

**AN ANALYSIS OF THE EXTENT TO WHICH ICT IS
INTEGRATED IN TEACHING AND LEARNING IN SELECTED
TEACHER TRAINING COLLEGES IN KENYA**

BY

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DECLARATION

This research Project is my original work and to my knowledge, it has not been presented for a degree in any other University.


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DEDICATION

This Research project is dedicated to my family. My Husband Patrick Wokabi for standing by me as I spent time away from my family while pursuing my studies. My daughters Vivian Muringi, Faith Njoki and son Edwin Murage for giving me a chance to be a role model and bearing with me for the long hours I had to be away during my studies.

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ABSTRACT

The potential for information and communication technology to support appropriate and sustainable teacher training programs cannot be underestimated. It is recognized that transformational potential of Information and Communication Technology (ICT)has not been harnessed by teacher training institutions in Kenya.

The aim of this research was to identify the extent to which teacher training institutions have integrated ICT in teaching and learning processes, find out what factors hinder or promote increased use of ICT in these institutions and develop strategies that would increase use of ICT for teaching and learning in these institutions. Three Teacher Training institutions were selected. They are Kilimambogo Teacher training College in Eastern Province, Kenya Technical Training College in Nairobi Province and Thogoto Teacher Training college in Central Province. Questionnaires and interviews were conducted on three categories of respondents in all of the three institutions. Category A was for the Principals of these colleges or their representatives, category B for the College Tutors and category C for the Student Teachers.

The results indicated that there is limited use of computers for teaching and learning processes. Only 5.9% indicated that all or almost all units of work that they teach contain learning activities which involve some student use of ICT tools. 94.1% did not. These findings show that the degree of ICT integration in the learning activities of the sampled institutions is very low indeed

The ICT potential was not fully harnessed because 48.5% used the internet, 45.5% sourced for learning materials in the internet, 27.3% used spreadsheets for teaching, 33.3% were confident in the creation of complex spreadsheets with multiple formulae and circular references and only 30.35% created complex databases with extensive search engines and analysis facilities. This shows that more than 50% of the respondents were not using ICT in all the categories of respondents. Among the factors cited as hindering the use of ICT were time limitation, shortage of computers, technophobia, poor

connectivity and lack of ICT skills. The strategies identified to enhance use of ICT were integration of ICT in pre service teacher training curriculum, investing in ICT training for tutors, Implementation of cost saving strategies through tax exemption by the Government and offering incentives to encourage the tutors to train in ICT

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List of abbreviations

ICT	Information and Communication Technology
EFA	Education for All
MOEST	Ministry of Education Science and Technology
MDGs	Millenium Development Goals
AVU	African Virtual University
NEPAD	New Partnership For Africa’s Development
EMIS	Educational Management Information Systems
LMS	Learning management Systems
CMS	Content Management Systems
TTCs	Teacher Training Colleges
RAM	Rapid Access Memory
KIE	Kenya Institute of Education
KIPRA	Kenya Institute for Policy Research and Analysis
GOK	Government of Kenya
KENET	Kenya Education Network
CSFK	Computers for School in Kenya
KTTC	Kenya Technical Training College
TSC	Teachers Service Commission
IRI	Interactive Radio Instruction
KESSP	Kenya Education Sector Support Program

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Teaching is becoming one of the most challenging professions in our society where Knowledge is expanding rapidly and much of it is available to students as well as teachers at the same time.(Perraton et al 2001)

Teachers are central to effective learning. They also represent the most critical element and the biggest investment in the educational enterprise. Thus, their preparedness and professional development is not only desirable but also necessary for the success of learners, schools and education systems. It is obvious that teachers cannot be prepared once and for all.

Teaching is one of the means by which education is often achieved and education is a common purpose of teaching. General professional interest in the nature of teaching is mostly focused upon its significance as an education promoting activity. Contemporary pedagogical theorizing has been overtaken by a larger trend - no doubt reinforced by modern developments in experimental psychology - toward a general construal of goal-directed activities as skills.

In correlation with those teaching strategies the instructor's own philosophical beliefs of teaching are harbored and governed by the pupil's background knowledge and experiences, personal situations, and environment, as well as learning goals set by the student and teacher (Carr 2005)

Alexander (1992) identifies teaching methods and pupil organization as the two facets of pedagogy. The implication of ICT in education is that since pedagogical content knowledge differs between subjects the choice and use of ICT resources will differ in terms of pedagogical practices for different subject teachers. The effective use of

technology encourages a move away from teacher centered approach towards a more flexible student centered environment

Many studies have shown that the pedagogical effectiveness of ICT depends more on the capacities of teachers to integrate and operate new technologies in a relevant pedagogical context than on the available technological infrastructure. ICT themselves do not encourage students to be creative or to grasp the scientific approach, However ,a pedagogical framework within which technology can facilitate the use, processing and production of relevant information is required.

Today's technologies are essential tools for teaching and learning. To use these technologies effectively and efficiently teachers need visions of the technologies potential, opportunities to apply them, training and just in time support and time to experiment. ICT can facilitate delivery of instruction and the learning process itself. (Jung 2005).

To thrive in a changing world, school children must learn how to learn, how to think, and how to understand how technology works and what it can and cannot do. Classroom teachers hold the key to student success with technology and represent an important factor in determining the quality of education.(Jacobsen et al 2004). The teacher training should be compatible with the technology so that their teaching enables students to use technology.

The Teacher curriculum that has been in use has had the assumption that the teacher is all knowing and the students are recipients, However with the infusion of technology the students can access information faster or at the same time with teachers. Technology will open up many ways of "being right" as opposed to the standard way where one answer is considered right.

The rapid development of ICT especially the internet has made traditional teacher training as well as in service training institutions worldwide to undergo a rapid change in

the structure and content of their training and delivery methods of their courses. Combining new technologies with effective pedagogy has become a challenge for teacher training institutions.

Classroom teachers hold the key to student success with technology, and represent an important factor in determining the quality of education.(Jacobsen et al 2004)

This calls for different ways of evaluating students, different ways of delivering instructions to ensure it is done in an interactive manner and different ways of relating with students. All these issues have to be addressed in teacher training if technology is to be infused into pedagogy. The way to assess how far this is done and what remains to be done is by studying current practices and assessing how they match the expected standards so that gaps are established.

There is emerging pressure for national competitiveness in globalized knowledge-based economy against an existing reservoir of untrained and under trained teachers in many African countries. It is evident that there is inability of traditional residential university model of teacher education and training to meet either current or projected demand for teacher education. Today's technology world is increasingly dominated by the Internet. Educational and learning programs, like many other activities, can benefit tremendously from Internet's open architecture and its unique multimedia and other capabilities. These and new technological advances are destined to play a key role in transforming teacher education in Kenya and the rest of Africa. New technologies, which can be used to reverse the traditional trend, can also be used to perpetuate the current teacher education disparity between the developed and the developing countries. Issues related to technology utilization strategy should receive highest consideration by the Kenyan government in relation to education. Careful analysis of various technology choices and options are necessary to create maximum impact and benefit for many. (MOEST, ICT in Education Option Paper)

It is essential to have motivated and well trained teachers if the Millennium Development Goals (MDGs) for Kenya are to be achieved by 2015 (UN, 2004). Without successful

teacher training programs it will be impossible to ensure that all girls and boys complete a full course of primary schooling (Goal 2), and that gender disparity in primary and secondary education is eliminated (Goal 3). Given the very great importance of teacher training, it is surprising that not more emphasis is placed on its enhancement by the government, donors and civil society organizations alike. Teacher training is all too often neglected in the face of more immediately visible educational goals and objectives. It is much easier to build a gleaming new school in an urban community than it is to successfully train a cadre of teachers. It is therefore important to look at the extent of ICT use for teaching and learning in Teacher training institutions so that intervention strategies can be developed to ensure use of ICT for teaching and learning

1.2 Statement of the problem

In light of the increasing acceptance that technology mediated learning can contribute significantly to the enhancement of teacher training across the world, this research seeks to explore the extent of use of ICTs in Kenyan Teacher Training Colleges for teaching and learning.

The Government of Kenya (GOK) recognizes this fact in its Ministry of Education Science and Technology (MOEST) ICT in education options paper, 2005. Without the knowledge and experience of ICT within the teaching fraternity, it would be impossible to impart this knowledge to the students. There is therefore a need to establish how far the teacher training institutions have gone into integrating ICTs in the teaching and learning experiences of teachers and the factors that could encourage or hinder the integration of ICT in pedagogy.

1.3The Purpose of study

As Riel and Becker (2000) state, "the rapid speed of technological development brings new computer mediated tools to the classroom door each year. Teachers have to make continual decisions about how to best utilize these tools in teaching, learning, and

assessment" communication and technology course attempts to develop the skills as well as the critical and reflective thinking necessary to engage in that process.

Integration of ICT into pedagogy is the way to make modern teachers help their students benefit from technology. A well designed training program is essential to meet the demand of today's teachers in need of learning how to use ICT effectively for their teaching. To provide proven strategies for designing effective ICT teacher training programs there is need for empirical research on the extent of ICT use for teaching and learning in teacher training institutions. It is important to evaluate whether the training of teachers is technology responsive and if not what needs to be done.

1.4 Objectives of the study

The study was aimed at meeting the following objectives:

1. Identify the extent to which teacher training institutions have integrated ICTs in the teaching and learning processes;
2. Investigate factors that may promote increased use of ICT for teaching and learning in the selected Kenyan Teacher training Institutions
3. Investigate factors that hinder the increased use of ICT for teaching and learning in the selected Kenyan Teacher training institutions
4. Recommend strategies towards increasing the use of ICT in these institutions.

