences between male and female teachers in overall attitudes towards technology. Examples of studies of business majors have found that males are better at computing and have more positive attitude and experienced low anxiety Fitzgerald *et al*. (2006). In a study of one hundred and eighty six in-service teachers Yuen and Ma (2002) found that perceived ease of use is not a significant factor.

In their study, Jamiesson and Finger (2007) reported that students of male teachers used ICT more frequently than students of female teachers for both curriculum and transformational dimensions of ICT use. There was however no significant difference between male and female school teachers with respect to how they preferred their students to use ICT for either dimension of use. Female teachers were found to prefer their students to use ICT more for either dimension of use. Although female teachers preferred their students to use ICT more to transform teaching and learning than was the case for male teachers, Male teachers preferred their students to use ICT to transform the curriculum.

In the same study, Jamiesson and Finger (2007) concluded that gender is significantly related to teachers' confidence in the use of ICT with students for teaching and learning and that both teachers' gender and teacher confidence have direct positive relationship with quality and quantity of students use of ICT. The students of male teachers or more confident teachers reported using ICT more to both enhance curriculum and teaching and learning. In a related study Derbyshire (2003), reported that boys were commonly found to be active in computer related discussions, to make spontaneous comments and to be asked more questions by teachers. Some researchers found gender to be a significant factor in their application of technology usage (Hu, Clark & Ma, 2003; Yue & Ma, 2002). Geffen and Straub (1997) found that there were differences between female and male teachers in usage of computers particularly concerning e-mail. Venketash and Morris, (2000) identified significant differences between female and male workers in introducing a system of information retrieval. They found that male workers emphasized more on perceived usefulness in determining behavioral intention to use, while women regarded perceived ease of use as a more significant factor in determining behavioral intention to use.

Houtz and Gupta (2001), found that male teachers regarded computer technology as a male domain. On the other hand, Gatticker and Nelligan (1998) showed that there is an association between gender and attitude to computer technology. Lee (1997) identified that male teachers were more active in computer usage and were also more confident in handling computers. From these foregoing results it is apparent that there were mixed research findings on the relationship between gender and actual computer usage. Given these mixed findings there is need to carry out further studies on the influence of gender in the integration of ICT in teaching in different settings. Literature reviewed reveals that little has been done to determine the influence of gender in the use of ICT in the teaching of agriculture in secondary education.

2.4 Teacher Preparedness in Integrating ICT in Teaching

Teachers' preparedness to effectively integrate ICT in the teaching of Agriculture as well as awareness of opportunities to exploit ICT is an aspect that is determined by interplay of several factors. One barrier that prevents teachers from using technology in their teaching is lack of confidence. This is one of the major barriers to the uptake of technology by teachers in the classroom. Beggs (2000) asserted that “fear of failure’’ caused lack of confidence. On the other hand limitations in teachers’ ICT knowledge makes them feel anxious about using technology in the classroom and thus not confident to use it in their teaching. British Education and Communication Technology Agency (BECTA) report of 2003 concluded in their study that many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in their teaching.

A survey by the British Educational and Technology Agency (2003) showed that many of the teacher respondents who identified their lack of confidence as a barrier reported being particularly afraid entering classroom with limited ICT knowledge with their students knowing that this was the case. It was argued that lack of confidence and lack of experience with technology influences teachers’ motivation to use ICT in the classroom (Khalid, 2009).On the other hand, teachers who confidently use technology in their classroom understand the usefulness of ICT. Khalid (2009) further pointed out that teachers who have confidence in using ICT identify that technologies are helpful in their teaching and personal workload. It can thus be concluded that teachers who have little confidence in using ICT technology in their work will try to avoid it altogether. Cornfield and Pearson (2006) reported that teachers who have little confidence in using computers in their work will try to avoid them altogether.

Another barrier which is directly related to confidence, is the teachers’ competence in integrating ICT into their pedagogical practice. Newhouse (2002) cited in Khalid (2009), found that many teachers lacked knowledge and skills to use computers and were not enthusiastic about the changes and integration of supplementary learning associated with bringing computers in to their teaching practices. In developing countries teachers’ lack of technological competence is a main barrier to their acceptance and adoption of ICT. In Syria for example, teachers’ lack of technological competence is a main barrier (Albirini, 2006). Similarly, in Saudi Arabia, lack of ICT skills is a serious obstacle to the integration of ICT technologies into science education. Korte and Husing (2007) found in a European study that teachers who do not use computers in their classrooms claim lack of skills as constraining factor. Pelgrum (2001), in a worldwide survey of nationally representative samples of schools from twenty six countries, found that teachers’ lack of knowledge and skills is a serious obstacle to using ICT in primary and secondary schools. Khalid (2009) further noted that in Denmark, many teachers still chose not to use multimedia in teaching situation because of their lack of ICT skills rather than for pedagogical reasons. Hence lack of competence may be one of the strong barriers to integration of ICT in teaching.

The most frequently referred factor negatively influencing ICT use in teaching is lack of effective training. One finding by Pelgrum (2001) study was that there were inadequate training opportunities in the use of ICTs in a classroom environment. In Turkey for example the main problem with implementation of ICT in science education was insufficient amount of in-service training programmes for science teachers (Khalid, 2009). The issue of training is certainly complex because it is important to consider several components to ensure the effectiveness of the training. These are time for training and pedagogical training in ICT in initial teacher training (Khalid, 2009). On the other hand lack of training in digital literacy, lack of pedagogic and didactic training on the use of ICT in the classroom, and lack of training concerning the use of technologies in science specific subjects were obstacles to using technologies in classroom practice. The weaknesses of teacher training in the use of computers, the use of a delivery teaching style instead of investment in modern technology as well as shortage of teachers who are qualified to use technology confidently are major issues that need to be addressed.

In order for teachers to be convinced of the value of using ICT in teaching, their training should focus on pedagogical issues. Cox, Preston and Cox (1999), showed that after teachers had attended professional development course they still did not know how to use ICT in their classroom. They explained that this was because the courses only focused on teachers acquiring ICT skills and did not often teach teachers how to develop pedagogical aspects of ICT. Balanskaat, Blamire and Kefala (2006), indicated that inadequate or inappropriate teacher training is not helping teachers in preparing classroom lessons. They assert that this is because training programmes do not focus on teachers' pedagogical practices in relation to ICT but on development of skills.

Besides the need for pedagogical training, it is still necessary to train teachers in ICT specific skills. The reason is that if ICT skills are to be integrated in the classroom, teachers have to train in the use of these particular ICTs .These requires continuous professional development opportunities to maintain appropriate skills and knowledge. Balanskaat, Blamire and Kefala (2006), note that inadequate or inappropriate training leads to teachers being neither sufficiently prepared nor confident to carry out full integration of ICT in the classroom. Teachers do not only need to be computer literate but they also need to develop skills in integrating computer use into their teaching and learning programmes.

2.5 Technological Factors

Reeves (2003) pointed out reasons why teachers need to use technology in the classrooms. He notes that the current passion for the instructional use of these technologies such as computers and the internet is not unique. He points that there was a great growth in the use of instructional technology use in the 1950s but by mid 1960s, the interest in instructional technology use had greatly abated due in part to the mediocre quality of most programmes, lack of interaction, inadequate curriculum support. According to Cuban in as cited by Reeves, the failure of technology use in the 1920s was inescapable and could be attributed to many reasons. First of all the supply of equipment was limited. It was expensive to have every classroom equipped film projectors in the earlier times, as it would be even today, and thus showing a film required adhering to a schedule. Teachers needed to order a machine to be send to classroom or reserve a special film classroom whenever they wanted their students to view a film. Reeves argues that teachers find adhering to strictly to ‘’time and place’’ schedule to be confining because it limits the possibilities of taking advantage of the ‘’teachable moment’’. When the opportunity to clarify or expand upon content comes at unpredictable time within the context of teacher and student interactions.

Reeves and Wang (2003) asserts that there are three factors for technology to accomplish widespread use and to be accepted by teachers. Pedagogical flexibility, support for teacher control, and accessibility. The success of chalkboards, textbooks, and overhead projectors in the classroom provide credible evidence for the importance of these three factors. These innovations can be flexibly integrated into curriculum plans and provide options to shape and shift their instructions whenever they think appropriate. Teachers can also utilize them without reducing their control over classrooms and instructional processes. Their flexibility and low cost makes them accessible and pervasive for students and teachers alike. With computers the current situation remains disappointing.

Korte and Husing (2006) in a study on Benchmarking ICT use in European schools pointed that there remains some infrastructure and equipment related barriers. Broadband access is not yet ubiquitous. They found that third of European schools do not have broadband access. In Greece for instance just 13% of the schools have broadband and internet access and also Poland, Cyprus, Lithuania, and Slovakia have some way to go. There is a general tendency that the higher the school level the better the internet access in terms of broadband. On the other hand ICT support or maintenance contracts in schools supports teachers to make use of ICT in teaching and not losing time fixing configurations or software and hardware problems. School policies which resort to maintenance contracts with professional ICT service providers appear considerably across Europe. Availability ranges from 12% in Portugal, to 82% in the United Kingdom with European average of 47%. In some countries schools have recognised the importance of maintenance support to motivate teachers to further use ICT in class.

Afshari, Abu Bakar, Wong, Afshari (2010) in their study on Principals level of computer use and some contributing factors found that principals overall computer use was moderate. E-mail was the most commonly used application among Principals who were surveyed. They report that computer access has been one of the most important obstacle in technology adoption and integration in both developed and developing countries. Afshari et al (2010) also found out that there was a strong positive correlation between access and use. Principals who had access to computers and internet were more likely to use them than those who did not have adequate access to equipment and network connection. Therefore access to hardware and software is an influential factor related to computer use. Afshari et al report that 60% the variance in the level of computer use can be explained by computer access. Thus this variable could have a unique contribution in predicting the level of computer use by principals. These finding supports Rogers theory of triability in that principals who have access to computers can try new management method with computers.

Afshari, Ab Bakar, Suluan, Samah, and Fooi (2009) report that manipulative factors affect technology adoption in schools. These factors include availability of vision and a plan about contribution of ICT to education. Characteristics of an innovation as perceived by an individual in a social system affects on the rate of adoption. Afshari et al (2009) five factors, these are, relative advantage, compatibility, complexity, observability, and triability. The relationship between an innovations attributes and adoption has been examined. Computer attributes were significantly correlated to teachers attitudes towards computers. Innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential triability, and observability will have more widespread and rapid rate of diffusion. Thus if teachers perceived ICTs as a beneficial tool, compatible with their current activities, easy to use, and have observable outcomes, they will demonstrate positive attitudes towards ICT.

Amory (2010) evaluates the production and use of education technologies that are used globally, and which are part of what he refers as part of the instructivist neo-liberal agenda. These technologies include: Reusable learning objects (RLOs) and associated standards learning standards management systems (LMS) and blended learning concepts., computer games are also included. Amory opines that RLO was devised by Wayn Hodgins who was a member of the learning technology standards committee. Learning was conceived as a process of assembling a number of information blocks similar to the way in which LEGO can be assembled into many different artifacts. According to Amory (2010) the development of RLO would change the nature of corporate learning , be available directly to the consumer, and be part of elementary education supported by software intelligent tutors who would provide personalised learning experiences. In other words learning would be nothing more than a content commodity, defined through a number of standards and presented by means of complex software to student. Accordingly Amory views RLOs as part of an information acquisition replication education paradigm.

To support content commodification, Amory (2010) posits that learning management systems need to use common language to describe e-learning, be supported by organization wide support policies, include compelling content and be standards driven. In order to address issues related to learning design , pedagogical scenarios and activities should be integrated into learning management systems. This concept of learning sequence embedded technology is found in the Learning Activity System (LAMS), (http//www. Lamsinternational.com/). This software includes control and monitoring as an integrated part part of learning design. While LAMS includes tools to support collaboration, the design sequence is fixed by the instructor and is

therefore immutable. Learning Activity System is therefor an interesting learning design tool as it not only includes collaboration but also involves panopticon surveillance and automation. Teachers using LMS often replicate a traditional instruction approach , emphasising skills based or remediation of information communication application. Additionally, they focus on technical issues and belief that access to information is more important than associated learning systems.
Afshari, Abu Bakar

Khalid (2009) point out that lack of access to resources including home access, is another complex barrier that discourages teachers from integrating new technologies into education. According to Becta (2004), inaccessibility of ICT resources is not always due to non-availability of the hardware and software or other ICT materials within the schools. It may be the result of one of a number of factors such as poor organization of resources, poor quality hardware, inappropriate software or lack of personal access for teachers.

Korte and Husing (2007), in a European study found that lack of access is the largest barrier to using ICT in teaching. They further reported that there are infrastructural barriers such as broad band not yet being available. Similarly, Pelgrum (2001) concluded that four of the top ten barriers were related to accessibility of ICT. These barriers were insufficient numbers of copies of software and insufficient simultaneous access to internet. Topracker (2006) found that low numbers of computers, oldness or slowness of ICT systems, and scarcity of educational software were barriers to the successful implementation of ICT into science education. A study in Syrian schools by Khalid, (2009) indicated that insufficient computer resources were one of the greatest impediments to the integration of ICT to the classroom. However, overcoming hardware and software barriers do not in itself ensure ICT will be used successfully. According to Balanskaat, *et al* (2006), the accessibility of ICT resources does not guarantee successful implementation in teaching and this is not merely because of lack of high quality hardware, suitable educational software and access to ICT resources. On the other hand poor choices of hardware and software and a lack of consideration of what is suitable for classroom teaching is a problem facing many teachers (Newhouse, 2000; Kiptalam & Rodrigues, 2010).

2.6 Teaching Approaches and the Use of Computer-Based Instruction

Experiential learning has been a valued landmark in agricultural education (Knobloch, 2003). Agricultural education developed during an era when “doing to learn” and education through experience were prevalent. The study of experiential learning dates back to about a century ago when agricultural education was organized in both formal and informal settings. Agricultural educators in formal and informal settings tested and practiced the premise that learning is experienced in many varied contexts. The educators in extension practiced field demonstration. Agricultural educators utilized the supervised Agricultural experience (SAE) project commonly associated with experiential learning as one of the three intertwined components of Agricultural education program in public secondary schools. Extension and agricultural education built their entire educational programs on the philosophical foundation of experiential learning. Extension educators commonly describe their instruction as practical, applied and hands on (Mabie & Baker, 1996).

Experiential learning has various dimensions: real experience, concrete experience, reflective thinking, and observational learning, abstract conceptualisation (Kolb, 1984); risk and responsibility, active experimentation and teacher facilitator (Knobloch, 2003). Knobloch, (2003), Nevgi and Lofstrom (2008) described experiential learning as practicing in real situation, modelling appropriate behaviours and procedures, receiving appropriate feedback and reinforcement, and providing opportunities to apply knowledge in new situations. Boud, Cohen, and Walker (1993) offered five propositions about learning from experience: (a) experience is the foundation and stimulus for learning; (b) Learners actively construct their experience; (c) Learning is a holistic process; (d) Learning is socially and culturally constructed; and (e) Learning is influenced by socio-emotional context in which it occurs. These principles are in agreement with the key features of constructivist learning, which include active learning, authentic instruction and project based tasks, collaborative or cooperative activities, diverse learning formats and learner choice, tasks requiring higher order thinking, interactivity, feedback and support (Nevgi and Lofstrom, 2008).

Students learn through real life experiences and experience influence how they learn because experiences shapes a persons' schema by building knowledge and past experiences to influence future experiences (Knobloch, 2003; Nevgi & Lofstrom, 2008). Moreover, experience influences our perception and serves as bridges between the school phenomena and the rest of the world. Experiential learning increased critical thinking and empowered students with greater responsibility (Griffin, 1992). Supervised agricultural experience, an example of experiential learning in agricultural education (Camp, Clarke & Fallon, 2000) was related to improved student achievement, motivation, work habits and responsibility. Experiential learning supports pedagogical principles of practice and student inquiry by applying problems in real life settings.