1.5 Research Questions

The study was based on the following research question

1. What is the extent of use of ICT for teaching and learning in the selected teacher training colleges in Kenya?
2. What factors are likely to promote use of ICT for teaching and learning in the selected teacher training colleges in Kenya?
3. What factors are likely to hinder the use of ICT for teaching and learning in the selected teacher training colleges in Kenya?

1.6 Significance of the study

The potential of ICT to support appropriate and sustainable teacher training programs is immense. I hope that by identifying the extent of use of ICT in the teacher training colleges in Kenya, identifying the factors that promote and/or hinder integrating ICTs in teacher training and by identifying factors essential for implementing valuable ICT-integrated programs in teacher training, this research will have gone a long way in illustrating how appropriate ICT can indeed contribute to a solution to the crisis of both quality and quantity of teachers in Kenya.

With the recently introduced free primary and secondary education, it has become increasingly important that Kenya trains new teachers and re-trains the existing teachers in order to meet the demand that has emerged. It is obvious that the traditional methods of teaching that basis enrollment on physical facilities, is not able to meet the needs of the teaching profession. It is therefore of paramount importance that teacher training institutions address the changing needs of the learner in the world today. In this context, this research is significant for this country since it will identify the extent to which the new technologies are being used to enhance teaching and learning and the findings will provide a baseline report against which policies and planning for ICT in teacher training can be based.

1.7 Limitation and delimitations

1.7.1 Limitations:

The research instrument used may generate varying data depending on the individual persons interviewed in the various institutions.

1.7.2 Delimitations:

The study's major delimitation is that the situation of ICT in any institution could change within a span of as short a time as 6 months making the findings of this study, obsolete.

The study dwells on ICT integration in tertiary teacher training colleges only. This leaves out other important teacher training institutions like the Universities. The findings therefore will not reflect the situation of training teachers across all levels.

1.8 Operational Definition of Terms

ICT for purposes of this research will be considered to mean computer mediated learning.

Pedagogy: is a term generally used to refer to strategies of instruction, or a style of instruction.

Curriculum: means two things: The range of courses from which students choose what subject matters to study, and a specific learning program. In the latter case, the curriculum collectively describes the teaching, learning, and assessment materials available for a given course of study. Crucial to the curriculum is the definition of the course objectives that usually are expressed as *learning outcomes*' and normally include the program's assessment strategy.

ICT skills: This is considered to be the basic know how in computing that can enable a trainer/educator pass knowledge through use of computers.

ICT practice: this is the regular use of information and communication technology particularly computer to mediate learning

Core technology: This is considered to be the main technology used to deliver instructions.

Pre service teachers: These are trainee teachers who have never served as teachers but are being trained to be professional teachers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section will look at other author's views regarding the use of ICT for teaching and learning and the factors considered to encourage and impend integration of ICT in teaching and learning. These views will later be compared in Chapter five with the Researchers findings to see whether the findings will concur with other authors or not.

2.2 Background Information

Each new technology, the alphabet, the printing press, and electronic technologies, has profoundly changed the way that humans come to know about and interact with knowledge. Schools are populated with children who often have a better understanding of major information and communications technologies than many of the adults charged to teach them. Children have grown up with communication technology as a natural part of their landscape; many teachers and parents, however, have not. Although pre service teachers do have a degree of knowledge with regard to information and communication technologies (ICT), "they have little know-how or techno-pedagogical ability with which to integrate those technologies into their teaching practice" (Karsenti 2001).

ICT integration means applying computer and Internet technology to enhance the quality of teaching and learning objectives. It is the end goal of ICT in education interventions. Using ICT to achieve learning objectives can happen at various levels. At the simplest level it allows for storage and display of information. However, using ICT also fosters *exploration* of materials and ideas. ICT allow learners to *apply a concept or understanding* to a new situation; to *analyze ideas* by organizing them and manipulating them; and to learn how to *evaluate* and *problem solve*. At the highest level, ICT are used to foster the *design or construction* of integrating projects,

whereby students must explore wide range of ideas and resources, analyze and evaluating them, and synthesizing them in a project. ICT can fully utilize the multimedia environment to support this process. Similarly, ICT can be used to enhance teaching objectives, such as managing student learning and assessment, researching professional development opportunities and preparing lessons. ICT can also help visually present information as well as demonstrate a concept, idea, phenomenon, law or theory. ICT such as computer simulations and animations help explain abstract reality. Teachers can also use the Internet to collaborate on projects with other teachers in the school or in other schools in the country or elsewhere, or even with scientists in the field.

While recognizing the importance of ICT in teaching and learning a majority of the countries in the world have provided ICT teacher training in a variety of forms and degrees. Even though many teachers report that they do not have adequate training to prepare themselves to use technology effectively in teaching, there seems to be several efforts around the world in which countries are effectively using technology to train teachers and also training teachers to use technology as tools for enhancing teaching and learning.(Jung 2005).

According to Anouk et al 2002 the use of ICT as part of the learning process can be subdivided into three different forms: as object, aspect, or medium. As object, one refers to learning about ICT as specific courses such as 'computer education.' Learners familiarize themselves with hardware and software including packages such as Microsoft Word, Microsoft Excel, and others. The aim is computer literacy. As aspect, one refers to applications of ICT in education similar to what obtains in industry. The use of ICT in education, such as in computer-aided design and computer-aided manufacturing, are examples. ICT is considered as a medium whenever it is used to support teaching and learning. However use of ICT as a medium is not common in Africa.

ICT must be used in curriculum delivery because it is clear that it will continue impacting significantly on all societies worldwide in all economic, social and political aspect (Karsenti 2001) Karsenti further says that when technology is used in curriculum delivery it ensures better mastery of basic competencies, better mastery of the technologies, better preparation for the knowledge society and higher motivation for school learning and advancement to higher learning.

Most of the early ICT teacher training programs in the 1990s focused on ICT use as the main training content. This approach has an emphasis on teacher training in how to use ICT in the classroom. It addresses issues such as selecting appropriate ICT tools and supporting students in the use of those tools, using ICT to promote learning activities developing new methods of facilitating learning and evaluating student performance. (Jung 2005)

The National Institute of Education in Singapore developed and began implementing a new ICT plan in education in 1998 in which the teacher training curriculum had the approach of using ICT as the main content focus of teacher training. It emphasized on the development of basic ICT skills, design and development skills and pedagogical strategies. However student teacher at the National institute felt that the foundation course provided useful pedagogical strategies for the use of ICT in classroom teaching but the time allocated for instruction was not sufficient to gain proficiency in ICT pedagogy integration.(Beaudin and Hadden 2004)

In Kenya the sessional paper No 1 of 2005 recognizes that ICT is one of the key pillars of education and commits to make education the natural platform to equip the Nation with ICT skills. The thrust of this policy is to integrate ICT into education and training systems in order to prepare learners and staff for the Kenyan economy of tomorrow. However the policy document does not have specific ICT targets and each education sub sector is expected to develop appropriate ICT strategies. (Kenya Education Network 2007).

ICT could also be used as a core technology for delivering teacher training. This approach covers a variety of ICT applications. The case of virtual high schools in USA provides an example of internet based ICT teacher training.

Drawing primarily on ideas originating in Europe, Canada, the USA, Australia and New Zealand, there is an emerging consensus on the general set of principles that need to be in place for ICTs to be used effectively in teacher training. Emphasis is frequently placed on the necessity for teachers first to be trained in basic ICT skills. Thus, for education to reap the full benefits of ICTs in learning, it is essential that pre-service and in-service teachers have basic ICT skills and competences. Once this is in place, it is generally argued that the following four competencies need to be addressed: pedagogy, collaboration and networking, social issues and technical issues. In turn, four key themes are seen as essential in any successful program: context and culture; leadership and vision; lifelong learning; and the planning and management of change.

Such arguments build on the increasingly widely accepted principles of the Society for Information Technology and Teacher Education (SITE, 2002) that technology should be: infused into the entire teacher education program; introduced in context; and that Students should experience innovation technology-supported learning environments in their teacher education program. Practical experience from across the world sustains such viewpoints but at the same time emphasizing the difficulties and challenges faced in the implementation of such programs in particular contexts.

2.3 African Context

In Africa, there have been numerous international and national schemes over the last decade designed to introduce ICT into schools. Most of these have been introduced with the best of intentions, but many have failed to live up to the ambitious aspirations of those who have promoted them. This has often been because they have been top-down and supply led with insufficient attention being paid to the involvement and training of teachers. Nevertheless, there have been some interesting initiatives that have indeed

sought to go beyond merely introducing computers into schools and giving teachers some training in how to use Microsoft Office packages on them. Among these are the Connectivity for Educator Development program in Uganda, Schools OnLine's programs in Senegal and Tanzania, World Links' programs in Ghana and Uganda School Net in Kenya and the Commonwealth of Learning's Southern Africa Teacher Training Program. Even with such programs, though, there have nevertheless been significant implementation problems. As the SRI (2001) evaluation of the World Links' programs reported, 'despite the significant progress that World Links has made, particular barriers persist. For example, in the nations of both Latin America and Africa, teachers reported that the lack of computers, inadequate hardware/software, unreliable Internet access, and the scarcity of time constituted the major barriers keeping them from using computers in their teaching'. A smaller number of teachers in selected countries also indicated a need for more technical support in integrating ICT into the curriculum and stronger national policies on the role of technology in student learning.

In Sub-Saharan Africa, the demand and supply of teachers has become a major issue occasioned by the need to achieve the Education for All (EFA) goal by 2015. This will require that the education system attracts, educates and retains sufficient numbers of well qualified teachers. According to EFA Global Monitoring Report (2002), 180 million children in Africa will be enrolled in primary school by 2015 and more than 3 million public primary teachers are needed in Africa without any improvement in quality and with the persisting teacher to student ratio as exist today. In 2000, there were 2.49 million public primary teachers in African primary schools and to meet the EFA goal there should be 3.85 million in 2015 (EFA GMR, 2002). The required number of new teachers is actually larger than the difference between 3.85 and 2.49 due to retirement of old teachers and death of HIV/AIDS infected teachers (EFA GMR, 2002). It is indicated that since 1985, the average growth rate of public teachers in Africa has increased by 2 percent per year, but to meet the demands there has to be an annual increase of 3 percent (EFA GMR, 2002). The distribution of qualified teachers varies significantly within and between the African countries. In Kenya, the National Union of Teachers estimates that an additional 60,000 teachers are needed for primary schools alone. Kenya was already

faced with teachers' shortage of about 35,000 even before 2003 introduction of free primary education. The need for more teachers is even more so when one takes into account that one out of five teachers is HIV infected (EFA GMR, 2002).

HIV/AIDS has serious effects on the situation in the schools. Apart from the irreplaceable number of teachers who die from the scourge, teachers' participation and performance in the learning process has been affected since absenteeism means that they are increasingly unavailable to the pupils. In Zambia, for example, estimates show that teacher absenteeism due to HIV/AIDS cost 12,450 teachers' years, or 20 million teachers' hours between 1999 and 2010, leaving 498,000 children without classroom education for a year. The number of primary school teachers that died in 2000 in that country is equivalent to 45 percent of all teachers that were educated during that year. In many countries in West Africa for example, teacher death caused by HIV/AIDS left 119,000 school children without an education in 1997/98. In Central African Republic, 107 primary schools closed when replacements of infected teachers could not take place (UNESCO's, 2002b).

Training systems are expensive and not producing enough new teachers to meet projected demand. The training systems often fail to reform teaching practices, offer training of limited relevance to the real conditions new teachers face in expanded school systems and fail to demonstrate effectiveness. Teacher education curricula and learning programs have been slow to reflect the changing characteristics of trainees. Expansion has meant that academic levels of new entrants may have fallen and in many cases some trainees already have experience of teaching as untrained teachers. The risk is that training programs may proceed on the basis of false assumptions about the capabilities and identities of trainees. (Fry, 2004).

The quality of teacher training programs is wanting. Many teacher training colleges have minimal professional links with schools and play little role in school-based curriculum development. (UNESCO, 2002). Teaching practice, an essential element of the training process, is rarely closely integrated with college-based learning and misses opportunities

to link theory and practice in the classroom. Key areas of training are often neglected. These include strategies for; large classes, multi-grade teaching, using the mother tongue where this is not the medium of instruction, teaching as a reflective practitioner and reliable assessment. Little attention is given to the induction of newly qualified teachers after training. Training institutions rarely ensure trainees leave with a portfolio of supporting manuals and teaching enrichment materials. Under-funding of training and inefficient use of existing resources are major problems. (Richardson 2001) There is a need in many countries to recruit more female teachers, as well as more women in other positions in the educational system. Female teachers are positive role models for girls and are identified as a way to enroll more girls in school and to encourage them to complete their education.

Among the most ambitious African initiatives is the e-Schools program being advocated by The New Partnership for Africa's Development (NEPAD). This has developed through various guises since its announcement at the Africa Economic Summit in Durban in June 2003 it now place growing emphasis on the important role of teacher training. Nevertheless, as with so many other educational-ICT initiatives in Africa, its focus remains primarily on the importance of giving pupils and teachers ICT skills, rather than on using ICT to enhance their wider learning experiences. At the All-Africa Ministers' conference on Open and Distance Learning held in Cape Town in February 2004, Peter Kinyanjui, NEPAD's e-Africa Commission Program Commissioner/Coordinator, thus stressed that 'The e-Schools Initiative will ensure that a majority of the people on the continent have the skills required to function in the knowledge economy'. He went on to define NEPAD's e-Schools' objectives as follows: to bridge the digital divide among young people and provide them with ICT skills necessary to function in the knowledge economy; to ensure that every African youth leaving school has the necessary ICT skills that will assist them find jobs, create jobs or further their education optimally; to make universal e-access in every institution a policy priority on the African continent; to re-define universal service/access to meet the requirement of the new economy; and to transform every institution of learning into a health literacy center and zone to combat diseases especially malaria, HIV AIDS and tuberculosis (Kinyanjui, 2004).

The initiative aims to connect more than half a million primary and secondary schools in Africa to the internet, but without comprehensive frameworks developed at national level to train teachers in the appropriate use of such technology, it is likely that such activities will achieve little in the way of real educational change in the continent.

2.4 Kenyan Context

Kenya has many educational needs, and the ambitious Millennium Development Goals for education are unlikely to be met without well-trained, qualified and committed teachers. The use of ICT is most definitely not a cheap solution for teacher education, but by facilitating the creation of new types of learning environment, by supporting distance based models of teacher training, and by opening up a wealth of new educational resources, it has a very significant role to play.

In its 2005 ICT in Education Options Paper, Kenya recognizes the many ways in which information and communications technologies (ICTs) can be leveraged to support and improve the delivery of quality education for all Kenyans. These options are as per the educational priorities outlined in Sessional Paper No. 1 of 2005 and the KESSP¹ document and which include: Quality Teaching and Learning through ICT; ICTs in Teacher Training Colleges; ICT for In-Service Teacher Training; Interactive Radio Instruction (IRI) for In-Service Teacher Training; Video for In-Service Teacher Training and Open and Distance Learning among others.

The challenges that exist in seeking to implement ICT for teacher training initiatives are immense but the benefits of overcoming these challenges are enormous. For the integration of ICTs in teacher training to be successful, it has to be tailored to the local needs and particularities of specific countries and scales of implementation.

2.5 ICT Teacher Training Colleges

The Kenyan government is committed to the improvement of Teacher Education and has continuously reviewed the program to make it more relevant to the needs of the country and in tandem with the latest international trends in teacher education. Currently there are 22 public teacher training colleges (TTCs) in Kenya, almost all of which have computer labs and are making bold efforts to establish and improve TTC ICT capacity. Due to lack of funding, however, a number of challenges have emerged:

Access to computers for students is poor. TTCs enroll between 500 to 1000 students with 20 to 40 staff members. In most cases, the number of functioning computers is around 15. If these were only available to staff, access ratios could be considered poor to good; however, the primary use of the labs is to teach ICT to students and not to college staff. Therefore, the ratios drop to very poor if the college staff also use the same computers. If 15 computers are available to 600 students, each student has only 1 hour per week at a computer which is not sufficient.

Secondly the condition of the computers does not meet the very basic standards. Many of the computers were donated by different organization and have inadequate RAM, processors, and software. TTCs do not require the latest ICT equipment, but it must meet some basic standards. Some machines viewed had less storage space than a 64MB flash drive.

The third concern is that the Teachers Service Commission (TSC) is unable to find qualified Education Technology instructors. Many of the ICT teachers are hired by the Boards of Directors for their computer knowledge but are not qualified teachers and have no background in pedagogy. Some of the ICT teachers are seconded from other subject areas, however, KTTC has developed a Teachers' Guidebook on how to integrate ICTs into teaching practice. KTTC has already trained a number of master teachers and any further training should be coordinated with these efforts, as they seem highly relevant to Kenyan context and in line with international best practices.

Some of the players in the country in the use of ICTs for education are:

Kenya Institute of Education (KIE) which has been offering radio broadcast to schools since 1968

Kenya Institute for Public Policy Research and Analysis (KIPRA)'s main interest in ICTs for education is to ensure that GOK enacts policies that transform Kenya to a knowledge based country where e-government, e-education, e-health and e-agriculture are fully operational.

The *NEPAD e-schools* This program forms part of NEPAD's larger project and is intended to support the design and development of computer labs in six schools in Kenya as part of a sixteen country initiative that seeks to enhance ICT capacity at secondary schools in Africa.

KENET has delivered connectivity to over 50 higher education institutions (with twice as many on their waiting list).

SchoolNet Kenya has drawn up regional ICTs in education strategies for training thousands of teachers.

Computers for Schools Kenya has installed computers in nearly 150 schools and provided sensitization, foundation skills, and integration training for principals and teachers.

Computers for Schools Kenya (CSFK) has also developed a refurbishment centre, collaborated with KIE for content development, and trained street children and women in computer skills.

The *African Virtual University (AVU)* which is a satellite-based teaching network established through the World Bank has initiated a continent-wide program on ICT integration in Teacher Education with funds from the AfDB.

Network of Initiatives in Computer Education (NICE) which is an Education Trust in Kenya intends to reach all schools in Kenya, particularly rural schools with basic computer literacy and with a vision of an ICT- competent 21st century generation benefiting from an increased opportunity and innovations in Information Technology. NICE includes a variety of NGOs, private sector partners, and GOK institutions from the education sector. Members include Computers for Schools Kenya, Kenya Community Media Network, African Regional Centre for Computing, Kenya Private Sector Alliance – ICT Board, Heinland Institute, Tracom College Nakuru, Rift Valley Institute of Science

& Technology, Rural Schools Computer Project, CRAIG Enterprise Development Institute, and KENET.

2.6 factors affecting use of ICT for Teaching And Learning

Classroom teachers face a formidable task in reinventing schools and classrooms for a world transformed by information and communications technologies. Public education, as most have experienced it, was developed to meet the needs of an industrial, print-based age. For more than a century, knowledge and learning activities in school have shared dominant characteristics of that larger culture: sequential, hierarchical, linear, externally determined and controlled, and compulsory for all. Perhaps because of societal shifts and changes in response to a major new communication medium, the topic of technology for teaching and learning is fast emerging as one of the forces leveraging educational reform. (Beaudin and Hadden 2004).

The forceful impact of technology is, in part, related to shifting power structures in schools and changing teacher and student roles brought about by widespread access to electronically published information. It is a hard reality that the technology in any school is only as good as the teacher's ability to use such technology to make learning more effective.