The teaching methods that make the learners to be actively involved in the learning process are highly recommended for effective teaching of agriculture and have been emphasized in teacher training programmes (Omoro, 2005).This is because agriculture is a practical subject which is not only enjoyable to the learner if the teacher allows the learners to take an active role in the teaching –learning process (Omoro, 2005). Agriculture teacher education programmes highly emphasises teaching approaches that offer experiential learning to agriculture students. In his study on the impact of experiential learning on student academic achievement Ngesa (2002) found that it yielded significant improvement in performance in agriculture and recommended that teachers explore possibilities of integrating teaching and learning approaches which emphasise learner involvement. In agriculture subject the methods that are highly recommended are practical teaching and project method. Kathuri, (1990), reported that project method was preferred by Agriculture teachers in rural and private schools. Kibett (2002) in his study concluded that learning which occurs in the context of project-based learning is more likely to be retained and applied than factual knowledge methods.

Since the early 1960s educational technologists have been developing programs of computer based instruction to drill, tutor and test students and to manage instructional programs. In recent years these programs have been used increasingly in schools to supplement or replace more conventional teaching methods. Education technologists believe that computer-Based instruction will not only reduce educational costs in the long run but it will also enhance education effects (Kulik & Kulik, 1991; MaCardle & Bertoloto, 2010; National Research Council, 2011). A continual dilemma experienced by agricultural educators is how to respond to the changing face of society and stay abreast of the possible impact that technology could have in the teaching learning contexts (Marrison & Frick, 1993). The potential use of computer mediated instructions is significant. Practical applications inherent to Agriculture make computer based instruction particularly multimedia a candidate for applying this technology to the teaching learning situation. In studies on perceptions of teachers of agriculture regarding methods used in Agricultural education, (Martin & Odubiya, 1991; Mbogoh, 2006) found that although teachers agreed on the need to use a variety of teaching methods, respondents appeared to cling to a few. They note that the most used methods were not necessarily rated the most effective, and that methods that were perceived by teachers to be the most effective were not used extensively. Given the practical nature of agriculture subject it has not been clear whether instructors of agriculture would prefer to use computer mediated instruction or teach the subject using practical approaches which experts in agricultural education have recommended. This study will attempt to answer this question.

Lotter, Harwood, and Bonner (2008), argue that teacher beliefs act as filters through which learning and instructional strategies flow. They added that this filtering can lead teachers to refine, distort or interpret information in different ways. Teacher beliefs are often difficult to change because they are based in part on their practical teaching knowledge that is learned over many years of classroom experience. Teacher practical knowledge is defined as an "integrated set of knowledge, conceptions, beliefs, and values teachers developing the context of teaching situation." Teachers' practical knowledge helps to drive the theories that drive decisions they make in the classrooms. These "Theories of teaching'' can be explicit, context based, and influenced by teachers, students, colleagues, and school environment. Lotter *et al*. (2008) further add that teachers develop and change their teaching theories through a "process of practice - centred inquiry. This process consists of a teacher deciding whether a new teaching idea is valuable, plausible, testing the idea out in classroom, reflecting on the experience and its results, and if satisfied incorporating the idea into her conception of effective teaching (Lotter *et al* 2008).

According to Chang, Lee and Wang (2010) technologies can be used as tools for exploring knowledge and solving real world problems and mediating collaboration and communication. With the help of internet and technologies for communication, visualization, and simulation teachers can offer students a more authentic learning experience, where learners are able to gain deeper sense of a discipline as a special culture shaped by specific ways of seeing and interpreting the world. Mixed reality is one important technological support for todays authentic learning environments.

2.8 Teaching Experience and Computer Use in Teaching

Experience is rooted in insightful behavior. It is a psychological event that involves a person acting positively with anticipation of possible consequences of such behavior. The experiences of agriculture teachers are developed through the interaction of the teacher with his or her environment Drawbaugh and William, (1971). This perspective views agriculture knowledge as emerging from an interaction with the physical and social agriculture environment. Dewey argued that "to learn from experience is to make backward and forward connection between what we do to things and what we enjoy or suffer from consequences." (Drawbaugh & William, 1971, p.44).

Individual teachers have different experiences arising from their training programmes, in-service courses attended, and demands of implementing the curriculum. Agriculture teachers' experience will greatly influence their behavior in teaching various topics. A teacher's background and experience plays a significant role in educating students. Teachers with agriculture experience have more knowledge and more accurate perceptions of agriculture. Teachers who have been teaching for longer periods are more exposed to agricultural activities, through doing and seeing making them more confident and knowledgeable to teach the subject.

Gatticker and Nelligan, (1998) and Rao, (2009), reported that age does affect teacher's perception and adoption of information technology and its usage. However, the relationships between computer usage and age were mixed. Out of the twelve studies they reviewed, 62% suggested insignificant relationships and 38% found significant relationship between computer use and age. On the other hand, Gan (2001) identified that the younger, less experienced teachers use computers in a broader, more transformational fashion since they were more likely to be computer proficient, they were also likely to have had more digitally focused teacher education courses, and will be less constrained by prior habits or attitudes than their older, more experienced colleagues. Besides, Smiths' (2001), review also recommended that with wide age range tend to report age effect. Kumar, Rose and D'silva (2008) found in their study that actual use of computers decreases as the age of teachers increase. The same trend applied to the subscale of teaching and administration.

Kumar, *et al* (2008), further reported in their study that actual usage of computers among Malaysian secondary school teachers decreased with increase in their work experience. They noted that it is believed that the more years a teacher has taught the better the teacher is. Unfortunately, with the birth of information age era, a teacher without knowledge in actual use of computers is considered old fashioned and anachronistic. Thus, this being the case, it is immaterial if a teacher has 20 years of experience or five years .What matters most is the exposure and adequate knowledge the teacher has in the actual usage of computers(Kumar *et al*, 2008). From the foregoing it is apparent that study attempting to establish the relationship between age and the use of computers has elicited conflicting findings necessitating further exploration.

2.9 Theoretical Framework

This study will be guided by the Technology Acceptance Model (TAM). Researchers over the decades have given much attention to identifying the conditions or factors that could facilitate technology into businesses (Legris, Ingham & Collerette, 2003). Arising from this motivation, models were developed and tested to help in technology acceptance. Among these models, technology acceptance model (Davis, Baggozi & Warsaw, 1989) is the most popular in technology acceptance studies. The TAM has been empirically proven successful in predicting about 40% of a systems use (Teo, Su Luan & Sing, 2008). It has also been found to be a parsimonious representation of how perceptions and attitude effect technology use.

The TAM had its origin in the theory of reasoned action (TRA). The TRA posits that beliefs and attitude are related to individuals' intention to perform. Individuals' behavior (e.g. user rejection of technology) is determined by ones' intention to perform behavior, and this intention is influenced jointly by the individuals' attitude and subjective norms (the person perception that most people who are important to him think he should or should not perform the behavior in question). According to TRA, attitude towards behavior is determined by beliefs about the consequences of the behavior and the affective evaluation of the consequences. Beliefs are defined as individuals' subjective probability that performing a given behavior will result in a given consequence. Affective evaluation is an implicit evaluative response to the consequences.

Introduced and developed by Davis (1989), TAM addresses the issue of how users come to accept and use a technology. It shows that a prospective user attitude towards using technology is a major determinant of whether he or she will actually use it (Legris, Igham & Collerette, 2003). Attitude towards using, in turn is a function of two beliefs: perceived usefulness and perceived ease of use. Perceived usefulness is the degree to which an individual beliefs that using a particular system would enhance his or her job performance. Perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort. Venkatesh & Davis (2000) and King & He, (2006) extended the original TAM to explain perceived usefulness usage and intentions in terms of social influence and cognitive instrumental processes Their new model theorized that in a computer usage context, the direct compliance effect of subjective norm on intention over and above perceived usefulness and perceived ease of use will occur in mandatory, but not voluntary system usage settings.

Despite the limited application of TAM in education settings, its predictive powers lend itself to studying technology acceptance in educational settings. The TAM framework has been used to examine user acceptance towards various technology applications (Teo, Lee & Chai 2008). The technology applications that have been studied include, graphic user interface, mainframe application, accounting applications and computer resources centre. The TAM has also been used to investigate education related issues such as students' satisfaction with online learning, student acceptance of online course, and the effect of technical support on student acceptance towards Websites. Teo *et al* (2008) employed technology acceptance as the basic model to examine the attitudes of pre-service teachers towards the use of computer technology in education and found that the model predicted 42% of the variance. Technology acceptance theory explains the adoption of technology as a function of individuals' perceived ease of use, perceived usefulness, and subjective norm. Empirical evidence reveal that perceived ease of use affects usefulness directly and acceptance indirectly, and that perceived usefulness has direct impact on acceptance. This influence an individuals' attitude, intention to use and actual use. In this study it is presumed that actual use of computer-based instruction in teaching is hinged on, adequacy of computers, preparedness, gender, experience, practical teaching and are predictors of use in teaching secondary school agriculture.

2.10 Conceptual Framework

The conceptual framework depicts how the variables in the study interact. On the basis of the technology acceptance theory, a teachers' attitude towards technology and actual use is determined by: external variables, perceived usefulness and perceived ease of use. In this conceptual framework, the availability of computers, preparedness of the teacher, experience, teachers' gender, and practical teaching approach presumed to directly influence the Teachers' use of computer-based instruction in teaching of Agriculture. Availability of computers would determine what the teacher would choose from to use in a given lesson topic. Preparedness would determine the teachers' attitude towards computer-based instruction and the ease with which he or she would apply them in actual teaching.

Most of the topics in secondary school agriculture are required to be taught using a variety of teaching methods and particularly practical approaches which are highly emphasized in teacher training programmes. This would determine a teachers' choice of the method to use and directly influence the use of computer based-instruction. The teachers' experience would determine an individual's perception of usefulness and the ease with which he would use computer-based instruction in classroom situation. Experience in teaching of Agriculture gained overtime would enable a teacher to have a deep familiarity with Agriculture syllabus and increase awareness of usefulness of various ICTs in specific Agriculture topics. The intervening variables that were considered in the study included learner characteristics, the teacher training curriculum and schools' ICT policy. These are considered because a learner who has no exposure to ICT would constrain the teachers' use of technology in his subject. The teacher training curriculum would determine the extent to which the teacher is ready to apply technology for teaching purposes as a result of exposure or none exposure to ICTs in initial teacher training. The schools' policy which informs administrators' decision to install ICT has direct bearing on the actual usage of the ICT facilities for learning purposes. In order to control their effect on the study, the intervening variables were included in the study at one level as recommended by (Mugenda & Mugenda, 2003).

The relationship between the dependent variables, the independent variables and the intervening variables in the study are as shown in Figure 1.

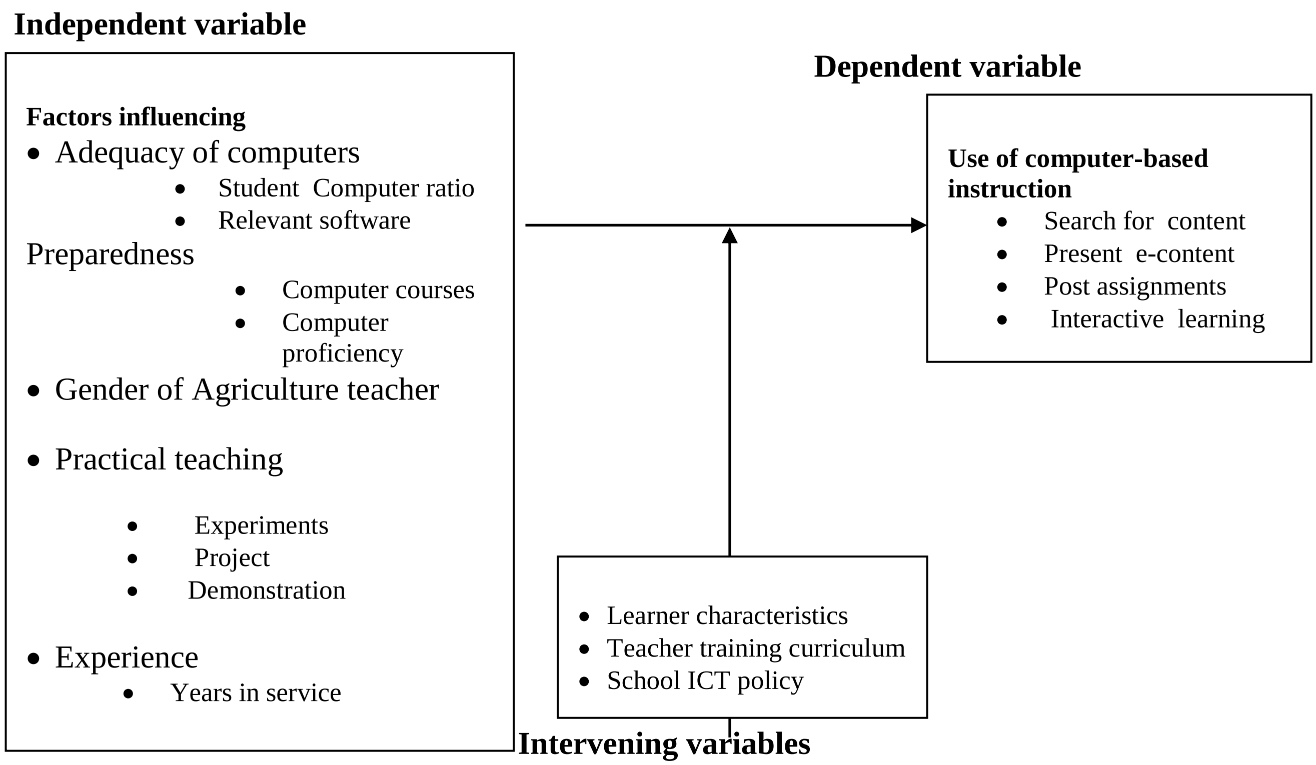


Figure 1: Conceptual framework showing relationships between Dependent, independent and Intervening variables.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section outlines the methodology that was used to attain the objectives of the study. It presents the research design, the location of the study, the population of the study, sampling procedures, instrumentation, validity, reliability of the instrument, data collection and analysis procedures that were used.

3.2 Research Design

The research design chosen for this study was a cross-sectional survey research design. Cross-sectional surveys involve the collection of data at a single point in time from a specified population (Mugenda & Mugenda, 2003). This type of research design is used to document the prevalence of particular characteristics in a population. The design was considered appropriate for this study because it offered an opportunity to establish relations and variations between subgroups in the population of study. The design also made it possible to test causal hypotheses.

3.3 Location of the Study

The study was conducted in three sub-counties in Bomet county. Bomet is county is one of the fourty seven counties in Kenya. The County was established in 1992. According to the Bomet county education office statistics, the sub-counties had a total of one hundred and six secondary schools in the year 2010. The county has four administrative units. The sub-counties were chosen for this study because they had a large number of schools designated as district or provincial schools. It was envisaged that it would yield a significant population of Agriculture teachers which could yield an adequate sample size for this study. Due to large number of schools it would also be possible to assess the computer adequacy and extent of use for teaching and learning agriculture.

3.4 Target population

The target population for the study consisted of 162 teachers of agriculture in the 106 secondary schools in the greater Bomet District. The study specifically targeted agriculture teachers since they are in a position to make decisions on when, and how to use computer-based instruction in teaching of agriculture. The teachers of agriculture have been trained on the appropriate pedagogy for teaching agriculture to meet the objectives of teaching agriculture in secondary school in Kenya. They are the ones who are supposed to choose the teaching method and resources suited for particular lesson topics to ensure effective learning. The teachers of agriculture are also supposed to develop innovative ways of using computer-based instruction to supplement the recommended methods of teaching and learning of secondary school agriculture.

Table 2

Agriculture teacher population

Sub-county	Number of schools	Agriculture teachers
Bomet	48	84
Chebalungu	28	38
Sotik	30	40
Total	106	162

Source: Bomet District Education Office, Annual Report 2011.

3.5 Sampling Procedure and Sample Size

A sample refers to a subset of a particular population. In order to represent the salient characteristics of the accessible population and to reduce sampling error, a sample must be large enough (Mugenda & Mugenda, 2003). Welman and Kruger (2004) suggest that any sample with less than 15 units of analysis should not be used but preferably one with more than 25 units of analysis. Ombati, (2009) notes that statistical tests require a minimum of 20 to 30 subjects per strata group. The preliminary stage of the study was the development of sampling frame of agriculture teachers in schools with computers. A list of agriculture teachers in schools with computers was obtained from the district education office in Bomet district and it formed the sampling frame. The respondents were then proportionately selected from the two sampling frames using stratified simple random sampling technique. Krajcie and Morgan (1970) and

Kathuri & Pals (1993) table for determining sample sizes for different populations provided in Appendix C was used to determine the sample size. The suggested appropriate sample size for the population based on Krajcie and Morgan (1970) table was 33 for provincial schools and 85 for district schools as summarized in Table 3. In order to compensate for attrition, respondents refusal to participate, and other similar circumstances a follow up using ten respondents was done after three weeks.