Most educational leaders agree that new teachers need to graduate from colleges of education with the knowledge and skills that will allow them successfully to integrate technology into their daily teaching. Some teacher candidates do come away with those skills. Unfortunately many do not, much to the disadvantage of future generations of students. Worse, many new teachers who *are* equipped to use technology effectively are placed into schools that lack the systemic resources to support effective use of educational technology. For such teachers, the frustrations of their first teaching assignments can be extreme (Jacobsen et al 2001).

Education in the East African region faces a number of problems. These problems include the shortage of qualified teachers, very large student populations, high drop-out rates of students and teachers, and weak curricula. All of these negative aspects result in poor delivery of education. The education crisis is worsened by the devastating effects of the HIV/AIDS pandemic, increasing poverty, a brain drain in the teaching community, budgetary constraints, poor communication, and inadequate infrastructure.

While societies in the region undergo rapid changes as a result of increased access to information, the majority of the school-going youth continue to undergo traditional rote learning. Very little is done to take advantage of the wealth of information available on the Internet. Whereas the processing of information to build knowledge is one of the essential literacy skills vital for the workforce in the 21st century, it is often overlooked in current educational practices (Anouk et al 2002).

Gakuu 2006 found out that over 80% of the university lecturers at the University of Nairobi have computers at home or in the office and over 90% of them are computer literate. He further says that if computer literacy and availability were to be used as a measure of readiness to use ICT in teaching then it can be concluded that Lecturers in the University of Nairobi are ready. However he noted that training on use of ICT for effective teaching is lacking. He further said that the results obtained from the University of Nairobi were similar to other institutions.

According to Jacobsen et al (2001) Many school and university students are using technology in their personal lives in a wide variety of ways, but they are not using computers very extensively in classrooms in order to learn effectively in a variety of subject areas. There are a number of explanations for this state of affairs. One, computers tend to be available to students mainly in labs. This means that for many students, computing remains an event, scheduled in advance according to the convenience of a timetable. Technology is not yet seamlessly integrated as a powerful way to think and learn. Too often, instead of making possible the new ways

in which people can share and exchange information in a digital commons, school networks and workstations are secure, standardized, pre-configured, and completely locked down places. Two, tasks involving technology tend to involve a fairly low level of thinking and research, focusing heavily on the presentation of final products rather than on thinking differently, rigorously and effectively at every stage of a project. Moreover there is a growing 'digital divide' between what students actually know how to do with technology and what they are permitted to do in school. There are growing numbers of students who routinely expect their school computers to be old, connectivity to be slow, networks to be unstable, and their teachers' knowledge and confidence to be significantly less than their own.

A *second* general trend that Jacobsen observed is that many classroom teachers and faculty members in teacher preparation programs lack confidence in their own ability to think broadly with technology. Few classroom teachers use computers extensively in their own lives outside of school. Traditional models of professional development, like workshops and courses, have not been particularly successful in helping teachers and university faculty find ways to integrate technology into their teaching. Faculty members and classroom teachers are not comfortable with this state of affairs. They often feel bad about not knowing how to use technology for teaching and learning.

Related to this second trend is the observation that many education faculty and teachers who feel more confident about their own ability to use computers for professional tasks are often uncertain about how to use technology in their teaching. Those in academic and school leadership positions often have less experience with technology than their teachers do, and are therefore not always able to provide strong leadership, or strongly informed support for required changes to enable the effective infusion of technology. This means that the emphasis on a good policy for use of ICT for curriculum delivery is either non-existent or not implemented due to lack of confidence among the Administrators who are meant to give guidance and leadership.

Almost by default, visions for the use of technology for teaching and learning are often created by IT specialists who are not educators. Network design and student

access are often determined according to what is standard, easy to maintain and monitor rather than according to what is educationally sound. Dominant curriculum models, based on fragmentation and discrete units of study (even in e-learning), tend to emphasize course delivery and information-transfer rather than knowledge creation. While there are thousands of examples of digital media objects and teacher-created units and lessons that claim a meaningful technology component, there are far fewer authentic images of the effective and imaginative infusion of technology. Teachers and leaders in the schools are looking to new teachers to shore up the gap between technology presence and use. However, Jacobsen 2001 further observed that the current generation of pre-service teachers simply do not routinely infuse technology in their own learning and student teaching, and thus, few bring the skills and experiences that are needed to transform today's classrooms.

There are several possible explanations for this state of affairs. Information and communication technology tends to be regarded as an optional area of specialization in pre-service courses rather than as a crucial way for everyone to learn. Two, when compulsory courses are available, they tend to emphasize software applications rather than technology-infused curriculum design. Three, not enough pre-service teachers are being taught in ways that demonstrate effective infusion of technology in all subject areas. Four, issues of perceived threats to professional freedom and standardized accountability mechanisms make it difficult to insist on the widespread and effective infusion of technology-enhanced teaching practices in pre-service courses. Finally, there has been no mechanism to deliberately place pre-service students in technology-enhanced classrooms where experienced teachers are finding new ways of teaching and learning with technology.

The final trend that Jacobsen noted is that many good teachers are leaving the profession. There is little or no sustained support for beginning teachers to learn or consolidate new ways of teaching. There is a lack of widespread support and professional development to help classroom teachers make the necessary changes to classroom practices. Teachers with a high level of technology expertise, or

commitment to learning to teach in new ways with technology, frequently end up frustrated by the barriers they face in using what they know in their daily work and they leave.

At issue for teachers, then, is not simply whether technology offers a better way to learn, or not. ICT represents a major technological and communications revolution; ICT changes forever how people manage, exchange, and share information. The integration of technology into teaching and learning demands and requires us to question conventional methods and approaches, enables shifts in power relations and roles, and puts new knowledge sharing capabilities into the hands of children and adults alike. ICT requires a reconsideration of changes that will enable students to take advantage of unregulated on-line resources, and to contribute to and extend those resources as they share their knowledge with the world.(Beaudin and Hadden 2004). The challenge is determining how much knowledge should be in the hands of students to ensure that it does not become counter productive.

Many classroom teachers and faculty members in teacher preparation programs lack confidence in their own ability to think broadly with technology. Few classroom teachers use computers extensively in their own lives outside of school. Traditional models of professional development, like workshops and courses, have not been particularly successful in helping teachers and university faculty find ways to integrate technology into their teaching. Faculty members and classroom teachers are not comfortable with this state of affairs. They often feel bad about not knowing how to use technology for teaching and learning.

Leaping into the knowledge age appears to be less about technology integration *per se*, and more about the fundamental changes to teaching and learning that are enabled and required by the new medium. The learning environment of the information and communication age calls many of the assumptions of the print-based models of schooling and teaching into question. The emerging technologies require thoughtful teachers to face fundamental issues and ask essential questions. For example, what is

the nature of literacy in a hypermedia environment? Composing and engaging with text and graphics in this environment calls for fundamentally different skills, dispositions and critical abilities, many of which are undervalued and some of which are actively discouraged by traditional text-based orientations in school. How do teachers negotiate these new expectations (Jacobsen 1998).

In most African higher learning institutions the biggest problem faced is very large auditoriums making it difficult to use ICT effectively. Though open and distance learning has been adopted to respond to this problem comprehensive pedagogical ICT integration is very necessary (Karsenti 2002).

The PanAfrican Research Agenda 2006 noted that institutions in most African countries have failed to integrate ICT in pedagogy because of insufficient funds, lack of teachers with ICT skills, teachers inability to integrate the computer into different subject areas and lack of appropriate microcomputer teaching programs. However the biggest problem is the high cost of equipments and. low Internet connection in most institutions.

2.7 Strategies to enhance use of ICT in teaching and learning

Technology is used to teach students about technology; the integration is thus practical as well as theoretical in its approach (Clifford, et al 2004). That many classroom teachers and faculty members in teacher preparation programs lack confidence in their own ability to think broadly with technology. Few classroom teachers use computers extensively in their own lives outside of school. Traditional models of professional development, like workshops and courses, have not been particularly successful in helping teachers and university faculty find ways to integrate technology into their teaching. Faculty members and classroom teachers are not comfortable with this state of affairs. They often feel bad about not knowing how to use technology for teaching and learning.

Meta cognitive teaching includes teacher awareness of the sources and characteristics of the students' misconceptions and subsequent monitoring and evaluating of the extent to

which important misconceptions have changed in productive ways (Hartman 2001). Through this approach, the students realize that meaningful teaching with technology does not require the teacher to be a technology or computer expert. Rather, the focus of the course is on the processes of learning—both about tangible technology and the implementation of that technology to improve teaching and student learning. Students learn a structure to learn about technology that could be applied to future learning about any technology; that is, be attentive, intelligent, reasonable, and responsible. A necessary component of teacher education, would be the act of explaining what is being done when technology is being integrated and a discussion of how to adopt different methods of integration given different educational contexts (Beaudin and Hadden 2004).

Meta-teaching helps prepare techno-pedagogically skilled teachers because it allows them to develop a holistic understanding of the process of teaching with technology. A focus on the process involves the premise that there are different forms of knowledge that can be fostered by the instructional use of technology. For example, cognitive and developmental psychologists have examined types of knowledge that change as learners advance from being intermediate learners to advanced learners; three major types include declarative knowledge (knowing *that*), procedural knowledge (knowing *how*), and conditional knowledge (knowing *when* and *why*). Declarative knowledge includes both ideas related to structure and goals as well as information helpful in developing goals and changing task conditions. While meta-teaching fosters a full range of key questions for pre service teachers, its greatest impact is that it compels them to think about the *why* questions regarding teaching with technology. Why is this technology appropriate for achieving learning outcomes? Why is this technology likely to improve student learning? Is there a positive change in student learning as a result of the use of technology? Through the use of meta-teaching, pre service teachers become aware that teaching with technology is about learning—both teacher learning and student learning (Beaudin and Hadden 2004).