Table 3:

Agriculture Teacher Population and Sample size

School Category	Teacher Population	Sample Size
County schools	45	33
Sub-county schools	117	85
Total	162	118

Source: Bomet District Education Office, Annual Report 2011.

3.6 Instrumentation

The instrument used for the study was a questionnaire containing structured or closed ended questions. A questionnaire was preferred for this study because it was cost effective and also allow for wider reach of the respondents. The questionnaire was administered to agriculture teachers. The instrument was developed so as to contain all the items that would aid in achieving the objectives of the research as stated in chapter one. The questionnaire was divided into four sections. Section one contained items to measure teachers' personal characteristics computer adequacy. Section two of the instrument contained likert scale items measuring teachers' preparedness to use computer-based instruction. Section three contained items measuring agriculture teachers' use of computer-based instruction on weekly basis. Finally section four of the instrument was developed to measure teachers' use of practical teaching methods. The section also contanined likert scale items measuring agriculture teachers' perception that computer-based instruction would promote practical teaching of selected agriculture topics in secondary school agriculture syllabus.

3.6.1. Validity

Two types of validity were considered while developing the research instrument. These were content validity and face validity. Content validity refers to representativeness of items on the instrument as they relate to the entire domain or universe of content being measured (Mugenda & Mugenda, 2003). This type of validity was enhanced subjectively through thorough examination of the instrument by three experts in the department of Agricultural education and extension of Egerton University. Face validity refers to the appearance of the instrument and this was enhanced by subjecting the instrument and objectives of the study to scrutiny by three professionals and agriculture teachers involved in piloting, and their comments incorporated into the instrument before being used in the field.

3.6.2. Reliability

Reliability refers to the instruments' capability to yield consistent results when repeatedly administered. To ensure the instrument was reliable, it was piloted with 30 agriculture teachers not included in the study from a population with similar characteristics as the one for the study. Piloting was done in Bureti District. Reliability coefficient of the instrument was determined using Cronbach's coefficient alpha to determine internal consistency this approach was preferred since it reduces the time required to compute reliability (Huysamen, 2006). Coefficient alpha also results in a more conservative estimate of reliability thus reducing erroneous conclusions (Mugenda & Mugenda, 2003). A reliability index of 0.896 was obtained. According to Kathuri and Pals, (1993) reliability index of 0.7 or higher would make the instrument reliable and acceptable for a study in social sciences. The instrument was therefore considered reliable for field data collection based on the piloting results.

3.7 Data Collection Procedure

Once the research proposal was approved a letter of authorization to conduct research was obtained from the Graduate school, Egerton University. The letter was then used to facilitate the acquisition of a research Permit from the National Commission of Science and Technology. Once research permit was obtained, permission to conduct research was obtained from Bomet County Director of Education. The teachers involved in the study were individually visited in their respective stations and given a questionnaire to respond. Respondents were given sufficient time to respond to the items in the questionnaire. Once the respondents completed the questionnaires the instruments were collected on the same day. This approach was aimed at ensuring a high response rate. In an event that the respondents failed to respond to the questionnaire initially, a follow up visit was done in which a new questionnaire was administered.

3.8 Data Analysis

The type of data that was collected was categorical and interval data. Once the measuring instrument had been administered, the collected data were systematically organized through coding to facilitate analysis. Quantitative methods of data analysis were used with both descriptive and inferential statistics being applied to explain the results of the study. Descriptive statistics was preferred because it aided the researcher to meaningfully describe the population of study; inferential statistics were deemed appropriate because they would enable the researcher to make inferences about a population based on the results of a representative sample (Mugenda & Mugenda, 2003). This aided the researcher to generalize the findings of the study to the population. The types of descriptive and inferential statistics that were used included the mean, percentages, regression analysis and t-test. Regression analysis was preferred because it enabled the researcher to establish the amount of variation explained by a variable or a group of variables on a given dependent variable (Mugenda & Mugenda 2003; Welman & Kruger, 2004). The t-test on the other hand was considered appropriate because it enabled the researcher to determine whether there was a significant difference between two groups on a given variable at a specified probability level (Mugenda & Mugenda, 2003). All tests of significance were computed at a significance level of 0.05. The statistical package for Social Sciences version 17 was used to aid in data analysis. A regression model of the following form was used to determine whether the independent variables predicted the dependent variable.

$$Y= \beta o +\beta 1x1+\beta 2x2+\ldots\beta 5x5+ \varepsilon$$

Where, Y- is the dependent variable

X1-5-Are the Independent variables

βo - is a constant

$\beta 1$-5- Are regression coefficients or change induced in Y by each x

ε- Is the error

Table 4

Summary of data analysis

Hypotheses.	**Independent variable.**	**Dependent variable.**	**Statistical procedures**
Ho_1There is no statistically significant relationship between adequacy of computers and use of computer based instruction in agriculture.	Adequacy of computers. • Student computer ratio • relevant software	Use of computer based instruction in teaching of agriculture. • Search for content • Present e -content • Post assignment • Interactive learning	Regression analysis
Ho_2There is no statistically significant relationship between teachers' preparedness in use of computer based instruction and use of computer- based instruction in agriculture.	Agriculture teachers' preparedness in using computer based instruction • Computer related courses studied at pre-service • Computer proficiency • ICT in-service courses attended	Use of computer based instruction in teaching Agriculture • Search for content • Present e-content • Interactive learning • Post assignments	Regression analysis
Ho_3. Practical teaching approach has no statistically significant influence on the use of computer based instruction in teaching secondary school agriculture.	Practical teaching approach. • Experiments • Project • Problem solving • Demonstration	Use of computer based instruction in teaching agriculture • Search for content • Present e-content • Post assignments • Interactive learning	Regression analysis

H_{O4}.There is no statistically significant difference by gender in the use of computer based instruction in teaching of agriculture	Agriculture teachers' gender. • Male • Female	Use of computer based instruction in teaching of agriculture. • Search for content • Present e-content • Interactive learning • Post assignment s	t- test
Ho_5 Agriculture teachers' experience in years of teaching has no statistically significant influence in use of computer based instruction teaching of agriculture	Teaching experience • Years in service	Use of computer-based instruction in teaching of agriculture. • Search for content • Present e-content • Post assignments • Interactive learning	Regression analysis

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Introduction

The findings presented in this section encapsulate quantitative and qualitative data that was obtained from the respondents in the field. This chapter is organized by the objectives of the Study. The objectives of the study as stated in Chapter one were:

i) To establish the influence of adequacy of computers in the use of computer-based instruction in teaching secondary school agriculture in Bomet District.
ii) To determine the preparedness of agriculture teachers to use computer based-instruction in teaching of agriculture in secondary schools in Bomet district.
iii) To determine the influence of practical teaching approach on the use of computer-based instruction in teaching of secondary school agriculture.
iv) To determine the influence of agriculture teachers gender in the use of computer based-instruction in teaching of agriculture in secondary schools in Bomet District.
v) To establish the influence of agriculture teachers' experience in years of teaching on the use of computer based-instruction in teaching of secondary agriculture in Bomet District.

The hypotheses of the study were to:

Ho_1: There is no statistically significant relationship between the adequacy of computers and use of computer-based instruction in the teaching of agriculture in Bomet District.

Ho_2: There is no statistically significant relationship between agriculture teachers' preparedness in use of computer-based instruction and the use of computer-based instruction in teaching of Agriculture in secondary schools.

Ho_3: Practical teaching approach has no statistically significant influence on the use of computer-based instruction in the teaching of agriculture in secondary schools.

Ho_4: There is no statistically significant difference by gender in use of computer based-instruction in the teaching of Agriculture in secondary schools in Bomet District.

Ho_5: Agriculture teachers' teaching experience has no statistically significant influence on the use of computers-based instruction in teaching of agriculture in secondary schools.

4.2 Demographic Characteristics of Agriculture Teachers.

4.2.1 Academic qualifications of Agriculture Teachers

Agriculture teachers were asked to indicate their highest level of education. The results are shown in Table 5.

Table 5

Academic Qualifications of Agriculture Teachers

Highest Qualification	Frequency (%)	Percentage (%)
Certificate	3	2.6
Diploma	46	39.7
Degree	55	47.4
Postgraduate Degree	3	2.6
Non respondents	9	7.8
Total	**116**	**100**

Table 5 shows that 39.7 percent of the respondents had attained Diploma level qualification, while 47.4 percent had a Bachelors degree. A further 2.6 percent had attained a postgraduate degree as their highest level of training. A further 7.8 percent of the respondents did not indicate their level of educational qualification.

4.2.2 Gender of Agriculture Teachers

Gender is known to be an important variable in technology adoption. Table 6 indicates that 67.8 percent of Agriculture teachers were male and 32.2 percent were female.

Table 6:

Frequencies and percentages of teachers gender

Gender	Frequency (f)	Percentage (%)
Male	78	67.8
Female	37	32.2
Non-respondents	1	
Total	**116**	**100**

4.3 Teaching Experience of Agriculture Teachers

Teaching experience as an independent variable was investigated as it is known to affect an individuals' level of technology usage. The teaching experience of teachers was measured on the basis of years of classroom teaching experience. Experience was categorized into classes as shown in Table 7.

Table 7

Teaching experience of Agriculture teachers

Teaching Experience	Frequency (%)	Percentage (%)
Less than 5 years	48	42.9
6-10 years	28	23.2
11-15 years	20	17.9
16-20 years	9	7.0
21-25 years	5	4.5
26-30 years	3	2.7
31-35 years	1	0.9
	*4	3.4
Total	**116**	**100**

Note:*are none respondents, N=116.

The sampled teachers had varying teaching experience. According to table 6, 42.9 percentage of Agriculture teachers had teaching experience of less than five years. A further 23.2 percent had teaching experience of between 6-10 years while 7.0 percent had a teaching experience of between 16-20 years. A total of 4.5 percent had a teaching experience of 21-25 years in service while 2.7 percent had a teaching experience of 26-30 years. Only 0.9 percent had teaching experience of 31-35 years while 3.4 percent of the respondents did not respond to the items to measure their teaching experience.

4.4 Adequacy of Computers for Teaching Agriculture

The study sought to determine the adequacy of computers in secondary schools and determine the extent this influenced the use of computer-based instruction in teaching of agriculture. Agriculture teachers were asked to rate the adequacy of computers and related accessories in their schools. The findings are presented in Table 8.

Table 8

Adequacy of computers for Teaching Agriculture (N=116)

Item	Adequacy					
	Inadequate		Moderately adequate		Adequate	
	f	%	f	%	f	%
Computers	46	41.4	45	40.5	20	18
Projectors	60	61.9	21	21.6	16	16.5
PC Compatible video camera	60	65.2	18	19.6	14	15.2
Video CDs	42	45.2	35	37.6	16	17.6
Digital camera	56	60.9	20	21.7	16	17.4
Networked computers	53	56.4	24	25.5	17	18.1
Internet connected computers	52	52.5	26	26.3	21	21.2

Note: n=82 mean=1.583

Table 8 shows that 41.4% of respondents rated computers as inadequate, at the same time 40.5 percent rated it as adequate for their teaching and 18 % rated them as adequate. As for projectors, 61.9 percent rated it as inadequate, 21.6% moderately adequate and 16.5% as adequate. Video CDs relevant for agriculture teaching were rated by 45.2 % of the respondents as inadequate, 37.6% as moderately adequate and 17.2 % as adequate. Digital camera was rated by 21.7% of the respondents as moderately adequate and another 17.4% as adequate 60.9 rated it as inadequate. Respondents were asked to rate the adequacy of networked computers for teaching, 56.4% rated them as inadequate, 25 percent adequate and 18.1% as adequate. Internet connected computers were rated by 52.5 % as inadequate, 26.3 % as moderately adequate and 21.2% as adequate.

4.5 Accessibility of Resources

An important factor known to impact on the use of computers for teaching and learning purposes in schools is the level of access of computers and related resources for both teachers and students. In order to measure the level of access respondents were asked to rate the accessibility of various resources in their work stations. The scale ranged from inaccessible for no access to most accessible for high access. The results are presented in table 9.

Table 9

Accessibility of computers and related accessories

Item	Inaccessible		Accessible		Moderately accessible		Most accessible	
	f	%	f	%	f	%	f	%
computers	19	16.8	39	34.5	28	24.8	27	23.9
projectors	38	36.5	29	27.7	27	26	10	9.6
Video camera	63	60.5	22	21.2	13	12.5	6	5.8
Video CDs	53	50.5	25	23	21	20	6	5.7
Digital camera	53	50.5	21	20.4	19	18.4	11	10.7
Networked computers	52	50.5	21	20.4	19	18.4	11	10.7

n=116

In relation to access to computers within their schools, an analysis of table 9 shows that 34.5 percent of the respondents rated computers to be accessible while only 23.9 rated them as most accessible. Projectors were rated by 36.5% of the respondents to be inaccessible and 27.9% to be accessible. On the other hand P.C compatible video camera were rated by 60.6% of the respondents to be inaccessible, 21.2% accessible 5.8% rated them as most accessible. Video CDs were found to be inaccessible to 51% of the respondents and most accessible to only 11.5% of the respondents. Digital cameras were found to be inaccessible to a total of 50.5% of the respondents and accessible to 23.8% of the respondents while 5.7% rated it as most accessible. Networked computers was found to be inaccessible to a total of 50.5% of the respondents. A total of 20.4% of the respondents rated them accessible and 10.7% moderately accessible. From the analysis of table 9 it may be concluded that while computers were accessible to most agriculture teachers. Projectors, P.C compatible video camera, and networked computers were not accessible to most agriculture teachers in the study area. Writing on the factors influencing the application of ICT in the management of agricultural information, Ombati (2009) noted that among agricultural extension staff computers were only available at the district headquarters. He further added that, they were used as systems for report writing and maintaining basic data in all areas, with no linkages to other subsystems. In his findings Ombati (2009) added that there was no centralized system for integrating all agricultural information in the district extension service, nor did the district agricultural office have an active website.

4.6 Location of computers in schools

Location of computers is known to be a factor which determines its accessibility to both teachers and students for learning purposes. In order to determine the degree of access of computers for learning relative to its availability, agriculture teachers were asked to indicate where computers were located in their schools. Results are presented in table 10.

Table 10

Location of computers in schools

Location	Yes		No	
	Frequency (f)	Percentage (%)	Frequency(f)	Percentage (%)
staffroom	15	12.9	101	87.1
classroom	1	0.9	115	99.1
Administration office	63	54.3	53	45.7
Computer laboratory	65	56	51	44
Other locations	23	19.8	93	80.2

n=116

An analysis of table 10 reveals that only 12.9% of the respondents had computers located in the staffroom while 87.1% did not. Another 99.1 % indicated that computers were not located in the classroom. It is further revealed that 54.3% of the respondents indicated that computers were located in the administrators' office. It was also found that majority of the respondents had computers located in the computer laboratory. A further 19.8% of the respondents indicated that computers were located in other locations. Oloo (2008) in a study done in Kenya found that majority of schools surveyed did not have internet connected computers, and that those which had there was poor connectivity making it impossible to use it for research and e-learning. This may imply that computers in schools are either used for storage of administrative information, for support services or are used for teaching computer as a study subject. Research on barriers hindering infusion of ICT in schools have shown that teachers are having infrastructural barriers where there are very limited spaces for accommodating computers and related peripherals in computer rooms, classrooms and staff room (Chung & Ngan, 2002). Chung and Ngan, (2002) added that the average time teachers incorporated ICT in teaching was less than 5%.

4.7 Pupil to Computer Ratio.

In this study agriculture teachers were asked to indicate the approximate pupil computer ratio in their schools. The idea was to compare the number of computers to the student population. The results are shown in Table 11.