Critical reflection is thinking about what one does when one teaches with technology, requiring reflection on one's teaching and on the technology used. Reflective instructors might consider questions such as: Is this the best approach? Does this technology

enhance teaching and learning? Did student learning improve? How do I know learning occurred or improved because of the use of technology? How was the level of student engagement influenced by the infusion of technology?

Being critical about technology integration is a time-consuming and difficult task for pre service teachers. Lonergan 1972, 1992 outlines a method that can be used in evaluating a variety of situations. Lonergan's model is seen as a valuable tool for decision-making regarding technology integration. His method transcends the present and the particular. Therefore it can be applied across a variety of situations and is able to address changing technology (Beaudin 2002).

The argument that effective technology integration should begin with the curriculum area (such as social studies or science) and move to finding technologies (such as spreadsheets or digital imaging) that are appropriate for the given curriculum implies that, educators should use technology to assist in effectively and efficiently achieving curriculum objectives. (Hadden 2004) attests that technology is best learned within the context of applications and that activities, projects, and problems that replicate real-life situations are among the most effective approaches for learning technology. Beaudin and Hadden 2004 found out that in the Language in Education course, for example, students used technology to develop their writing portfolios and photo journals while in the Curriculum and Instruction course, technology was used for collaborative discussion and in collecting teaching materials. Discussions on the validity of their experiences with technology and how these experiences impacted their learning were conducted in the Communication Technology (CT) course.

Teacher education institutions and programs have the critical role to provide the necessary leadership in adapting pre-service and in-service teacher education to deal with the current demands of society and economy. They need to model the new pedagogies and tools for learning with the aim of enhancing the teaching-learning process. Moreover, teacher education institutions and programs must also give guidance in determining how the new technologies can best be used in the context of the culture, needs, and economic conditions of their country.

A shift in thinking is required for teacher preparation that is similar to that needed in professional development for pre service teachers (Clifford et al 2001). Pre-service teachers must routinely encounter the effective infusion of technology in the normal course of their learning in the training institutions and in their teaching practice in schools. The technology is simply too new. This means that the teacher trainers must figure out what to do with these new tools, and create meaningful learning opportunities for students. Learning how to teach and learn in new ways with technology requires imagination, intellect, creativity, and a lot of courage.

According to (Clifford et al 1998) good professional development practice, is learning Technology just in time not just in case, Planning, designing, implementing and evaluating in collaboration with others, learning in authentic, challenging and multidisciplinary tasks, developing a culture of enquiry around technology for learning supports risk taking and knowledge creation and intentional and meaningful opportunities to reflect on professional development and growth.

ICTs can be used to support traditional forms of learning, more flexible ways of learning as well as transform learning. Kenya Technical Teachers Training College established an ICT training program specifically targeted at teacher educators. It focuses on the 'I' and the 'C' of ICT, rather than concentrating on the traditional 'T' for technology. The teachers not only 'learn to use ICT, but more importantly use ICTs to learn.(Anouk et al 2002) At Kenya Technical Teachers college the Learning Resource Centre (LRC) was established using flexible modes and innovative methods as a learning place where lecturers and students come to teach, learn, or undertake research. The LRC now embodies an ICT unit of 48 networked computers next to a documentation unit and working space.

The KTTC established the LRC in 2002 as part of its educational management program. The LRC integrates the provision of the Internet into a well developed capacity building program, mainly targeting teacher educators, in-service and pre-service teachers, but also reaching out to the whole KTTC community. Action research is undertaken on a regular basis in the LRC to improve practice, assess impact, and to inform institutional policy. In

this way, the researchers and project personnel try to look at the deeper meaning of teachers' ICT experience.

Respective governments in Eastern Africa recognize that ICT has a critical role to play in improving education and are engaged in drafting ICT policies or ICT chapters in a number of development plans across economic sectors. The policies tend to clearly link development to a forward-looking educational sector and increased investment in human resources and ICTs.

In the education sector, curriculum review efforts are geared towards modernization, including the incorporation of important ICT components. However, even the reviewed curricula tend to treat ICT as a subject rather than as an application tool that can be used in all other subjects, in teaching and learning. Very recent discourse indicates that future curriculum reviews may consider a fully fledged ICT mainstreaming process.(Anouk et al 2002).

The fundamental aim is to give the learners the opportunity to become critical thinkers, problem solvers, information literate citizens, knowledge managers and, finally, team members who are proficient in collaborating with others. Meeting this aim requires a fundamental change in how teachers are trained and in curriculum development approaches. ICT in education is not transformative on its own. Transformation requires teachers who can use technology to improve student learning. The professional development of teacher educators in the area of ICT integration is essential. Unless teacher educators model effective use of technology in their own classes, it will not be possible to prepare a new generation of teachers who effectively use the new tools for teaching and learning. (Anouk et al 2002)

The Kenyan Government together with a network of development partners – through the coordination efforts of Kenya School Net – are currently looking into ways to use the LRC's at KTTC best practices and lessons learned as a basis for a program for ICTs in teacher education. The restructuring of the teacher training program is necessary to reflect incorporation of ICT.

Considering both activities that can be undertaken within the colleges, and at a distance, and drawing on established examples of good practice elsewhere in the world (for example, UNESCO, 2002b; Yates and Bradley, 2000; Somekh and Davis, 1997), the following are some of the ways in which such technologies can best be used in an African context, that is, within African Teacher Training Colleges:

Acquisition of basic ICT skills;

Self-paced learning through access to resources on servers, CDs, or where available, on-line;

Group discussion of audio and video training materials available on videos, CDs, DVDs or even on-line;

Filming of teaching practice sessions, followed by individual review and group discussion (as is currently taking place in some parts of rural China); Training in use of educational management information systems (EMIS);

At a more advanced level, training in the development of Learning Management Systems (LMS) and Content Management Systems (CMS);

Group development of learning resources shared collectively;

Formative and summative assessment, which can also be undertaken at own pace; and

Introduction to the use of ICT in support of young people with disabilities in the classroom (Casely-Hayford and Lynch, 2004).

The level of infrastructure provision varies enormously across Africa . This must be taken into consideration when developing programs to use ICT in teacher training. What can be done in parts of South Africa, or in capital cities elsewhere, is very different from what is feasible across much of the continent. Indeed, the digital divide is very much expressing itself across Africa as a bandwidth divide. While good Broadband connectivity, for example, is now taken for granted in many of the richer countries of the world, and educational software is increasingly being developed to take advantage of this, such access to the internet is rare and expensive in Africa. Two-way satellite connectivity is indeed now available across most of Africa, but the costs of using this for educational purposes remain prohibitively high to be a sustainable choice for teacher training in the

short- to medium-term (Vanbuel, 2004). Variability in infrastructure provision means in practice that blended solutions for the use of ICT in teacher training will need to be thought through carefully in specific national contexts so that teachers can have access to similar training in different media depending on the infrastructure available to them.

2.8 Theoretical Background

This research is based on two pervasive models used to describe teaching and learning with technology: constructivist, and conversational models. The models are both based upon the central premise that knowledge and understanding are constructed through a process of negotiated meanings. The idea that technology-based learning and teaching should be led by pedagogical imperative is a truism among educational technologists today. These theories recognise the potential of technology in educational contexts while situating the learning process at their very cores.

The Constructivist Model states: “The key idea is that students actively construct their own knowledge: the mind of the student mediates input from the outside world to determine what the student will learn. Learning is active mental work, not passive reception of teaching.” (Woolfolk, 1993). The role of technology in education today is largely perceived in terms of constructivism. For the constructivist, knowledge is constructed by the learner by drawing on prior knowledge and personal experience, and lies in the mind of the beholder. As such, it finds its diametric opposite in the objectivist epistemology according to which knowledge is external to the learner and is imposed upon him or her and then replicated under controlled conditions.

The Conversational Model theory states: “Essentially, a learning process complex enough to achieve the aims of academic learning must involve at least two participants, operating iteratively and interactively on two levels – practice and discussion – and connecting those two levels by the activities of adaptation and reflection.” (Laurillard, 1999). The Conversational Model of learning and teaching was first presented by Diana Laurillard in 1993 in her influential work “Rethinking University Teaching: A Framework for the

Effective Use of Educational Technology”. This model describes the teaching and learning process as dialogic relationship between tutor and student. The thrust of Laurillard’s framework is the negotiation of views of the given subject matter between teacher and learner in such a way as to modify the learner’s perceptions of it.

In other words, the learner will enter the learning process with his or her own preconceptions of the subject matter at hand. By setting a task, the teacher then engages the learner in further exploration of the subject. In the light of teacher feedback on the task, the learner will then reconsider prior understandings and form new conceptions of the subject matter. The final part of the first ‘cycle’ of this model is the setting of a new task to guide the learner toward the next stage of subject enquiry. In turn, this stage is formulated in such a way as to account for the learner’s response to the initial task.

As such, this reflective, iterative model of goal – action – feedback – new goal exemplifies the general approach to teaching and learning in Higher Education today. It encapsulates the changing and changed roles of teacher and learner where that of the teacher moves from transmitter of knowledge, to that of facilitator of learning, and that of the learner moves from passive receiver of knowledge, to that of active constructor of knowledge.

Against this theoretical framework, it is important to investigate how far the teacher training colleges in Kenya have integrated the use of ICTs in the teaching and learning. The findings of this study would therefore inform the education policy makers as far as how far they need to go in making sure that ICTs are integrated in the teaching and learning of student teachers. These skills would then be cascaded to the primary school students once the teachers go to the field.