Table 11

Pupil computer ratio

Pupil Computer Ratio	Frequency (%)	Percentage (%)
250:1	6	5.2
200:1	5	4.3
150:1	2	1.7
100:1	11	9.5
50:1	12	12.9
25:1	19	16.4
10:1	9	7.8

n=116

With regard to the ICT infrastructure in schools, an important statistic is the student to computer ratio, which indicates how many students there are in the school per computer. Table 11 shows the Pupil to computer ratio in the respondents' schools. A total of 9.5 percent respondents reported that pupil Computer ratio was 100:1, 12.9 percent reported a 50:1 pupil computer ratio, and 16.4 percent reported a 25:1 ratio and 9 percent a ratio of 7.8. The findings are in contrast to Zhang (2004) study in Korea where he reports that the student computer ratio in primary and secondary schools had reached 16.7:1, and almost every school had been connected to the Internet by the year 2000. Zhang (2004) adds that between 1997 and 2000, Korean MOE spent $1.4 billion dollars on building educational system's ICT infrastructure. Also in 1997, the MOE of Singapore pushed out the Master plan for IT in Education. The Master plan envisaged that by 2002, pupils would spend up to 30% of curriculum time using IT. To achieve this, a pupil-computer ratio of 2:1 was targeted for every school by 2002. Pupils are provided with access to ICT in all learning areas of the school including computer laboratories, classrooms, libraries and special rooms. Oloo (2008) in a baseline survey carried out in Kenya noted that majority schools in Kenya had 11-20 computers and that in most cases the computers were very old. Oloo (2008) further added that most of the computers in Kenyan schools were located in offices, meaning there were no special rooms designated as computer rooms. The studys' findings indicates that schools are lagging behind in terms of investment in ICT infrastructure, or that the value of ICT in teaching and learning has not been given the deserved recognition. This is evidenced by the fact that computers and other accessories were rated to be inadequate for teaching purposes in most cases and that a limited number of schools had computers designated for student use.

4.5 Preparedness to Use Computer-Based Teaching in Agriculture

Preparedness of teachers to use computer-based instruction in their teaching was considered an important variable in this study. Preparedness was measured by determining computer-based instruction causes undertaken by teachers in pre-service training. The results are presented in table 12 and 13 respectively

Table 12

Computer-Based Teaching training in pre-service training

	Frequency (f)	Percentage (%)
No	54	47
Yes	61	53
Total	**115**	**100**

Note: n=115

In order to measure agriculture teachers' preparedness to use computer based instruction, teachers were presented a series of questions to gauge their training both at pre-service level and as in-service teachers. Although Egerton University and Bukura College of Agriculture, the major trainers of agriculture teachers have no computer-based instruction as an independent course of study, a total of 53 percent indicated that they undertook a course in computer-based instruction during the pre-service training. A further 47 percent indicated they never received. This responses could be as a result of aspects of computer-based instruction being covered under education technology course which is a common course for all trainee teachers.

This implies that majority of the responding agriculture teachers never received training on computer-based instruction at pre-service training. From these responses the percentages of those who undertook training in computer-based instruction and those who did not are both significantly high. One possible reason for this is that ICT use in teaching is fairly a recent development in Kenya and quite a number of teachers may have undertaken their teacher training programes when computers were not widely available. On the other hand majority of the respondent teachers are young and it is likely that they undertook their training when computers were widely available.

4.5.1 Unit of training

Agriculture teachers were also asked to indicate whether they had taken Computer-based instruction training course. The results are shown in table 13.

Table 13

Unit of Training

	Source of training	Frequency (f)	Percentage (%)
	University	34	29.3
	College	11	9.5
	Self	13	11.2
	Other	15	12.9
	Non respondents	*43	37.1
Total		**116**	**100**

Note:* Non respondents

Preparedness of agriculture teachers to use computer-Based instruction in teaching of agriculture was considered an important variable because it could determine the extent of actual application of computers for teaching. In order to measure teacher preparedness a number of variables were considered. These were mode of training, duration of training, and level of proficiency in ICT skills. Table 13 shows that 29.3 percent of the respondents received computer based teaching training during University, 9.5 percent in college, while 11.2 percent indicated that they received training on their own initiative and 12.9 percent through other mode of training. A total of 37.1%

of the respondents did not respond to this item. One possible explanation could be that this group of non respondents may not have taken a computer related training course at all. A factor which is directly related to teacher confidence levels is that of teacher competence. In order to achieve high levels of teacher competence in ICT, there is a need to provide training, and perhaps unsurprisingly, there is a great deal of literature evidence to suggest that effective training is crucial if teachers are to implement ICT effectively in their teaching (British Education and Technology Agency, 2004). If training is inadequate or inappropriate, then teachers will not be sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in classroom.

4.5.2 Time of Training

Continuous training is an important determinant of teacher preparedness to apply computer-based instruction in their teaching. Respondents were asked to indicate whether they had undergone any training in computer-based instruction over a period of time. The results are shown in Table 12.

Table 14

Time of Training

Time	Frequency (f)	Percentage (%)
Last one year	68	58.6
Last two years	12	10.3
Last three years	6	5.2
Not at all	21	18.1
Non-respondents	9	7.8
Total	**116**	**100**

n=116

In order to measure the extent of agriculture teachers' were prepared to use computer-based instruction in teaching, respondents were asked to indicate whether they had received training in computer-based instruction over the last three years. The idea was to determine whether teachers were undergoing continuous training. An analysis of table 12 shows that a total of 58% of the respondents had taken the training in the last one year, 10.3% in the last two years and 5.2% in the in the last three years. Another 21% of the respondents indicated that they had not taken the training at all. The high number of the respondent who had taken the training in the last one year may be attributed to an in-service training jointly undertaken by the Kenyan Government and the Japanese International Cooperation agency (JICA) and mainly targeting science teachers in secondary schools.

In order for teachers to apply computer technology in their classrooms there is need for continuous training. In a study of teacher education institutions in Scotland, Simpson, Payne, Munro, Hughes and Lynch (1999) found lack of pedagogy in ICT training to be a problem for students undergoing initial teacher training: "The trainee teachers clearly felt that their tutors had failed to deal extensively or as effectively as they would have wished with the key factors associated with the pedagogical use and management of (ICT)

4.5.3 Extent of Agriculture teachers Preparedness by Training.

Agriculture teachers were asked a series of questions to gauge the extent various modes of training had prepared them to use computer-based instruction. The results are shown in Table 13.

Table 15

Extent teachers are prepared to use CBI by Training

Training	Small extent		Moderate extent		Large extent	
	f	%	f	%	f	%
College University	51	46.4	36	32.7	23	20.9
Professional development	28	25.2	55	49.5	28	25.2
Seminars and workshops	18	16.4	58	52.7	34	30.9
Colleagues	25	22.7	51	46.4	34	30.9
Independent learning	23	20.7	41	36.9	47	42.3

n=116

Training is a key means through which individuals acquire skills which they use in their daily lives. Individuals may acquire skills formally or informally through their own initiatives. According to Table 15, a total of 46.4% indicated that college and university training prepared them to a small extent, 32.7 % indicated that it prepared them to a moderate extent. A total of

49.5 p% reported that professional development activities had moderately prepared them, 25.2% reported that it had prepared them to a large extent. Seminars and workshops had to a moderate extent (52.7 %) and to a large extent (30.9 %) prepared them to use computer-based training in teaching agriculture. Colleagues had to a moderate extent (46.4 %) and to a large extent (30.9 %) prepared agriculture teachers to use Computer-Based instruction in teaching. Independent learning was to a moderate extent (36.9 %) and to a large extent (42.3%) to have prepared agriculture teachers to use computer-based instruction in their teaching.

The findings of this study are in agreement with Ombati (2009) findings among agricultural extension staff who reported that training in ICT based application in management of agricultural information received either none or low emphasis during their pre-service training. This therefore calls for improvement in teacher and agricultural extension staff training programs to incorporate aspects of computer-based instruction and ICT based agricultural information management. Teachers should also be encouraged to undertake independent learning as a means of acquiring computer-based instruction skills. This finding seems to imply that pre-service training did not prepare agriculture teachers to a large extent in the use of computer-based instruction in their teaching subjects.

Rogers (2002) noted that the area which is most in need of development is that of appropriate pedagogy and teachers understanding of the philosophy of behind the different ICT applications. This understanding can only come about when teachers have successful lessons using ICT, sometimes by stepping out of their preferred teaching approaches. Such successful teaching episodes depend on thorough preparation beforehand, linking the ICT to ongoing teaching and learning. Thus other than adequate training successful ICT implementation in classroom can only take place if teachers undertake independent skill and pedagogical training.

4.5.3 Agriculture Teacher Proficiency in Computer Skills

Agriculture teachers were asked to rate their proficiency in computing skills. The idea was that a teacher’s level of proficiency would determine the extent they would apply computers in actual classroom teaching. The results of analysis are presented in Table 16.

Table 16

Teacher Proficiency in Computer Skills

Skill	Computer skill Proficiency					
	Lowly proficient		Averagely proficient		Highly proficient	
	f	%	f	%	f	%
Accessing information online	18	17.3	56	53	30	28.8
Searching information online	16	15.4	60	57.7	28	26.9
Disseminating information online	27	28.1	47	49	22	22.9
Word processing	21	21	51	51	28	28
Spreadsheet construction	32	33.7	45	47.4	18	18.9
Information storage	19	18.8	59	58.4	23	22.8
Displaying information	23	23.7	53	54.6	21	21.6
Downloading information	20	19.4	63	61.2	20	19.4
Data analysis	38	41.8	34	37.4	19	20.9
Software Development and Engineering	18	36	22	44	10	20
Local area networking	33	50.8	18	27.7	14	21.5
Information retrieval	38	43.7	27	31	22	25.3
Data Recovery	38	45.8	31	37.3	14	16.9
Updating information	33	40.7	30	37	18	22.2
Software Development	25	46.3	22	40.7	7	13
Relational database	32	52.5	20	32.8	9	14.8
Internet web based communication	28	33.7	37	44.6	18	21
E-learning	35	43.2	31	38.3	15	18.5

n=116 mean= 2.22

Note: Figures in parentheses are percentages.

The sample agriculture teachers were asked to rate their proficiency in selected computer skills which may be a prerequisite if teachers are to fully exploit computer-based instruction in teaching of agriculture. Proficiency of teachers in computer skills is known to be a key determinant on the extent teachers can apply computer-based instruction for a variety of teaching activities. A total of eighteen computer skills were selected and agriculture teachers asked to rate their proficiency each. Table 16 shows that a total of 53.8% of the respondents rated themselves as averagely proficient in skills of accessing information online, while 28.8% rated as highly proficient. Another 57.7% were averagely proficient in skills for searching information online while 26.9% were highly proficient. In skills for disseminating information online, 49% of the respondents were averagely proficient, 22.9 % highly proficient and 28.1 were lowly proficient. With regard to word processing skills, 51% were averagely proficient, while 28% were highly proficient. On spreadsheet construction, 47.4% of the respondents were averagely proficient and 18% highly proficient. On skills for information storage, a total of 18.8% of the respondents were lowly proficient, 58.4% averagely proficient, and 22.8% highly proficient. On the other hand majority of the respondents rated themselves to be averagely proficient in skills for displaying information where a total of 54.6% were averagely proficient and 21.6% highly proficient.

Other skills that were considered included skills for downloading information. A total of 61.2% of the respondents rated themselves averagely proficient and 19.2% highly proficient. On data analysis skills, 41.85 were lowly proficient, 37.4% averagely proficient and 20.9% highly proficient. On software development and engineering skills 44% of the respondents rated themselves as averagely proficient, and 36% lowly proficient while 20% were highly proficient. With regard to local area networking skills, 50.8% of the respondents were lowly proficient and 25% rated themselves to be highly proficient. In skills for retrieving information, a total of 43.7% of the respondents were lowly proficient, while 25.3% were highly proficient. On data recovery skills a total of 45.8% of the respondents were lowly proficient 37.3% were averagely proficient and 16.9% of the respondents were lowly proficient.

A total of 46.5% of the respondents were lowly proficient and 40.7% averagely proficient on software development skills. With respect to internet web based communication, a total of 33.7% of the respondents were lowly proficient, 44.6% averagely proficient, and 21.7% highly proficient. In e-learning skills, 43.2% of the respondents rated themselves to be lowly proficient, 38.5% averagely proficient and 18.5% highly proficient. These findings on the overall reveal that majority of agriculture teachers were either lowly proficient or averagely proficient in most of the computer skills. Ombati (2009) in a similar study conducted among research and extension staff found that agricultural staff possessed less computer skills than they needed. Teacher attitude towards computing is critical if computers are to be effectively integrated into the school curriculum. Research has shown that a teacher's attitude towards the computer is a major predictor for future computer use (Myers & Halpin, 2002). It also predicts the need to learn computing skills that in turn will lead to computer literacy. For example, Yildirim (2000) found that teachers who used computers more would tend to develop positive attitudes that promote further use of the computer in their daily teaching tasks and conduct activities that require computers to play a major role, for example, computer-mediated forums. In addition, the relationship between perceived usefulness and perceived ease of use on computer attitudes has been reported in various studies that provided evidence in support of a positive relationship among them (Cheng, Lam, & Yeung, 2006; Teo, Lee, & Chai, 2008). Hussein and Safa (2009) in a study carried out among Iranian agricultural faculty members established that faculty members level of knowledge and skill in applying ICTs (Beta=0.471) had the greatest influence on the use of ICTs by faculty members.

4.5.4 Use of Computer Based Instruction in Teaching of Agriculture

Respondents were asked a series of items to measure their intensity of use of computers for a variety of teaching activities on weekly basis. The usage of computers for these teaching activities were measured on a scale 1-4 ranging from always, sometimes, rarely, and never. The results of the analysis are shown in Table 17.

Table 17

Agriculture Teacher use of Computer-Based instruction

Use of CBI	Always		sometimes		rarely		Never	
	f	%	f	%	f	%	f	%
Search internet for agriculture relevant content	20	17.4	59	51.3	25	21.7	11	9.6
Use computer to present agriculture audio media	11	9.6	41	36	31	27.2	31	27.2
Use computer to present agriculture relevant simulations	8	7.1	29	25.9	43	38.4	32	28.6
Students select and retrieve agric information in computer	7	6.2	25	22.1	30	26.5	51	45.1
Allow students to search internet for further study	13	11.4	25	21.9	27	2.7	49	43
Store information relevant for Agric teaching in computer	24	21.4	37	33	23	2o.5	28	25
Require students access Agric assignments online	11	9.6	21	18.3	29	25.2	54	47
Use computer to prepare agric lesson notes	7	6.2	36	31.9	40	35.4	30	26.5
Use computer to prepare schemes of work	35	31	34	31.1	22	19.5	22	19.5
Use computer to analyze examination data	29	25.2	39	33.9	25	21.7	22	19.1

Note: n=118 mean=3.60

Agriculture teachers from the sample schools were asked questions intended to measure how often they used computers for a variety of teaching activities. Internet use to search for content relevant to agriculture was always used by 17 % of respondents or sometimes used by 51.3%. Computer use to present agriculture relevant multimedia/audiovisuals was sometimes used by 36.6 percent and always used by 9% of agriculture teachers. Use of computer to present simulations relevant to agriculture was always used by 7.1% sometimes used by 25.9% of agriculture teachers. A total of 6.2% indicated that their students are allowed to retrieve agriculture information in computer another 22.1% indicated that they sometimes. On student use of internet 11.4% always allowed students to search internet and 21.4% sometimes allowed. A total of 21.4% always stored agriculture relevant content in computer and 33% sometimes. On student use of computer to access agriculture assignments online, 9.6 percent always required and 18.6% sometimes. On use to prepare agriculture lesson notes, 6.2% always used and 31.9% sometimes used. 31% used to prepare schemes of work and 21.7%sometimes used. A total of 25.2% used computer to analyze students' data and 33.3% sometimes used. From the findings it may be concluded that although most schools are currently equipped with computers, and teachers have access to computers in schools, actual usage for a variety of teaching activities is low or at the emergence stage.

Oloo (2008) in a baseline survey report in selected secondary schools in Kenya found that computers were mainly used for administrative uses, examination processing, and teaching of basic computer skills. Oloo (2008) also noted that use of computers for teaching and learning remained dismal with a 7.14 performance in the survey, with responding schools reporting that 92.86 percent of their teachers not integrating computers in teaching and learning. This result converges with Cuban, Kirkpatrick and Peck (2001); Zhag (2004) and Kiptalam and Rodrigues (2010) findings that access to equipment and software seldom led to widespread teacher and student use. Most teachers were occasional users or nonusers. When they used computers for classroom work, more often than not their use sustained rather than altered existing patterns of teaching practice.