2.9 Conceptual framework

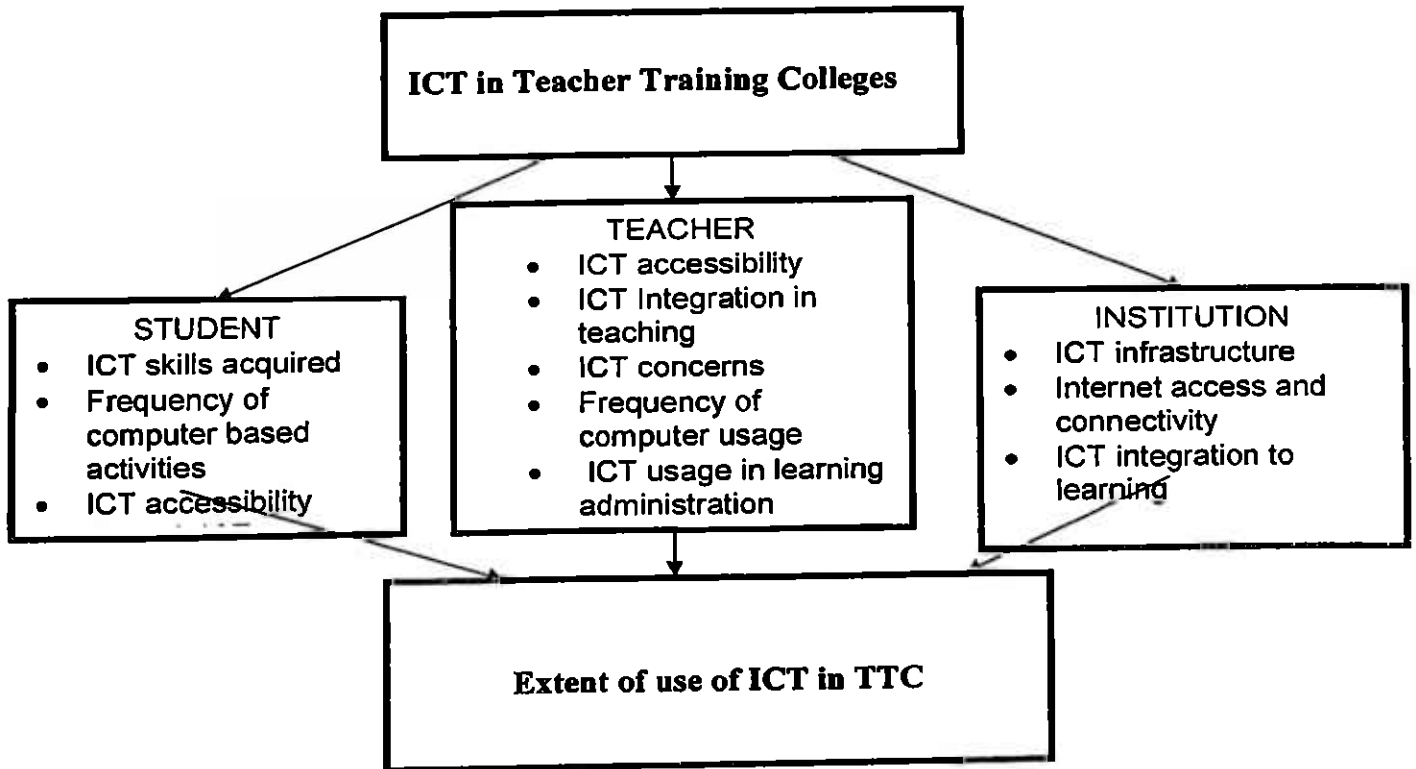


Figure 1: A diagrammatic representation of the conceptual framework of the study.

Innovative practices are likely to be sustained when the institution management supports the practice by adjusting the curriculum as necessary, provides professional development and offers other incentives, resources, and services for the teachers (Louis & Miles, 1991). The macro level encompasses a variety of cultural and policy characteristics at regional, national, or even international levels. Curriculum standards and assessment requirements are examples of such factors, as are professional development trends and telecommunication infrastructures. Theories of comparative education (Arnone & Torres, 1999) identify a fundamental tension that affects contemporary educational change. This is a dialectical tension between massive global forces that affect social relations and institutions across national boundaries and the accommodation of these forces based on local cultural, political, and historical factors. Thus, the transnational,

economically driven pressures to increase educational quality and efficiency may play out differently in the United States, England, and Australia (Berman, 1999) than in Asia (Su, 1999), Eastern Europe (Bucur & Eklof, 1999), or Africa (Samoff, 1999).

2.10 Summary of the Literature Review

Drawing from the various authors it is clear that integration of ICT in teaching and learning in Teacher training institutions is a necessity if the country has to reap the benefits of the technology. ICT must be used in curriculum delivery because it is clear that it will continue impacting significantly on all societies worldwide in all economic, social and political aspect .When technology is used in curriculum delivery it ensures better mastery of basic competencies, better mastery of the technologies, better preparation for the knowledge society and higher motivation for school learning and advancement to higher learning.

It is however noted that

The quality of teacher training programs is wanting. Many Teacher training colleges have minimal professional links with schools and play little role in school-based curriculum development and Teaching practice, an essential element of the training process, is rarely closely integrated with college-based learning and misses opportunities to link theory and practice in the classroom. This is compounded by under-funding of training and inefficient use of existing resources.

Another challenge is that access to computers for students is poor and many classroom teachers and faculty members in teacher preparation programs lack confidence in their own ability to think broadly with technology this is because few classroom teachers use computers extensively in their own lives outside of school. Traditional models of professional development, like workshops and courses, have not been particularly successful in helping teachers and university faculty find ways to integrate technology into their teaching

The solutions were identified as follows

Use of meta cognitive teaching where the Teacher and learner reflect on whether the technology is applicable and whether it enhances learning. The fundamental aim is to give the learners the opportunity to become critical thinkers, problem solvers, information literate citizens, knowledge managers and, finally, team members who are proficient in collaborating with others. Meeting this aim requires a fundamental change in how teachers are trained and in curriculum development approaches

Teacher Training administration needs to model the new pedagogies and tools for learning with the aim of enhancing the teaching-learning process by giving guidance in determining how the new technologies can best be used in the context of the culture, needs, and economic conditions of the country.

Variability in infrastructure provision means in practice that blended solutions for the use of ICT in teacher training will need to be thought through carefully in specific national contexts so that teachers can have access to similar training in different media depending on the infrastructure available to them.

In Kenya KTTC is considered a model where best practices are noted in their Learning Resource centre and efforts to spread the practices in other TTCs are underway. The authors concur that ICT in education is not transformative on its own but transformation requires teachers who can use technology to improve student learning

CHAPTER THREE

RESEARCH METHODOLOGY

This section describes the procedures that were followed in conducting the research. In this chapter the researcher has discussed the population, sample, sampling methods, research design types of variables and measurement scales. The section is expected to guide other researchers in case there is need for replication

3.1 Research Design

The study utilized a survey methodology to achieve an in-depth analysis of the extent of use of ICT in teacher training institutions. The survey method was particularly useful in collecting data on the extent of use of the ICT in the teacher training institutions as well as identifying factors promoting or hindering wider use of ICT for the same. The method made use of self administered questionnaires to generate data on extent of use of ICT, while interview methods were used to generate data on the factors that could promote and/or hinder the use of these technologies on the selected institutions. To determine the level of connectivity and accessibility to ICT observation method was used where the researcher visited the computer laboratories and offices that had personal computers. These methods were preferred over others since the findings were envisioned to be both quantitative and qualitative in nature.

3.2 Target population

Best and Kahn (1998) defines population as any group of individuals who have one or more characteristics in common that are of interest to a researcher. Mugenda (1999) defines populations as the entire group of individuals, events or objects having common observable characteristics. The target population is defined by Best and Kahn (1998) as

the small portion of the population selected for observation and analysis. It is considered the population to which a researcher wants to generalize the results of a study.

This study's target population was the teacher training institutions while the accessible population was identified as the Kilimambogo Teacher training college, Kenya Technical Teachers training college and Thogoto Teachers training college. This was a selection of three colleges two for primary teacher training and one to represent technical and secondary school teacher training. The three are in three different provinces namely Eastern, Central and Nairobi provinces in Kenya.

3.3 Sample size and sampling procedure

The accessible population covered 3 of the 22 public teacher training institutions. This was deemed a reasonable representation of the total number of these institutions in Kenya. The researcher chose the three institutions using purposive sampling to reduce the transport costs and to ensure at least three provinces out of the eight were represented. The sample size was determined using the population in the three teacher training institutions which was 2000. five percent of the population was taken as the sample in the following manner

Principals	3
Teachers	37
Students	60
Total	100

All the questionnaires were randomly distributed except the ones for the Principals since each college had one principal or one representative. Five percent was considered adequate because the population was relatively homogenous in terms of the parameters the researcher was interested in.

3.4 Data Instruments

The research instruments used were questionnaires, interview schedules and observation. The questionnaires were targeted at the 60 students and 37 randomly selected teachers in four different departments and the 3 Principals. The interview schedules were mainly targeted at the Principals and the thirty seven teachers for more analytical or qualitative data. In total 100 Questionnaires were distributed and only 80 were returned showing a response rate of 80%. The highest failure rate was among the Teachers with 10 from the teachers not coming back and ten from students while all the ones for principals were returned

3.5 Instrument validation

In order to test and improve the validity of the questionnaire and interview schedules, the researcher first pre-tested the instruments in one selected institution. The selection of this pilot institution was simply based on its proximity to the researcher's and was identified as Machakos Teacher training College. This pre-test assisted the researcher in identifying items in the instruments that were ambiguous and/or difficult and hence amended them accordingly. The training colleges in the study could not be used for the pretest to avoid sensitization of the subjects.