The seemingly marginal use of ICT in schools and classrooms is due less to inadequate funds, unprepared teachers, and indifferent administrators than it is due to dominant social beliefs about what teaching, learning and proper knowledge are and how schools are organized for instruction (Zhang, 2004). Zhang adds that in an examination-oriented educational culture, the average scores of the classes and the rate of students who are able to enter higher level schools or colleges are often regarded as the exclusive standards to evaluate teachers' work. This is disadvantageous to those volunteer teachers because the examination achievements do not fully reflect their efforts of ICT uses. New social context that encourages ICT uses and educational reforms should be established in schools, he concludes.

4.5.6 Practical Teaching in Agriculture

Experiential learning has been noted theoretically and empirically as an underpinning in of secondary agricultural education programs and has been noted as a psychological framework for learning in secondary agricultural education. Under the framework agriculture the context for learning in that learning involves construction of knowledge, engages students in an inquiry into the content, and demonstrates an overall value beyond school. In agriculture a number of teaching methods seen to engage students in the learning process are highly recommended. These approaches to teaching of agriculture were taught to overly influence a teacher's application of computer-based instruction. To rate the frequency to which teachers applied the conventional teaching methods in agriculture, teachers were asked to rate on a five point scale the frequency of application of selected teaching methods. The scale ranged from not at all, rarely, often, very often, and most often. The results are presented in table 18

Table 18

Extent of use Practical Teaching Approaches in teaching Agriculture

Teaching method	Not at all		rarely		often		Very often		Most often	
	f	%	f	%	f	%	f	%	f	%
Experiments	12	10.6	19	16.8	4	5.4	26	23	16	14
Demonstration	8	7	10	8.8	34	29.8	40	35.1	22	19.3
Field practical's	8	7	15	13.2	47	41.2	14	12.3	30	26.3
Project learning	12	10.6	34	30.1	41	36.3	17	15	9	8
Field excursion	12	10.5	33	28.9	35	30.7	23	20.2	11	9.6

Note: n=116 mean=3.1246

Two broad approaches to teaching have been identified: content centered and learning-centered. Practical teaching approaches are given a high premium in teacher training curriculum it is therefore expected that agriculture subject teachers would prefer these approaches over other teaching methods. To determine the extent agriculture teachers applied student-focused, learning –centered approaches to teaching, agriculture teachers were asked to indicate how often they applied selected practical teaching methods on a weekly basis. An analysis of table 18 shows that total of 35 percent of the respondents indicated that they conducted experiments often, 23 percent very often and 14 percent most often. A total of 35 percent used demonstrations very often and 29.8 percent used it often while 19.3 used it most often. Field practical was rarely used by 41.2 percent of the respondents and most often by 26.3 percent. Project learning was rarely used by 30.1 percent of the respondents and often by 36.3 percent of the respondents. Field excursion was often used by 30.7 percent of the respondents and very often by 20.2 percent. Although a significant percentage of agriculture teachers use practical teaching approaches, a significant percentage rarely applied these methods.

A teacher who adopts a content-centered approach to teaching focuses on the subject and the materials to be taught, whereas a teacher with a learning-centered approach concentrates on the student (Kember & Kwan, 2000). Teachers with a student-focused, learning-centered approach to teaching have been shown to be more pedagogically aware and to vary their teaching methods according to the context (Lindblom-Yla¨nne, Trigwell, Nevgi, & Ashwin, 2006). The findings of this study seem to be in agreement with Omoros' (2005) and Kathuri (1991) findings that teachers of agriculture were not teaching agriculture practically despite being highly recommended. Kathuri (1991) found that although teachers reported that they taught agriculture practically, actual school visits indicated that teachers preferred lecture- based methods thus denying learners acquisition of practical skills. Adoption of computer-based instruction would offer more learning opportunities over purely lecture-based methods since it allows addressing issues of contextualization which are very important in for agriculture subject.

4.57 Extent of teachers' perception that Computer-based instruction promotes practical teaching of agriculture topics

Teacher respondents were also asked to rate on a six point Likert scale their level of agreement that computer-based instruction would promote the teaching of selected agriculture topics. The selected topics were drawn from the Kenya Institute of curriculum development recommendations that they be taught using practical approaches. The results of the analysis are shown in Tables 19.

Table 19

Extent of teacher's Agreement that Computer-based instruction promotes practical teaching of agriculture topics

Topic	Strongly disagree		Disagree		Slightly disagree		agree		Slightly agree		Strongly agree	
	f	%	f	%	f	%	f	%	f	%	f	%
Operations in land preparation	8	7.1	7	6.2	10	8.8	45	39.8	8	7.1	35	31
Methods of irrigation	2	1.8	5	4.4	7	6.2	42	37.2	12	10.6	49	39.8
Preparation of organic manures	4	3.6	8	7.1	11	9.8	38	33.9	18	16.1	33	29.5
Livestock breeds	0	0.0	6	5.3	4	3.5	26	23	9	8	68	60.2
Soil testing	3	2.7	11	9.8	19	17	42	37.5	11	9.8	26	23
Preparation of planting materials	5	4.5	11	9.8	12	10.7	35	31.3	23	20.5	26	23.2
Methods and procedures of budding	3	2.6	6	5.3	15	13.2	27	23.7	13	11.4	50	43.9
Routine field practices	4	3.6	4	3.6	21	18.8	33	29.5	17	15.2	33	29.5
Postharvest practices	7	6.3	5	4.5	12	10.8	40	36	16	14.4	31	27.9
Onion production	3	2.7	8	7.3	19	17.3	36	32.7	16	14.5	28	25.5
Appropriate methods of handling livestock	7	6.2	8	7.1	7	6.2	32	28.3	14	12.4	5	39.8
Signs of ill health in livestock	1	0.9	7	6.3	8	7.1	30	26.8	24	21.4	42	37.5
Digestive system in ruminants	2	1.8	5	4.4	7	6.2	23	20.4	21	18.6	55	48.7
Reproduction and reproductive systems	2	1.8	2	1.8	6	5.4	23	20.7	25	22.5	53	47.7
Routine livestock rearing practices	3	2.7	7	6.2	13	11.5	24	21.2	23	20.4	43	38.1
Types of erosion	2	1.8	4	3.5	6	5.3	21	18.6	29	25.7	51	45.1
Physical and cultural methods of erosion control	1	0.9	4	3.6	10	8.9	26	23.2	24	21.4	47	42
Weeds and weed control	3	2.7	6	5.3	10	8.8	28	24.8	26	23.0	40	35.4
Harvesting of industrial crops	2	1.8	7	6.1	10	8.8	35	30.7	23	20.2	37	32.5
Forage conservation	4	3.5	9	8.0	6	5.3	40	35.4	24	21.2	30	26.5
Management of incubator	3	2.7	3	2.7	10	8.8	28	24.8	26	23	43	38.1
Poultry rearing systems	1	0.9	4	3.6	6	5.4	22	19.6	30	26.8	49	43
Sources of farm power	1	0.9	3	2.6	6	5.3	28	24.6	28	24.6	48	42.6
Four stroke cycle engine	1	0.9	5	4.5	5	4.5	24	21.6	15	13.5	61	55
Systems of a tractor	2	1.8	5	4.4	3	2.6	29	25.4	15	13.2	60	52.6
Tractor drawn implements	2	1.8	2	1.8	6	5.3	27	23.7	21	18.4	56	49.6

Agriculture teachers were asked to rate on a six point Likert scale the extend they agreed that Computer-based instruction would promote practical teaching of selected agriculture topics. The topics listed were selected randomly from agriculture syllabus based on the Kenya Institute of Curriculum Development recommendations that they be taught practically. An analysis of the responses in table 19 show that the majority of agriculture teachers either agreed or strongly agreed that computer-based instruction promotes the practical teaching of selected agriculture topics. However, there was a strong agreement that computer-based instruction would promote practical teaching of the following Sub-topics: operations in land management 39.8 percent, methods of irrigation, 39.8 percent, livestock breeds percent 48 percent, methods and procedures of budding 43.9 percent, appropriate methods of handling livestock 39.8 percent, signs of ill health in livestock 37.8 percent, digestive systems in ruminants, 48.7 percent, reproductive systems, 47.7 percent, routine livestock rearing practices 38.1 percent, types of erosion 45.1 percent, physical and structural control of erosion 42 percent, management of an incubator 38. percent, poultry rearing systems 43.8 percent, sources of farm power 42.1 percent, four stroke cycle engine 55 percent, tractor systems 52.6 percent and tractor drawn implements 37.6 percent.

4.6 Test of Hypotheses

4.6.1 Ho_1: Adequacy of computers has no statistically significant influence on the use of computers in teaching secondary school Agriculture

The study sought to determine whether there was a relationship existed between adequacy of computers and the use of computers in the teaching of agriculture in secondary schools. A regression analysis was used to test the hypothesis at significance level of $\bar{\alpha}=0.05$. The results are presented in Table 20..

Table 20

A regression analysis showing the relationship between Pupil-computer ratio and use of computer based instruction

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.084	1	1.084	2.246	.137[a]
Residual	49.713	103	.483		
Total	50.797	104			

N=104; df; =1, 104, F=2.246 r^2=0.012 p=0.137

Table 21

und-standardized and standardized coefficients

	Un-standardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	2.189	.097		22.457	.000
Pupil to computer ratio	.037	.025	.146	1.499	.137

An analysis of table 18 shows that the adjusted r^2 was 0.12 with a standard error of 0.69473. This implies that adequacy of computers predicted 12% of computer-based instruction in teaching secondary school agriculture. The F value was 2.246 for the df (1.104). An analysis of table 19 shows that the standardized β coefficient was 0.146. This imply that computers adequacy statistically influences their use in actual classroom teaching. Implying that adequacy of computers alone explained 12% of computer use in teaching of agriculture. Albirini (2006) carried out a study examining the factors relating to the teachers' attitudes toward information and communication technologies. A questionnaire was designed to collect evidence from high school English teachers about their perceptions of computer attributes, cultural perceptions, computer competence, computer access, and personal characteristics (including computer training background). The sample consisted of 63 male and 251 female teachers. The results showed that a relatively high percentage of the respondents (57%) had computers at home while only 33.4% of the respondents had access to computers at school. This percentage gives a clear indication of the insufficiency of computers in schools, particularly for teacher use. Thus, Albirinis' findings substantiated this globally felt barrier that computer access has often been one of the most important obstacles to technology adoption and integration worldwide (Pelgrum, 2001). Also, a report on teachers' use of technology by the National Center for Education Statistics (September, 2000) indicates a correlation between availability of computers and computer use. In general, teachers who had computers in their classes were more likely to use them in instruction than teachers who did not; more than 50% of teachers who had computers in their schools used them for research and activities related to lesson preparation. A total of 78% of teachers surveyed cited limited access to computers as a barrier to effectively using computers in their classes. Of this total, 38% thought "not enough computers" was a "great barrier" to using technology in their classes. Therefore, efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students an administrative staff.

4.62 Ho_2: There is no statistically significant relationship between agriculture teachers' preparedness in use of computers in teaching and the use of computer-based instruction in teaching of Agriculture in secondary schools

The second hypothesis of the study was to determine whether agriculture teacher's preparedness to use computer-based instruction predicted their actual usage of computers in teaching of agriculture. Preparedness was measured by determining the computer-based instruction courses undertaken by teachers at pre-service and in-service training and measuring their proficiency in computer skills. A multiple regression was carried out and the results are presented in Table 20. The hypotheses was tested at significance level of $\alpha=0.05$.

Table 22

A regression analysis showing the relationship between preparedness and use of computer-based instruction

	Sum of Squares	df	Mean Square	F	Sig.
Regression	8.800	2	4.400	10.686	.000[a]
Residual	41.997	102	.412		
Total	50.797	104			

N=104, df= 2, 104; F=10.686, r^2=0.157, p=0.000

Table 23

un-standardized and standardized coefficients of preparedness in use of CBI in teaching agriculture

	Un-standardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.642	.156		10.533	.000
Mean of level of your proficiency in the skill	.548	.126	.402	4.362	.000
Receive training in pre-service training	.073	.128	.052	.566	.573

An analysis of table 20 shows that the r^2 adjusted value is 0.157 indicating that this variable alone contributed 15.7 use of computers in teaching of agriculture. The beta standardized coefficient was 0.052 (a change in standard deviation in preparedness leads to an increase in usage by (0.057). The F statistic for the degrees of freedom (df 2, 104) was 10.686. The p value was 0.000 which is higher than 0.05. The standardized β coefficients were 0.402. According to the statistics presented in table 19 there was evidence to reject the null hypothesis and accept the alternative. There was therefore enough evidence to conclude that teacher level of preparedness on computer-based instruction predicted their classroom use of computer-based instruction in teaching of agriculture.

This finding is in agreement with Pelgrum (2001), assertion that the success of educational innovations depends largely on the skills and knowledge of teachers. Also, he found that teachers' lack of knowledge and skills was the second most inhibiting obstacle to the use of computers in schools. Similarly, in the United States, Knezek and Christensen (2000) hypothesized that high levels of (attitude), skill and knowledge (proficiency), and tool (level of access) would produce higher levels of technology integration. Their model postulated that educators with higher levels of skill, knowledge, and tools would exhibit higher levels between computer use in the classroom and seven independent variables: perceive; beliefs about technology; administrative support; and peer support. He found that the faculty's belief in their computer competence was the greatest predictor of their use of computers in the classroom; relevance; desire to learn; emotional reaction to technology; beliefs about computer competence. Therefore, teachers should develop their competence based on the educational goals they want to accomplish with the technology integration in the classroom.

In addition to the factors mentioned above, there are other factors that influence teachers' decision to use ICT. They are collegiality among computer using teachers, self image, student-oriented educational philosophy, a will to reflect on student achievements positively by the teacher, positive views about the impact ICT has on teachers' work, perceived changes, student-oriented pedagogical approach, personal entrepreneurship, professional engagement, self confidence, and willingness to change. In their research Vajarga, Jahani, and Azadmanesh (2010) reported that computer illiteracy of academics, especially experienced faculty members was one of the most important barriers and therefore, assessing ICT literacy and planning for their training would improve their performance on teaching and learning activities.

4.63 *Ho_3: Practical teaching approach has no statistically significant influence on the use of computer-based instruction in teaching of agriculture in secondary schools*

Practical teaching approach was considered an important variable taught to impact agriculture on teachers' use of computer-based instruction. Experiential teaching strategies are highly emphasized in agriculture teacher training programs. Demonstration, project learning, problem solving and experimentation have been empirically proven to impact positively on student achievement. To what extent these methods influence agriculture teacher agreement that practical teaching approaches had a significant influence on the use of computer-based instruction in teaching of secondary school agriculture was determined. A regression analysis was used to test the hypothesis at α=0.05. The results are presented in Table 22.

Table 24

A regression analysis showing relationship between practical teaching methods and use of CBI in teaching secondary school Agriculture

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	2.504	1	2.504	5.381	.022[a]
	Residual	47.465	102	.465		
	Total	49.968	103			

N=103; df=1,103; F=5.381; r^2=0.04; p=0.22

Table 25

un- standardized and standardized coefficients for practical teaching methods and Use of CBI in teaching

Model		Un-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	1.747	.242		7.22	.000
	Mean of practical teaching methods	.171	.074	.224	2.320	.022

F=5.381, df=1,102>p=0.458, α=0.05

According to table 22, the r^2 adjusted for this variable was 0.41, implying that the practical teaching approaches predicated a total of 41% of computer usage in teaching of agriculture. The F value for the degrees of freedom (df, 1,102) was 5.381. The p value was 0.22. The standardized coefficient in table 23 was 0.224 (a change in standard deviation in practical teaching resulted in increased use of computers in teaching agriculture by 0.224). According to the statistics presented in table 23 and 24 respectively it is evident that the null hypothesis could not be accepted. There was therefore enough evidence to accept the alternative hypothesis; *that practical teaching approach has a statistically significant influence on the use of computer-based instruction in teaching of secondary school agriculture.* Writing on the effects of project-based learning on student achievement, Olatoye and Adekoya (2010) established that project-based learning brought about a significant effect on student achievement due to social interaction and friendliness that project based strategy provided to students. They further add that project-based learning promoted collaboration whether in small groups , student led presentations, or whole class evaluation of project results. Olatoye and Adekoya (2010) further affirm that project-based strategy shared overlapping characteristics with inquiry based or experimental learning and appears to be an equivalent or slightly better model for producing gains in achievement. Thus the superiority of project–based learning and demonstration may be one of the reasons the reasons these methods are widely used in teaching agriculture. A study by McConnel (2011) to determine the relationship between teachers' level of technology implementation and current instructional practices did not show a statistically significant relationship to the level of implementation at a significance level of .05. A further regression analysis as it relates to using more constructivist practices, did not show a statistically significant effect on the level of technology implementation. McConnel (2011) found that teachers current instructional practices did not show a statistically significant relationship to the level of technology implementation, further according to McConnell's' findings teachers instructional practices had no significant effect on the level of technology implementation.