As a measure to ensure the validity of the instrument, the researcher also requested the supervisor's assessment of the instrument. The supervisor's recommendation were integrated to constitute the final instruments.

3.6 Instrument Reliability

The split-half technique (Charles 1989) was employed to test the reliability of the instrument. This was done by dividing the responses into two sets using the odd numbers for one set and even numbers for the other set. The responses were then scored based on the assigned score and then correlated using the Pearson's Moment Product Correlation Coefficient formula

3.7 Data collection procedures

Through questionnaires and interview schedules (see Appendices), the researcher collected data for the study.

The researcher sent out questionnaires to the Principals of the institutions requesting for interview sessions convenient to them. The researcher and some research assistants then visited the institutions and collected qualitative and quantitative data from the Principals, Trainers and Trainees through questionnaires, interviews as well as observation of the ICT infrastructure in the institution

3.8 Data analysis

This section describes the process of data analysis and the presentation style used. The Qualitative data collected from the open-ended questions was coded to enable quantitative analysis. The coded data and the quantitative data was analyzed using descriptive statistics. These are bar charts and tables.

3.9 Measurement of Variables

The researcher used measurement scales to investigate the various variables in the study. Since the research was Qualitative, the nominal scale was widely used. The Table below shows the variables and the measurement scales used

Table 1: Measurement of Variables

Variable	Measurement	Measurement scale
Dependent variable Extent of ICT usage	ICT training received ICT accessibility ICT concerns Frequency of computer usage Frequency of computer based activities ICT infrastructure Internet connectivity	Nominal Scale Nominal Scale Nominal Scale Ordinal Scale Ordinal Scale Nominal Scale Nominal Scale
Independent Variable Teaching and Learning	ICT skills acquired ICT integration to learning ICT usage in learning administration	Nominal Scale Nominal Scale Nominal Scale

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the findings from data collected through the use of questionnaires, interviews and by personal observations of the activities in the teachers training colleges by the researcher. Questionnaires were given to Principals, Teachers and students. The information gathered has been analyzed using the statistical package for social science (SPSS), presented and discussed as per the objectives and research questions of the study. The four objectives were to find out the extent of ICT usage in teacher training institutions for teaching and learning, factors that encourage use of ICT for teaching and learning, factors that hinder use of ICT for teaching and learning and strategies that could be used to encourage use of ICT for teaching and learning in Teacher training institution

4.2 Extent of ICT usage for teaching and learning

Section 1 is aimed at addressing the extent of ICT usage for teaching and learning (objective 1) The variables looked at were Extent of ICT integration in teaching and learning, Tutors ICT activities, Students ICT activities, Frequency of student's use of ICT for learning, communication, presentation and research and Tutors ICT use for learning administration.

4.2.1 Extent of ICT integration in Teaching and learning

Forty one point two percent (41.2%) have not yet blended the use of any computer-based technologies into student learning activities.

Eleven point eight percent (11.8%) include an ICT learning activity into several of the units of work that they planned.

Forty one point two percent (41.2%) have once or twice included an ICT based learning activity into units of work that they plan.

Twenty nine point four percent (29.4%) indicated that most units of work that they teach contain learning activities which involve student use of ICT tools. Seventy point six (70.6%) did not.

Five point nine percent (5.9%) indicated that all or almost all units of work that they teach contain learning activities which involve some student use of ICT tools.

Table 2: Extent to which ICT is integrated in learning

		Yes
a	We have not yet blended the use of any computer-based technologies into student learning activities.	41.2%
b	We have once or twice included an ICT based learning activity into units of work that I plan.	41.2%
c	We include an ICT learning activity into several of the units of work that I plan.	11.8%
d	Most units of work that I teach contain learning activities which involve student use of ICT tools.	29.4%
e	All or almost all units of work that I teach contain learning activities which involve some student use of ICT tools.	5.9%

This shows that the TTCs have not blended use of ICT in student learning activities.

4.2.2 Tutors ICT Activities

When a survey was conducted on the various uses of ICT by tutors it was clear that most of the tutors eighty four point five percent (84.5 %) used computers to teach one or two subjects. It was also evident that more than half of the teacher trainers used ICT for own personal development and basic administration. These two responses had sixty six point seven percent (66.7%.) However the percentage of tutors who cannot use databases was at fifteen point two percent (15.2%) and only twelve point one percent (12.1%) have an

email account that they do not use. These findings show that the tutors have the basic skills in ICT and are using the skills only that integrating that to teaching has not been fully effected.

Refer to Table 3

Table 3: ICT activities by Teachers

	COMPUTER USE	PERCENTAGE USAGE
1	use computer to teach one or two subjects	84.5%
2	I use the computer for my own personal development.	66.7%
3	I learn new computer skills on my own	60.6%
3	I can handle the basic administration of at least two computer programs	66.7%
4	I create and save teaching documents on the computer.	51.5%
5	I source for learning and teaching materials on the internet.	45.5%
6	I create my own folders to keep my files organized on the computer.	54.5%
7	I move files between folders and drives.	60.6%
8	I occasionally use a word processing program for simple documents.	60.6%
9	I use a word processor for much of my written professional work ie. Memos, tests, activity sheets and home communication.	57.6%
10	I use spreadsheet in teaching.	27.3%
11	I understand the use of a spreadsheet and can navigate within one. I create simple spreadsheets and	45.5%

	charts/graphs.	
12	I use spreadsheets for a variety of record-keeping tasks. I use labels, formulas, cell references and formatting tools in my spreadsheets. I choose charts which best represent my data.	39.4%
13	I am confident in the creation of complex spreadsheets with multiple formulae and circular references.	33.3%
14	I do not use a database.	15.2%
15	I understand the use of a database. I can locate information from a pre-made database.	48.5%
16	I create my own databases.	51.5%
17	I can create complex databases with extensive search and analysis facilities.	30.3%
18	I use graphics in my teaching presentations.	45.5%
19	I open/create and place simple pictures into documents using a drawing program and/or clipart and/or a scanner.	51.5%
20	I can create and enhance graphic images using simple editing tools eg. Resizing, recolouring, cropping and rotating.	57.6%
21	I capture and edit images from a wide variety of sources eg. Scanner, digital camera, Internet.	45.5%
22	I use the World Wide Web (internet).	48.5%
23	I can access Internet websites to find information. I follow links from these sites to various other resources.	57.6%
24	I have an e-mail account.	63.6%
25	I have an e-mail account but I rarely use it.	12.1%
26	I send and receive e-mail messages and I check my e-mail regularly.	57.6%
27	I am confident in the use of e-mail. I use attachments to exchange learning materials with other colleagues.	54.5%
28	I am able to PowerPoint program for my teaching presentation.	51.5%

4.2.3 Teachers use of ICT for Learning Administration

On the use of ICT for administration, recording marks and calculating assessment were the activities that were most frequently done using ICT with forty seven point one percent (47.1%) stating that they used it always. However the frequency of ICT use for all the other administration activities was very low. This means that the potential of ICT is yet to be harnessed for learning administration

Refer to Table 4.

Table 4: Frequency of Teachers use of ICT for administration activities

	ACTIVITY	5 = Always	4 = Often	3 = Someti mes	2 = Rarely	1= Never
a	Recording or calculating assessments, marks and grades.	47.1%	11.8%	11.8%	11.8%	17.6%
b	Recording students' learning records.	29.4%	35.3%	17.6%		17.6%
c	Accessing staff notices.	35.3%	23.5%	17.6%	5.9%	17.6%
d	Email correspondence with colleagues on administrative matters	5.9%	17.6%		17.6%	58.8%
e	Writing Reports for parents.		11.8%	11.8%	17.6%	11.8%
f	Recording absences.	5.9	17.6	11.8	11.8	52.9%
g	Other (Please specify)					

4.2.4 ICT for Maintaining Students Academic Records

The researcher requested the Principals of selected TTCs to state the level to which they use ICT to keep student records.

Thirty five point three percent (35.3%) of the institutions use twenty percent (20%) ICT facilities to maintain student's academic records. Those that involved twenty to forty percent (21 – 40%) ICT to maintain their student's academic records were five point nine percent (5.9%). Eleven point eight percent (11.8%) of the institutions involved sixty to seventy nine percent (60 – 79%) ICT to perform the above mentioned activities. The majority forty one point two percent (41.2%) of the respondents indicated that they involved eighty percent (80%) and above of ICT to maintain students academic records. The above finding shows that teachers training institution have embraced the use of ICT to do administration work in their institutions.

4.2.5 Student ICT use for Presentation, Communication, Learning and Research

The researcher requested the students to indicate the how frequently they participated in various computer based activities and got the following responses. All the institutions libraries were not automated. This made it impossible for students to access electronic catalogue to find appropriate reading materials.