4.6.4 Ho4*: There is no statistically significant difference by gender in use of computer based-instruction in teaching secondary school agriculture in Bomet District.*

Gender as a variable in this study was investigated as it is known to influence the perception of individuals towards technology and consequently influences their use. A t-test was used to determine whether there was a significant difference on the use of computer-based instruction based on the gender of agriculture teacher. The results are shown in Table 24.

Table 26

Relationship between Gender and the Use of Computer- Based instruction in Teaching Agriculture

		Levene's Test for Equality of Variances		t-test for Equality of Means				
				95% Confidence Interval of the Difference				
		F	Sig.	t	df	Sig. (2-tailed)	Lower	Upper
Mean use ICT in teaching agriculture	Equal variances assumed	.441	.508	-1.133	102	.260	-.45134	.12310
	Equal variances not assumed			-1.171	71.220	.246	-.44366	.11543

Table 24 shows that the F value for the df 102 was 0.508. The t-values were -1.133 (equal variance assumed) and -1.71 (equal variances not assumed). The p values were 0.26 the t-value two tailed is greater than $\alpha=0.05$, hence the null hypothesis is accepted. This suggests that there was no difference between male and female agriculture teachers on the use of computer-Based instruction in teaching of secondary school agriculture. This is led credence by descriptive statistics which showed that the mean for male agriculture teachers was 2.23 and 2.239 for female agriculture teachers wih regard to the use of computer-based instruction. Hence there was enough evidence to accept the null hypothesis. This finding contradict that of Aypay (2010) who found out that there was a relationship between being male and usage of internet by students. He further adds that male students more often downloaded music from internet than female students. Isman and Yaratan (2007) found that there is no significant difference in teachers' responses about the use of educational technology based on teachers' gender and educational level. In a study to determine male and female attitudes towards the impact of technology on people and work environment, Ray, Sormunen, and Harris (2009) found that, women showed significantly less concern than male towards the impact of technology on people and their work environment. Venkatesh and Morris (2000) found that decisions of men and younger workers were were more strongly influenced by their attitude towards using new technology. In contrast women and older workers were influenced by subjective norm and behavioral control. Then these two groups of people adopt different decisions processes in evaluating new technologies.

4.6.5 *Ho_5: Agriculture teachers' experience in years of teaching has no statistically significant influence on the use of computers-based instruction in teaching of agriculture in secondary schools.*

The last hypothesis of the study was to determine whether agriculture teachers' teaching experience influenced the teachers use of computer-based instruction. Teaching experience was considered an important variable in the study as it is known to invariably influence an individual adoption and subsequent use of the technology.

Table 27

A regression analysis showing relationship between Teaching Experience and Use of Computer-Based instruction in teaching agriculture.

	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.849	1	2.849	5.905	.017[a]
Residual	47.769	116	.483		
Total	50.618	100			

N= 116; D f=1, 116; F=5.905; r^2=0.047; p=0.017

Table 28

Un-standardized and standardized coefficients for relationship between Teaching experience an use of ICT in teaching Agriculture.

	Un-standardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	2.035	.128		15.953	.000
Teaching experience	.125	.052	.237	2.430	.017

Table 25 shows that the r^2 was 0.047. The F value for the degree df 1,100 was 5.905, while the p value was 0.017. Table 26 shows that the standardized β coefficient was 0.237. From table 25 it is clear that the p value is less than 0.05 suggesting that agriculture teachers' teaching experience has a statistically significant influence ($F=5.905>P=0.462$; df= 1, 99) on the use of computer-based instruction in teaching of agriculture. The r^2 value indicated implies that this factor alone predicted 4.7% use of CBI in teaching of agriculture. Isman and Yaratan (2007) conducted a study on how technology was integrated into science education in Cyprus and found out that according to ANOVA test results that were done for years of teaching experience of teachers, almost all values (between 0.049 and 0.018) were smaller than the standard value of α: 0.05. It indicated that teachers who had experience of 10 years or less agreed more to use educational technology tools than those teachers who had an experience of 11 years or more. McConnel (2011) in a study on the factors affecting teachers level of technology implementation found out that, variables teaching experience, years participating in the professional development program, age, and subject taught did not show a significant relationship to the level of technology implementation. In addition, multiple regression performed to support the findings and the level of technology implementation to overall teaching experience, years participating in the professional development program, age, and subject taught all showed no statistical significance ($p>.05$). Years of teaching experience, the years that a teacher has participated in the school's professional development program, the teacher's age, and the teacher's subject all showed no statistically significant effect on the level of technology implementation and therefore a relationship could not be determined.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter presents a summary of the findings, conclusions drawn from the findings and recommendations made for realizing the application of computer-based instruction in teaching secondary school agriculture.

5.2 Summary

This section briefly covers the contents of chapter one, two, three and four. Chapter one presented the background of information on the study, the problem statement, objectives and hypotheses of the study. The literature review was presented in chapter two with the purpose of emphasizing the role that ICT could play in education and the factors that may constrain teachers from exploiting the technology in classroom. It also pinpointed the gaps that require attention. The third chapter dealt with the methods and procedures of the study while chapter four captured the findings of the study.

The underlying theme of the study was that while computers though a recent development in education, they are now a commonplace in many learning institutions. However, there was evidence from research carried out locally that teachers rarely used it in classroom delivery of learning. Information and communication was thought to have immense potential in improving the achievement of students in agriculture which has been a concern to education stakeholders. The key features of computer-based instruction that make it crucial in learning is its reliability, an interactivity and capability to enhance speed of learning and retention of learned content. Few studies have, however, been undertaken on the factors influencing the application of Computer-based instruction in specific subjects. This study sought to provide empirical information on the factors influencing the use of computer-based instruction in the teaching of secondary school agriculture in Bomet District.

The first part of literature review was on ICT education this section drew from various authors and researchers (Adenyika, Adedeji & Majekoduni, 2005; Ogunsola 2005; Prensky 2005; Lei & Zhao 2007). Literature on what ICTs are, types and the roles they could play in learning was captured in this section. The second section dealt with gender and technology usage. The works of Fitzgerald, Meser, Nicolino & Morote, 2006; Hong and Koh 2002; Jamieson and Finger 2007; Venkatesh and Morris, 2000)e were cited. The third section of the literature review was on teacher preparedness in intergrating information and communication and technology in teaching. The works of (Albirini, 2006; Khalid, 2009; Korte & Husing, 2006; Balanskat, Blamiere & Kefala, 2006) were cited. The idea was to point out the relationship between teacher preparedness in terms of ICT skills, pedagogical training and application of computer-based instruction in teaching.

The fourth and fifth section dealt with the practical teaching approach inherent in agricultural education, and teaching experience on the use of computer-based instruction. The idea was to point out the practical nature of agriculture and the teaching methods emphasized and how this may influence a teachers choice of resources to apply in various topic areas. This section also dealt with teaching experience and how this could influence a teachers use of computer-based instruction. Finally the sixth section presented the theoretical framework. In this section the theory that guided the study was presented, its origin and how it has been applied in education technology studies was presented.

The study used a cross-sectional research design. In the study no variables were manipulated but were studied in retrospect in search of possible relationships. Questionnaires were used to collect data which was analyzed using descriptive and inferential statistics. The descriptive statistic used included the frequencies, means and percentages. Regression analysis and t-test were used to test the hypotheses at at α level of 0.05. The major finding of the study was that there was limited application of computer-based instruction in teaching of secondary school agriculture. Factors that were found to contribute to this were, inadequacy of computers and related pheripherals, low teacher skill proficiency, and low access within school.

5.3 Conclusions

From the findings of the study, a number of conclusions were made.

5.3.1. Computer adequacy was found to have no statistically significant influence on agriculture teachers' use of computer-based instruction in their teaching. Majority of the respondents indicated that computers and projectors were available in their schools. However pc compatible video camera, video CDs, digital cameras, networked computers, and internet connected computers were not available in most cases.

5.3.2 Computers and related equipment were inadequate. Majority of the respondents in the sample schools rated computers as either moderately adequate or inadequate for teaching purposes. Projectors, P.C compatible video camera, video CDs, digital cameras, networked computers and internet connected computers were inadequate in most cases.

5.3.3 Computers were accessible to agriculture teachers. However, projectors, pc compatible video camera, video CDs, Digital camera, and networked computers were inaccessible in most cases.

A significant percentage of respondents indicated that there were no computers designated for students use. Where there were computers designated for students use, the pupil computer ratio was high.

5.3.4 There was a significant relationship between teachers' preparedness in use of computer-based instruction and use of computer-based instruction in teaching secondary school agriculture. A high percentage of respondents indicated that they received training in computer-based instruction during their pre-service training. A smaller percentage undertook training on their own initiative. College training, professional development activities, seminars and workshops, and training by colleagues prepared agriculture teachers to a moderate extent to use computer-based instruction in teaching.

5.3.5 Agriculture teachers are not proficient in most computer skills. Computer skills which teachers rated themselves to be highly proficient included skills for accessing information online, processing information, disseminating information online, and word processing skills.

5.3.6 There was limited application of computers in teaching of agriculture. Most agriculture teachers sometimes searched internet for content relevant to agriculture, used computer to present simulations, audio media, store information relevant to agriculture, post assignments online, to prepare schemes of work, or to analyze examination data.

5.3.7 There was no significant difference between male and female agriculture teachers with regard to usage of Computers in teaching of agriculture.

5.3.9 Practical teaching had an influence on the use of computer-based instruction in teaching of secondary school agriculture. Practical teaching methods were the commonly used teaching methods on weekly basis. In majority cases agriculture teachers reported that they used experiments, demonstrations, field practicals, project learning, and field excursions either often, very often, or most often.

5.3.10 Teaching experience of agriculture teachers was found have a statistically significant influence on the use of computer-based instruction in teaching. Majority teachers in sample schools were found to have teaching experience of less than five years. This relatively young group of teachers could explain the high percentage of teachers who responded that they took a course in computer-based instruction during their pres-training.

5.5 Recommendations

Based on the findings of this study the researcher made some recommendations that when fulfilled could result in increased application of computer-based instruction in teaching of agriculture in secondary schools to improve achievement of students.

5.5.1 There is need for stakeholders in education to ensure there is increased investment in computers in schools. This will not only reduce pupil computer ration but also ensure enhanced internet connectivity but also enhanced on school access to the facilities for teachers and students for learning.

5.5.2 Teacher preparedness in the use of computers emerged as a factor influencing use of computer-based instruction in teaching of agriculture in the sample schools. It is there for recommended that agriculture teacher training institutions re-orient their teacher training curriculum to incorporate computer-based instruction as a course of study for trainee teachers. This will not only ensure that the trainee teachers are well prepared in delivery of subject content but also that they are capable of developing digital learning content.

5.5.3 Agriculture teachers were found to be average in most computers skills. There is need to provide continuous in-service training for teachers to improve their ICT skills and ensure that teachers are inducted on pedagogical uses of emerging ICTs in education.

5.5.4 Practical teaching methods were the commonly used methods in teaching and learning of agriculture on weekly basis. However, there was agreement among agriculture teachers that computer-based instruction would promote practical teaching of selected topics. Therefore agriculture teachers need to employ the principles of authentic learning in design of learning environments where computer-based instruction is incorporated.

5.5.5 Teaching experience was found to have a statistically significant influence on agriculture teachers use of computer-based instruction. There is need to provide continuous in-service training of agriculture teachers to induct them on application of emerging ICT technologies in teaching of agriculture.

5.4 Recommendations for further Research

5.4.1 A study similar to the current one be conducted in a wider geographical coverage to evaluate if the findings hold true in a wider population.

5.4.2 Experimental studies need to be conducted to evaluate the effectiveness of computer-based instruction in teaching and student achievement in selected topic areas.

5.4.3 The current study did not find a statistically significant difference between male and female teachers with regard to use of computer-based instruction in teaching of agriculture in secondary schools. Further research may need to be conducted to understand how gender may impact on technology use in teaching and learning.

5.43 A study should be conducted to evaluate specific software available in schools for teaching agriculture.

REFERENCES

Adenyika, T., Adedeji,T., Majekoduni, O.T (ud). An Assessment of Secondary School Teachers Uses of ICT'S In Nigerian Secondary Schools. Available at?

Albirini, A. (2006). Teachers' attitude towards information and communication technologies. The case of Syrian EFL Teachers,*Computers and Education, 47 (3), 73-398*.

Alonge, J. A. (2005*). Beyond technology determinism, Applying technology triangle model to assess the integration of technology by Floridas' secondary Agri-Science Teachers*. Proceedings of the 21st century association of American agricultural educators annual conference, san Antonio, Tx.

Afshari, M., Abu Bakar, K., Wong, S.C., Afshari, M. (2010). Principals level of computer-use and some contributing factors. *International Journal of Education and Information Technologies 5 (2) 43-53*

Afshari, M., Abu Bakar, K., Wong S.L., Bahaman, A.S and Fooi S.F (2009). Factors affecting Teachers use of information and communication technology. *International Journal of Instruction 2(1) 78-106*

Amory, (2010). Instructivist Ideology: Education technology Embracing the past? Interactive Learning Environment, Available at http://dx.doi.org/10494821003714707

Aypay. A (2010) Information And Communication Technology (ICT) Usage and Achievement Of Turkish Students In PISA 2006, *The Turkish Online Journal of Education Technology. 9(2), 116-124.*

Balanskaat, A., Blamire, R., and Kefala, S. (2006). *A review of studies of ICT impact on schools in European schoolnet*. Available at http://aae.otestate.edu/proceedings /2007/AAA/ proceedings. Retrieved on 5/5/2010.

Beggs, T.A. (2000). *Influences and barriers to the adoption of instructional technology*. Paper presented at the fifth annual Mid south instructional technology conference, Murfreeboro, T.N. Available at, http://www.mstu.edu/itconf/proceed 00/beggs.htm. Accessed on 13/4/2010

Bereiter, C. (2002). Education and mind in the knowledge age. Mawah, NJ: Lawrence Erlbaum associates.

Bransford, D. J., Brawn, L.A., and Cocking, R. R. (2000). *How People Learn: Brain, Mind, Experience and School.* Washington D.C: National Academy Press.

British Educational Communication and Technology Agency (2003). *Primary schools –ICT and standards*. Available at, http://dera.ioe.ac.uk/1700/1/becta-2002-Ict standards-analysis report pdf. Accessed on 18 / 6 /2010.

Camp, W.G., Clarke, A., and Fallon, M. (2000). Revisiting supervised agricultural experience, *Journal of Agricultural Education, 31 (3), 13-22.*

Chang , C., Lee, J., Wang, C. Che, G (2010) Improving the Authentic Learning Experience By integrating Robots Into Mixed Reality Environment. *Computers and Education 55 (5) 1572-1578*

Cheng, T. C. E., Lam, D. Y. C., & Yeung, A. C. L. (2006), Adoption of internet banking: An empirical study in Hong Kong, *Decision Support Systems, 42*(3), 1558-1572.

Cohen, L., Manion, L., Morrison, K. (2000).*Research Methods in Education*. London: Rautledge Falmer.

Cornfield, G., and Pearson, E. (2007). The use of ICT in teaching and learning, the pervasive solution. *The Academy for Information and Computer Sciences*.

Cox, M., Preston.C., and Cox, K. (1999). What motivates teachers to Use ICT? Paper presented at the *British Educational Research association annual conference*. University of Sussex at Brington. September 25 1999. Available At,http://www. Leeds.ac.uk/educol/documents/ 00001329, html. Accessed on 12 / 4/2010 at 9:20 p.m.

Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High Access and Low Use of Technologies in High School Classrooms: Explaining an Apparent Paradox. American Educational Research Journal, 38 (4), 813- 834.

Davis, F. D., (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly, 13 (3), 319-340*.

Davis, F. D., Baggozi, R. P., and Warshaw, P. R. (1989). User acceptance of computer technology. A comparison of two theoretical models. *Management Science, 3 (8), 982 - 1003*

Derbyshire, H. (2003). *Gender use of computers in education in Africa, Page 22-35* Available at.http://www.schoolnetafrica.org/fileadmin/resources/gender-pdf.Accessed on, 16/4/2010.

Drawhbaugh, C.C, and William, Lee. H. (1971). *Agricultural Education Approaches to Learning and Teaching*.Columbus Ohio: Charles E. Merrill Publishing company.

Dunn, C., Thomas, C., Green, C., and Mick, J. (2006). The impact of interactive multimedia on nutrition and physical activity knowledge of high school students. *Journal of Extension, 44 (2), 1-13.*

Firth, V., Jathfa, J., and Prince, R. (2004). Evaluating the effectiveness of interactive computer tutorials for undergraduate mathematics literacy course. *British Journal of Education and Technology, 35(2), 159-171.*

Fitzgerald, B., Messer. K., Nicolino, P., and Morote. E. (2006). Gender differences in using technology as a result of an introductory course for Educators conference proceedings. *International Conference for School Effectiveness and Improvement (ICSES) fort Landerdale* Available at, http://www.edit lib.org/d/2264/ proceedings-22643.pdf. accessed on 8/6/2010.

Gakuu, M.C., Kidombo, J. H., Ndiritu, A. A., and Gikonyo, N. (2009). Status of Pedagogical Integration of ICT in Education in Selected Schools In Kenya. *A report of the Pan African Research Agenda,91-96.* Available at, http://www.ernwaca.org/panaf/pdf Accessed 10/4/2010.

Gan, S .L. (2001). *IT and educational experience in Malaysia: Problems, Issues and Challenges*. Selangor:Pearson Education Malaysia.

Gatticker, U., and Nelligan. A. (1998). Computer attitudes and learning performance, Issues for management education and training. *Journal of Organizational Behavior, 13 (7), 78-90.*

Griffin, C. (1992). Absorbing experiential learning. In J. Mulligan and C.Griffin (Eds), *Empowerment through experiential learning, 31-3.* London: Kogan Page.

Hennessy, S., Harrisson . D., and Wamakote. L. (2010). Teachers factors influencing classroom use of ICT. *Itupale online Journal of African Studies, 2, 39-54.*

Herrington, J., Kevin, L. (2007). Authentic Learning Supported by Technology and Cases of Integrating in Classrooms. Education media international, 44(3), 219-236. Available at, http://www.tandf.co.uk/journals/rouledge/09523.987.html

Hong, K., and Koh, C. (2002). Computer anxiety and attitudes towards computers among Secondary School Teachers. A Malaysian Perspective. *Journal of Research on Technology in Education, 35 (1), 27.*

Houtz, S., and Gupta, P. (2001). Gender Roles, Computer attitudes, and dyadic computer interaction performance among teacher educators. *Journal of Organizational Behavior, 20 (3), 1-9.*

Hussein. M. S., and Safa. L. (2009). Factors affecting use of information and communication technologies (ICTs) by Iranian agricultural faculty members. *World of Applied Science Journal, 6 (8), 1103-1106.*

Huysamen, G.K. (2006). Coefficient alpha: Unnecessarily ambiguous; Unduly ubiquitous. *Journal of Industrial Psychology, 32 (4), 34-40.*

Isman, A., Yaratan, H., Caner, H., (2007). How technology is integrated into Science Education in a Developing country. *Turkish Online Journal of Education Technology, 6(3)55-59.*

Jamiesson R., and Finger G. (2007). Act to improve ICT use for learning. A synthesis of studies of teacher confidence using two Queensland schooling systems. *Australian Educational Computing, 23(2), 12-18.*

Jonassen, D. H, and Land M. (2000). *Theoretical foundation learning environments*.Mahwah: Lawrence and Erlbum associates.

Jonassen, D.H (1994). Technology as Cognitive Tools: Learners as Designers[Electronic Version*]*. *IT forum*. Available at: http//itech.co.uga/itforum/paper.html. Retrived on 3/7/2013.

Kathuri N. J., and Pals, A.D. (1993). *Introduction to educational research.* Education Media Center. Egerton University.

Kathuri, N.J.(1990). *A study on the new agricultural education curriculum in secondary schools of Kenya. (Unpublished P.hD Thesis).* Urbana, IL.,U.S.A: University of Illinois at Urbana-Champaign.

Kember, D., & Kwan, K.P. (2000). Lecturers' Approaches to Teaching and their Relationship to conceptions of good Teaching. *Instructional Science, 28, 469–490.*

Kenya National Examinations Council, (2008). *Examination Report, 235.* Nairobi, Kenya: Government Printer.

Kenya National Examinations Council, (2010). KCSE *Examination Report, 245.* Nairobi, Kenya: Government Printer.

Khalid, A.B. (2009). Barriers to successful integration of ICT in Teaching and learning Environments. A Review of literature. *Eurasian Journal of Mathematics, Science and Technology Education, 5(3), 235-245.*

Kibet, J.K. (2002). *Effects of Project-Based learning on Student performance in secondary school agriculture(Unpublished Ph.D Thesis).* Njoro Kenya: Egerton University.

King, R.W., and He, J.(2006). A meta analysis of the technology acceptance model. *Information and Management, 45(7), 40-55*

Kiptalam,K.G., and Rodrigues, A., (2010). Internet utilization : A case of connected rural and urban secondary schools in Kenya. *International Journal of Computing and ICT Research, 4(1), 50-65.*

Knobloch, A.N. (2003). Is experiential learning authentic? *Journal of Agricultural education, 44(4) 22-34.*

Kolb, D.A. (1984). *Experiential learning.* Engelwood cliffs, NJ: Prentice Hall.

Korte, B. W, and Husing, T. (2007*). Benchmarking access and use of ICT in European schools. Final report from Head teachers and classroom teacher survey in 27 European countries*. German European commission.

Krejcie,V.R., and Morgan, W.D. (1970). Determining sample size for research activities. *Educational and Psychological measurement, 30, 607-610.*

Kulik, A.J., and Kulik, C.C. (1991). Effectiveness of computer-based instruction. An updated analysis. *Computers in Human Behavior, 7, 75-94*

Kumar, N., Rose C. R and D' Silva, L. (2008) Teachers readiness to use technology in the classroom. An empirical study. *European Journal of Scientific Research, 21(4), 603-616.*

Lee, V. (1997). Effects of high school restructuring and size on early gains in achievement. *Sociology of Education, 68 (2), 41-70.*

Legris, P., Igham, J., and Collerette, P. (2003). How do people use information technology? A critical review of the technology acceptance model. *Information and Management, 40, 191-204.*

Lei, J., and Zhao, Y. (2007). Technology uses and student achievement. A longitudinal study. *Computers and Education, 49 (2), 284-296.*

Lindblom-Yla¨ nne, S., Trigwell, K., Nevgi, A., & Ashwin, P. (2006). How approaches to teaching are affected by discipline and teaching context. *Studies in Higher Education, 31(3), 285–298.*

Lotter, C., Harwood, S.W., Bonner, J. J. (2008). The influence of core teaching conceptions on teacher's use of inquiry teaching practices. *Journal of Research in Science Teaching, 44 (9), 1318-1347.*

Mabie, R., and Baker, M. (1996). A comparison of experiential instructional strategies upon science process skills of urban elementary Youth. *Journal of Agricultural Education, 37 (2), 1-7.*

Marison, L.D., and Frick, J.M. (1993). Computer multimedia instruction versus traditional instruction in post secondary agricultural education. *Journal of Agricultural Education, 34 (4) 24-37.*

Martin.A.R., Odubiya, O.A.(1991). Perceptions Iowa vocational agriculture teachers regarding methods used in Agricultural Education. *Journal of Agricultural Education, 47, (6) 16-25.*

Mcardle, G., and Bertlotto, M. (2010). Assessing the application of three dimensional collaborative technologies within an e- Learning environment. *Interactive Learning environments, 1-19.*

McConnel, J.B (2011). *Factors affecting Teachers level of Technology in A Texas Private School.* Available at, http//www.gradworks.umi/3460960.html. Retrieved on 10/3/2013

Mugenda, M.O., and Mugenda, G.A. (2003). *Research Methods, Quantitative and Qualitative approaches.*Nairobi: African centre for technology studies.

Mwiria, K (2002) Vocationalization of Secondary Education: Kenya Case Study. Regional Vcational Skills Development Review. Human Development African Region. World Bank. Available at. http://www.adeanet.org/.../sessions. Accessed on 6/9/2013.

Myers, J. M., & Halpin, R. (2002) Teachers' attitudes and use of multimedia technology in the classroom: Constructivist-Based professional development training for school districts. *Journal of Computing in Teacher Education, 18*(4), 133-140.

National Research Council, (2011). *Learning Science through Computer games simulations.*Washington, D.C: National Academy Press

Nevgi, A., and Lofstrom, E, (2008). University teaching staffs' pedagogical awareness displayed through ICT facilitated teaching. *Interactive Environments, 16(2), 101-116*

Newhouse, P. (2002). Literature Review. *The impact of ICT on learning and teaching*. Perth: Western Australia Department of Education.

Ngesa, F.U. (2002). *Impact of Experiential and Mastery Learning programs on Academic achievement in secondary school Agriculture*.(Unpublished Ph.D Thesis). Njoro Kenya: Egerton University.

Nyaema, K.M (2008). *Effects of Computer Supported Cooperative Learning on Secondary School Student Achievement and Attitude in Chemistry in Nakuru North District, Kenya.* (Unpublished Masters thesis). Njoro Kenya: Egeron University.

Ogunsola, L. A., (2005). Information Communication Technologies and Effects of Globalization. Twenty first century "Digital slavery''for Developing Countries Myth or reality. *Electronic Journal of Academic and Special Librarianship, 6 (1), 1-10*

Olatoye, A.R., Adekoya, M.Y. (2010). Effects of Project-Based Demonstration and Lecture Strategies on Senior Secondary Students 'Achievement in aspect of Agricultural Science. *International Journal of Educational Research and Technology, 1(1) 19-29.*

Oloo, M.L (2008). Baseline Survey Report For ICT In Secondary Schools in Selected Parts of Kenya, *Developing Partnership for Higher Education*, Available at: http// www…

Ombati, J.M. (2009). *Factors influencing the Application of Information and Communication Technology in the Management of Agricultural Information in Nakuru District Kenya.* (Unpublished PhD thesis). Njoro Kenya: Egerton University.

Omoro, J.A. (2005). *The Relationship between Instructional Procedures and Students Performance in Secondary School Agriculture in Nakuru District*. (Unpublished masters thesis). Njoro Kenya: Egerton University.

Pelgrum, W. J. (2002). *The effectiveness of ICT in Schools. Current trends and future prospects* . Teachers , Teacher policies and ICT. OECD Japan Seminar Tokyo Japan 5-6 Dec 2002. Available at, http://www.oecd.org/data oecd/11/41187615.pdf Accessed on, 3/12/2009

Pensky, M. (2005). What can you learn a cell phone? Almost anything! Innovative. *Journal of online Education, 1(5), 1-8.*

Rao, R. (2009). Digital Divide: Issues facing Adult learners. *Computer and Information Science, 2 (1), 132-136*

Ray, M. C., Sormunen, C., Harris, Y. (2009). Mens' and Women's' attitude Towards Computer Technology: *A comparison: Office Systems Research Journals, 17 (1) 1-8*

Rogers, L. (2002). Integrating ICT in Teaching Science in Secondary Schools. Proceedings of the International Conference in Computers on Education (ICCE, 02). Available at, http//www.

Serin, O. (2011). The effects of effects of computer-based instruction on the achievement and problem solving skills of science and technology students, *Turkish online journal of education technology, 10 (1), 183-201.*

Simpson, M., Payne, F., Munro, R. ,Hughes, S., Lynch, E. (1997). ICT in initial Teacher Education in Scotland. Northern College, Department of Educational Research.

Smith, S. L. (2001). Relationships between computer attitudes to gender, age grade level and teachers influence. *Education, 106, 338-344*.

Teo, T., Su Luan, W., and Sing, C.C. (2008). A Cross sectional examination of the intention to use technology between Singaporean and Malaysian Pre-service Teachers: An application of Technology Acceptance Model (TAM). *Education Technology and Society, 11 (4), 265-280.*

Teo. T., Lee., C. B., and Chai, C. S. (2008). Understanding Pre-service teachers computer attitudes. *Journal of Computer Assisted Learning, 24(2), 128-143.*

Topracker, E. (2006). Obstacles at integration of schools into information and communication technologies by taking into account the opinions of teachers and principals of primary and secondary schools in Turkey. *Journal of Instructional Science and Technology (e-Jist), 9(1), 1-16.*

UNDP Evaluation office, (2001). Information Communication Technology for Development. *Essentials: Synthesis of Lessons Learned, No.51-31.* Available at, http://www.undp.org/evaluation/documents/essential-5pdf, accessed on 17/4/2010.

Vajargah, F.K., Jahani, S., and Azadmanesh, N. (2010). Application of ICTs in the teaching and Learning at University Level, *the Turkish online journal of Education Technology, 9 (2), 33-39.*

Venkatesh, V., and Davis, F. D. (2000). A Theoretical Extension of Technology Acceptance Model, four Longitudinal field Studies. *Management Science, 46 (2), 186-204.*

Venkatesh, V., and Morris, M.G. (2000).Why do not men ever stop to ask directions? Gender, social influence, and role of technology acceptance usage. *MIS Quarterly, 24(1), 115-139.*

Wang, F., Reeves, C.T (2003). Why do teachers need to use technology in their classrooms? Issues, Problems and solutions. *Computers in schools 20 (4*). Available at http://harworth press.com/web/CTs.

Wekesa,W.E. (2003). *Effects of a Computer Based Instruction Module on Students' Achievement, Perception of Classroom Environment and Attitude towards School Biology in Nakuru District, Kenya* (Unpublished Masters Thesis) Njoro Kenya: Egerton University

Welman, J.C., and Kruger, S.J. (2004). *Research Methodology for the Business and administrative Sciences 2nd Edition*. Cape Town: Oxford University Press.

Young. B. J. (2001). Gender differences in students attitudes towards computers. *Journal of Research and Computing in Education, 25 (2), 200-218.*

Yue, A.H., and Ma, W. W. (2002). Gender differences in teacher computer acceptance. *Journal of Technology and Teacher Education,10 (3), 365-382*. Accessed at http//www.thefreelibrary.com, on 12/3/2010.

Yusuf, O.M., and Afolabi, O.A. (2010). Effects of Computer Assisted Instruction (CAI) on Secondary School Students Performance in Biology. *Turkish online Journal of Education Technology, 9 (1) 62-69.*

Zhang. J. (2004) Using ICT to prepare learners for 21st century: The perspectives of Eastern APEC Economies. Presentation for APEC summit on education innovation: " striking Balance from East and West" , Beijing , 2004. Available at http//www.?

APPENDICES

APPENDIX A

LETTER OF TRANSMITTAL.

Dear respondent.

Ref: Request to Fill a Questionnaire.

Please spare some minutes of your busy schedule to respond to the items in this questionnaire. The purpose is to conduct research on the factors influencing the integration of ICT in the teaching of agriculture in secondary schools. The findings of the study may be valuable to teachers of agriculture and other educationists as it will unearth the constraints faced in integrating of ICT in teaching of Agriculture and other subjects. Once the study is over the results will be shared with you. Any sensitive information that you may reveal will be treated with utmost confidentiality and will not be divulged to a third party.

Yours faithfully,

Justus K. Rutto.

APPENDIX B

AGRICULTURE TEACHER QUESTIONNAIRE

SECTION ONE: Personal information

A Please give the following information about you. Put a tick (√) against the appropriate response.

1. Your academic qualification.

Certificate ( ) Diploma ( ) Bachelors Degree ( ) Post Graduate degree.( )

2. Gender
Male ( ) Female ( )

3. Teaching experience in years

5 and below ( ) 6-10 ( ) 11-15 ( ) 16-20 ( ) 21-25 ( ) 26-30( ) 31-35( ) Other ( ) Specify ……..

B. Availability of ICTs for teaching.

1. The following items relate to availability of ICTs in your school. From the list given, put a tick (√) against the item available in your school.

S	Item	Availability	
		Yes	No
1	Computers		
2	Projectors		
3	PC compatible video camera		
4	CDs/DVDS relevant for teaching agriculture		
5	Digital camera		
6	Networked computers		
7	Internet connected computers		

2. Where available, please rate their adequacy for teaching purposes. Put a tick (√) against the appropriate response by use of scale 1-4.

(Key**: 1= Adequate, 2=moderately adequate, 3= Inadequate**.

S	Item	Scale		
		1	2	3
1	Computers			
2	Projectors			
3	PC Compatible Video Camera			
4	CDs relevant for teaching agriculture			
5	Digital camera			
6	Networked computers			
7	Internet connected computers			

3. Please rate the extent of accessibility of the following for your teaching purposes. Put a tick (√) against the most appropriate response using scale 1-

Key: 1= Most accessible, 2=moderately accessible 3= Accessible 4= Inaccessible

Item	Scale			
	1	2	3	4
Computers				
Agriculture relevant Video CDs				
Networked computers				
Projectors				
Internet connected computers				
Digital Camera				

4. Please Indicate by putting a tick ( ) against appropriate response, the approximate pupil Computer ratio in your school.

More than 250:1 ( ) 200:1 ( ) 150:1 100:1 ( ) 50:1 ( ) 25:1( ) 10:1( )

5. In which of the following are Computers located in your School.

Staffroom **( )**
Classroom **( )**
Administrators office ( )
Computer Laboratory ( )
Others ( ) Specify…………..

SECTION TWO: Preparedness to use ICT in teaching agriculture

A. The items in this section relate to your preparedness to use computer- based instruction in teaching of Agriculture. Put a tick (√) against the appropriate response.

1. Did you receive training in the use of information and communication technology in teaching prior to joining the teaching profession?
   Yes ( ) No ( )

2. If yes indicate by ticking who provided the training.
   University ( )
   College ( )
   Self ( )
   Others ( ) Specify……………

3 Indicate by putting a tick (√) whether you have received training on the use of ICT in teaching during the following periods.

Last one year ( ) Last two years ( ) Last three years ( ) Never ( )

Beach of the items below indicates a computer skill. Using any number 0-3 along the given scale, please indicate by a tick (√) the level of your proficiency in the skill.

Not proficient (NP) 0
Lowly proficient (LP) 1
Averagely proficient (AP) 2
Highly proficient (HP) 3

s	Skill	SCALE			
		0	1	2	3
1	Accessing information online				
2	Searching information online				

3	Disseminating information online				
3	Word processing				
4	Spreadsheet construction				
5	Information storage				
6	Displaying information				
7	Downloading information				
8	Data analysis				
9	Software development and engineering				
10	Local area networking				
11	Information retrieval				
12	Data recovery				
13	Updating information				
14	Software development				
15	Relational database construction				
16	Internet web-based communication				
17	e-learning				

B. To what extent has each of the following prepared you to integrate ICT in teaching agriculture

Key: 1=Small extent, 2=Moderate extent, 3= Large extent

	Scale		
	1	2	3
College/ University training			
Professional development activities			
Seminars and workshops			
Colleagues			
Independent learning			

SECTION THREE: Use of ICT in teaching agriculture

A. The following items relate to the application of ICT in the teaching of agriculture. Please tick () against the most appropriate response to indicate how often you use ICT in teaching agriculture subject 0-4. **(Key: 4= Never; 3=Rarely; 2= Sometimes 1= Always.)**

s	Item	1	2	3	4
1	I Search internet for agriculture relevant content				
2	I use computer to present agriculture relevant multimedia				

3	I use computer to present simulations relevant to agriculture subject				
4	Students select and retrieve agriculture information in computer				
5	I allow students to search internet for further research in agriculture				
6	I store information relevant for agriculture teaching in the computer				
7	I require students to access agriculture assignments online				
8	I use computer to prepare agriculture lesson notes				
9	I use computer to prepare schemes of work				
10	I use computer to analyze data				

SECTION FOUR: Teaching methods

A. The following are approaches to teaching of secondary school agriculture. Please tick ( ) the most appropriate response to indicate how often you use each on weekly basis.

Key: 1= Most often 2=Very often 3=often 4=rarely 5=Not at all

	Teaching method	Scale				
		1	2	3	4	5
1	Experiments					
2	Demonstration					
3	Field Practical's					
4	Project learning					
5	Field excursion					

B. The following topics are drawn from the secondary school agriculture syllabus. Please indicate by use of a tick ( ) your level of agreement that Computer-based instruction would promote the practical teaching of the topics listed. Use scale 1-6

Key1=strongly disagree. 2=Disagree 3=slightly disagree 4= agree 5=slightly agree 6=strongly agree.

		1	2	3	4	5	6
1	Operations in land management						
2	Methods of irrigation						
3	Preparation of organic manures						
4	Livestock breeds						
5	Soil testing						
6	Preparation of planting materials						

7	Methods and procedures of budding						
8	Routine field practices						
9	Postharvest practices						
10	Onion production						
11	Appropriate methods of handling livestock						
12	Signs of ill health in Livestock						
13	Digestive systems in Ruminants						
14	Reproduction and Reproductive systems						
15	Routine Livestock rearing Practices						
16	Types of erosion						
17	Physical and structural control methods of erosion						
18	Weed and Weed control methods						
19	Harvesting of Industrial crops						
20	Forage conservation						
21	Management of an incubator						
22	Poultry rearing systems						
23	Sources of Farm power						
24	Four stroke cycle engine						
25	Systems of a tractor						
26	Tractor drawn implements						

C. Which of the following statements best describes your schools' ICT Policy? Put a Tick ( ) the most appropriate description.

		1	2	3	4	5	6
1	Computers are meant for teaching						
2	Computers are meant for storage of administrative information						
3	Computers are meant for teaching computer studies						
4	Computers are meant to support leaning						

Thank you

APPENDIX C

TABLE SHOWING SUGGESTED SAMPLE SIZE FOR DIFFERENT POPULATION

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
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	265	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	175
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	82	600	234	8000	367
130	87	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	1000000	384

Note: N is population size.

S is sample size.

Source: Crecy, V.R and Morgan, W.D., (1970). Educational and Psychological measurement.

APPENDIX D

RELIABILITY INDEX

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	25	100.0
	Excluded	0	.0
	Total	25	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.896	99

Item-Total Statistics

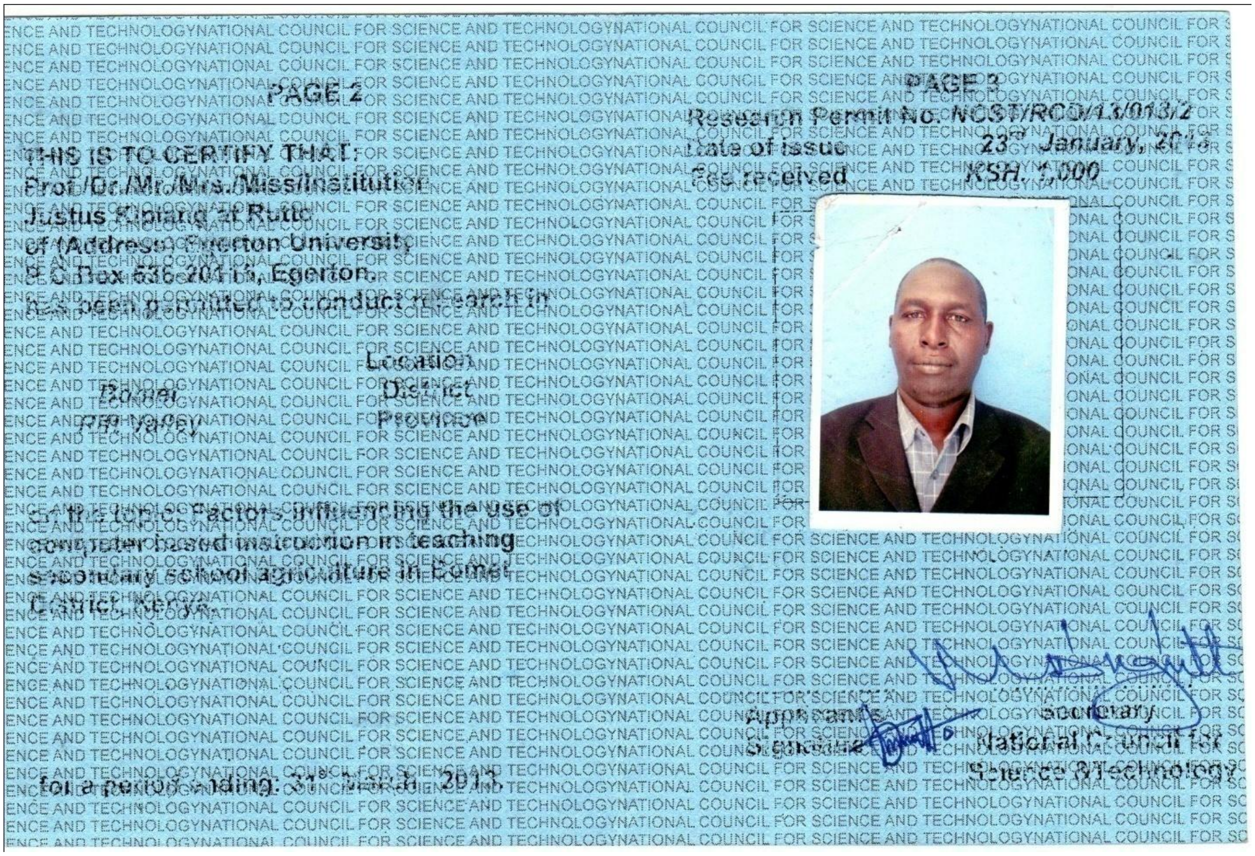
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
academic	282.6800	1554.560	.064	.896
gender	283.5600	1563.507	-.092	.896
teach_exp	282.5600	1553.673	.056	.896
avai_comp	283.6800	1561.560	-.045	.896
avai_project	283.2800	1564.793	-.120	.896
avai_camera	283.0400	1564.957	-.163	.896
avai_video	282.4000	1581.250	-.116	.908
avai_digital	283.1200	1572.860	-.310	.897
avai_network	283.2400	1554.107	.154	.895
avai_internet	283.2000	1554.167	.116	.895
ade_comp	282.9200	1531.577	.308	.894
ade_project	282.8400	1503.723	.541	.893
ade_camera	283.4400	1522.757	.329	.894
ade_video	283.2400	1514.773	.426	.893
ade_digital	283.2000	1513.917	.415	.893
ade_network	283.4400	1523.923	.364	.894
ade_internet	283.4000	1522.750	.376	.894
acce_project	282.3200	1543.727	.156	.895
acce_camera	282.3600	1488.157	.627	.892

acce_comp	282.3200	1508.477	.374	.894
acce_network	282.2400	1523.357	.291	.894
acce_internet	282.4000	1516.833	.314	.894
acc_camera	282.3600	1498.157	.462	.893
comp_ratio	282.1200	1564.610	-.055	.901
loc_staff	283.0800	1560.077	-.001	.896
loc_class	282.9600	1553.790	.201	.895
loc_admin	283.6000	1547.333	.297	.895
loc_lab	283.5200	1552.593	.145	.895
prep_train	283.4800	1565.177	-.130	.896
prep_who	283.4800	1548.927	.092	.896
prep_2yrs	282.8400	1596.807	-.394	.899
skill_access	282.3600	1540.323	.212	.895
skill_search	282.4800	1523.760	.404	.894
skill_dissemi	282.6400	1514.407	.570	.893
skill_word	282.2400	1499.690	.644	.892
skill_spread	282.4800	1511.677	.481	.893
skill_infor	282.3200	1506.310	.535	.893
skill_display	282.4400	1501.507	.555	.892
skill_dload	282.2800	1520.627	.457	.893
skill_danaly	282.8800	1510.443	.603	.893
skill_sware	283.2800	1527.377	.376	.894
skill_lan	283.2400	1516.690	.527	.893
skill_inforetr	282.7200	1508.127	.593	.893
skill_drecover	282.9600	1519.873	.558	.893
skill_update	282.7200	1508.960	.583	.893
skill_sdeve	283.2400	1506.773	.712	.892
skill_relati	283.2000	1505.750	.620	.892
skill_inter	282.8000	1496.417	.608	.892
skill_elearn	282.6800	1490.227	.747	.891
inter_coll	283.3600	1525.240	.477	.894
inter_prof	283.1200	1520.777	.510	.893
inter_seminar	283.0800	1544.910	.215	.895
inter_collea	283.0000	1523.833	.518	.893
inter_indepe	283.0800	1530.910	.422	.894
use_search	282.4800	1583.843	-.279	.898
use_media	282.0000	1562.833	-.044	.897
use_simu	282.0000	1578.250	-.199	.898
use_select	281.6800	1571.477	-.140	.897
use_allow	281.5600	1563.757	-.055	.897
use_store	282.0000	1563.000	-.044	.897
use_require	281.4400	1548.923	.131	.895
use_notes	282.0000	1570.333	-.134	.897

use_schemes	282.2000	1594.417	-.342	.899
use_analyse	282.2000	1599.917	-.412	.899
often_experi	281.9600	1557.040	.023	.896
often_demo	282.3200	1578.060	-.182	.898
often_field	282.1200	1557.193	.030	.896
often_project	281.6800	1588.727	-.356	.898
often_excur	281.7200	1572.127	-.186	.897
agree_oper	280.4000	1504.833	.431	.893
agree_irriga	280.2400	1483.857	.735	.891
agree_manure	280.8000	1499.250	.488	.893
agree_livest	279.8400	1483.807	.784	.891
agree_soil	280.2800	1485.043	.619	.891
agree_materi	280.6000	1527.000	.286	.894
agree_bud	280.3600	1510.823	.534	.893
agree_practi	280.2000	1516.250	.496	.893
agree_post	280.2000	1516.500	.493	.893
agree_onion	280.6400	1521.907	.289	.894
agree_appro	280.4800	1505.260	.406	.893
agree_signs	280.2800	1488.043	.605	.892
agree_digestive	280.0000	1479.500	.640	.891
agree_repro	280.0000	1484.250	.611	.891
agree_rear	280.2800	1523.043	.412	.894
agree_erosion	280.2400	1475.440	.668	.891
agree_physi	280.0400	1484.707	.665	.891
agree_weed	280.4800	1487.677	.596	.892
agree_harve	280.2800	1535.710	.204	.895
agree_forage	280.1600	1518.807	.412	.894
agree_incub	279.9600	1492.373	.684	.892
agree_poul	280.3600	1477.157	.592	.891
agree_power	279.8800	1519.360	.472	.893
agree_four	280.0800	1489.493	.617	.892
agree_sys	280.1200	1480.693	.680	.891
agree_tractor	280.3600	1514.073	.293	.895
poli_teach	282.0000	1592.000	-.207	.901
poli_storage	281.0400	1525.873	.193	.896
poli_studies	282.0400	1541.790	.083	.897
poli_laern	280.3200	1587.977	-.196	.900

APPENDIX E

RESEARCH PERMIT



PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Justus Kipiang'at Rutto
of (Address) Egerton University
P.O Box 536-20115, Egerton.
has been permitted to conduct research in

Location
Bomet District
Rift Valley Province

on the topic: Factors influencing the use of computer based instruction in teaching secondary school agriculture in Bomet District, Kenya.

for a period ending: 31st March, 2013.

PAGE 3

Research Permit No. NCST/RCD/13/013/2
Date of issue 23rd January, 2013
Fee received KSH. 1,000

Applicant's Signature

Secretary
National Council for Science & Technology

APPENDIX F

LETTER OF RESEARCH AUTHORISATION

REPUBLIC OF KENYA

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349, 254-020-2673550
Mobile: 0713 788 787 , 0735 404 245
Fax: 254-020-2213215
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref:
NCST/RCD/13/013/2

Date:
23rd January, 2013

Justus Kiplang'at Rutto
Egerton University
P.O.Box 536-20115
Egerton.

RE: RESEARCH AUTHORIZATION

Following your application dated ***10th January, 2013*** for authority to carry out research on "***Factors influencing the use of computer based instruction in teaching secondary school agriculture in Bomet District, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Bomet District** for a period ending **31st March,** ***2013.***

You are advised to report to **the District Commissioner and the District Education Officer, Bomet District** before embarking on the research project.

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

DR M.K. RUGUTT, PhD, HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The District Commissioner
The District Education Officer
Bomet District.