The computers were used by 20% of the students for presentation of their school work daily, 6.7% used ICT daily for communication, 9.6% used ICT daily for learning and 11.8% used ICT daily for researching

Those who used ICT one to two times a week were as follows 34.67% for presentation 20% for communication, 24.15% for learning and 0% for research

The students used ICT one to two times a month in the following manner Presentation 11.68% communication 22.5% Learning 26.90% and research 41.20%

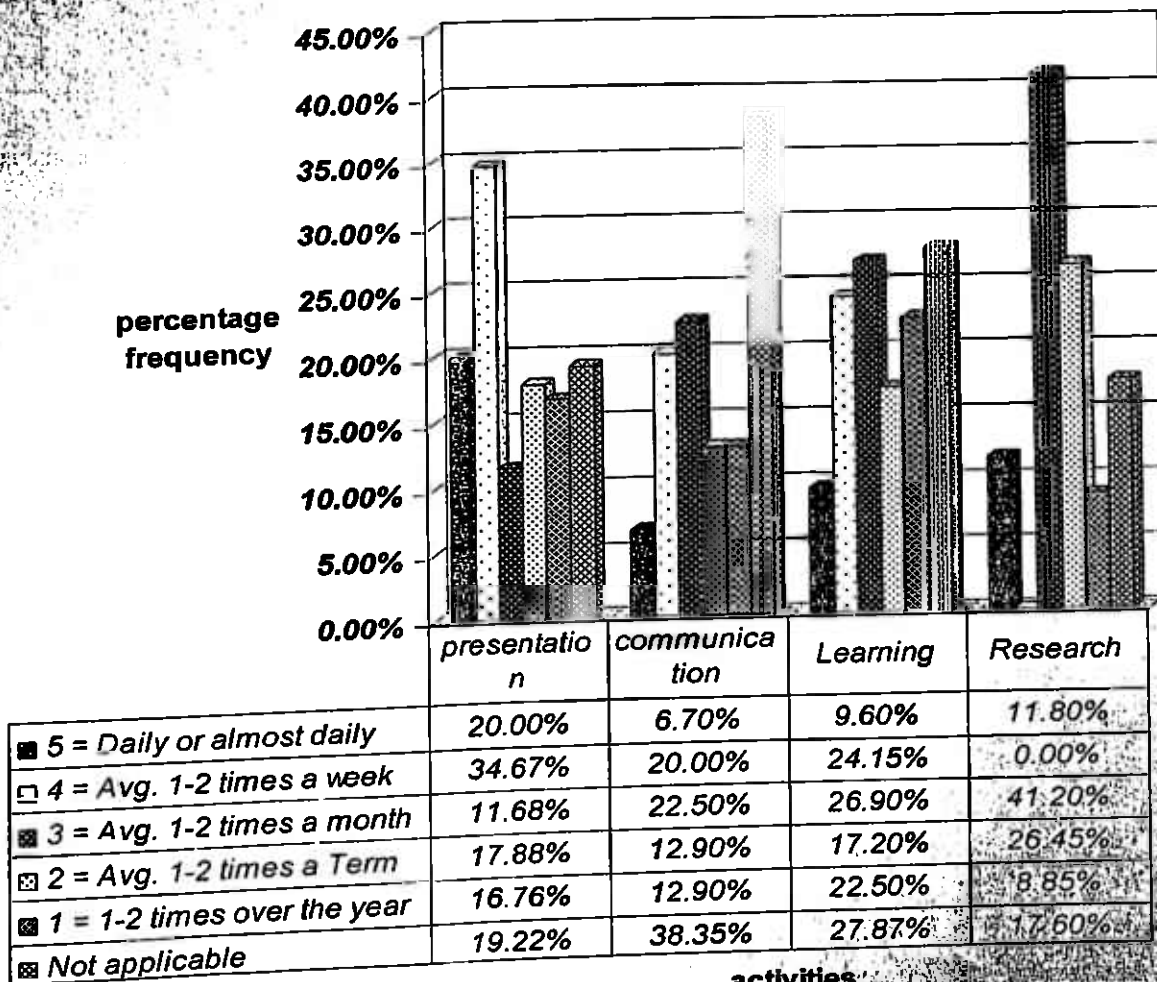
On average one to two times a term the usage was as follows Presentation 17.88%, communication 12.90% Learning 17.20% and research 26.4

The usage in one to times a year was as follows 16.76% presentation, 12.90% communication, learning 22.50% and research 8.85% the ones who said that they do not use presentation 19.22% communication 38.35% learning 27.87% and Research

17.60%. This still shows a big percentage of students who have low literacy levels or none in ICT.

Figure 2 illustrates the results

Frequencies of computer based activities among students



activities

	presentatio n	communica tion	Learning	Research
				11.80%
■ 4 = Avg. 1-2 times a week	34.67%	20.00%	24.15%	0.00%
■ 3 = Avg. 1-2 times a month	11.68%	22.50%	26.90%	41.20%
■ 2 = Avg. 1-2 times a Term	17.88%	12.90%	17.20%	26.45%
■ 1 = 1-2 times over the year	16.76%	12.90%	22.50%	8.85%
■ Not applicable	19.22%	38.35%	27.87%	17.60%

Figure 2: Frequencies of student's ICT use for Communication, Research, Learning and Presentation

4.2.6 Frequency of ICT based activities among students

The Researcher sought to know how frequently the students used ICT and which activities. The frequency was categorized as daily or almost daily, on average one to two times a week, on average one to two times a month, on average one to two times a term, on average one to two times a year and those who found it not applicable.

The frequency of ICT usage among students show that on average half of the students do ICT activities twice a week. Though the activities are varied it is evident that some students do not even do any ICT based activity. Most of the students used ICT to present their work one to two times a week

Computer based activities vary and the frequency shows that most students do not use computers often. It is also evident that computer literacy among students is very low because thirty point three percent (30.3%) do not use the email. Majority of the students used the computer twice a week. Only eleven point one percent (11.1%) learnt from a computer program once a week equally eleven point one percent did not find it applicable to use computer program for learning. None of the students used ICT to present slide shows once or twice a week.

Table 5: Frequency of ICT based activities among students

		5 = Daily or almost daily	4 = Avg. 1-2 times a week	3 = Avg. 1-2 times a month	2 = Avg. 1-2 times a Term	1 = 1-2 times over the year	Not applica ble
a.	Composing, editing and presenting creative work using Word Processors &/or graphics packages	20.0%	53.3%	13.3%	6.7%	3.3%	3.3%
b.	Composing, editing and presenting 'project' or content-based work using Word Processors &/or graphics packages		47.8%	13.0%	21.7%	13.0%	4.3%
c.	Accessing or searching for information on the internet	11.8%		41.2%	17.6%	11.8%	17.6
d.	E-mailing other students or experts about a current topic or problem	6.7%	20.0%	20.0%	13.3%	13.3%	26.7

e.	Presenting learning in the form of computerised slide shows (mainly or exclusively text & pictures)		22.2%	11.1%	33.3%	16.7%	16.7%
f.	Editing and composing multimedia presentations or videos using computer software (ie: including sound and moving images)..	13.3%		13.3%	20.0%	20.0%	33.3%
g.	Working through content or concept simulations on computer	7.7%		38.5%	15.4%	7.7%	30.8%
h.	Practicing skills or reinforcing knowledge using content specific Drill and Practice programs (eg: Maths Games, Reading Games etc)	10.0%	15.0%	20.0%	20.0%	35.0%	
i.	Learning from a computer based tutoring program	11.1%	33.3%	22.2%	16.7%	5.6%	11.1%

j.	Writing computer programs or scripting interactive presentations		15.4%	7.7%	7.7%	30.8%	38.5%
k.	Accessing or searching for information on electronic encyclopedias (e.g. on CD ROM)			41.2%	35.3%	5.9%	17.6%
l.	Designing and/or creating web-pages to present learning				16.7%	41.7%	41.7%
m.	Recording, calculating and analyzing data using Databases or Spreadsheets.	7.4%	63.0%	3.7%	14.8%	3.7%	7.4%
n.	Faxing or phoning other students or experts about a current topic or problem			25.0%	12.5%	12.5%	50%
o.	Using the electronic catalogue to find appropriate reading in the library						

4.3 Factors affecting use of ICT for teaching and learning in TTCs

In this section the Researcher looked at the factors that could encourage use of ICT for teaching and learning. The issues looked at were the number of personal computers, number of computer laboratories, processor speed, number of servers, internet access and band width, ICT concerns of teachers, ICT training mode attended by Tutors and preferred ICT training mode for Tutors

This was to address objective two (2) and three (3)

4.3.1 Number of Personal Computers

According to the findings 18% of the teacher training institutions had between 50 to 100 personal computers while 82% had less than 50 personal computers. This shows an acute shortage considering that TTCs admit between 500 to 1000 students every academic year. The same computers are expected to be used by other support staff and tutors.

The institutions that had less than fifty (50) personal computers were eighty two percent (82%) and those that had between fifty and one hundred personal(50 to 100) computers were eighteen percent(18%)

On objective no 2 and 3 the processor speed was considered and the findings are here below

4.3.2 The Processor Speed

In the institutions sixty six point seven percent (66.7%) of the computers had a processor speed of 300 – 400 Hz. Those that had a processor speed of 401 – 600 Hz were sixteen point seven percent (16.7%) and above 1000 Hz were sixteen point seven percent (16.7%) . This findings shows that computers available are few and very slow and cannot facilitate effective ICT training

Table 6: Processor speed for the Institution computers

Processor speed	Percentage
300 – 400Hz	66.7%
401 - 600	16.7%
Above 1000 Hz	16.7%

4.3.3 Number of Servers

The number of servers was also considered where seventy five percent (75%) had 1 server; the institutions that had 3 servers were represented by twelve point five percent (12.5%) and those with 4 servers were represented by twelve point five percent (12.5%). This may be attributed to the fact that most institutions are not networked, linked to internet and most if not all of their operations were not automated. All the institutions had less than 10 printers.

4.3.4 Number of Computer Laboratories

The teachers training institutions with 1 computer laboratory were forty seven point one percent (47.1%), while thirty five point three percent (35.3%) and seventeen point six percent (17.6%) had 2 and none respectively. The institutions that had computer laboratory lacked enough working computers and the rooms were found to be very small to accommodate the high number of students.

4.3.5 Internet Access and Connectivity (bandwidth)

This study found out that those that allocated less than twenty percent (<20%) of their time to browsing internet in the sampled institutions were thirty five point three percent (35.3%). Those institutions that had their staff allocating between twenty one and forty percent (21 – 40%) and between forty one and fifty nine percent (41 – 59%) of their time to browsing internet were five point nine (5.9%) consecutively. Fifty two point nine

percent (52.9%) of the staff do not use internet services at all. Either the services were not available in the sampled institutions, lack of interest, lack of awareness of what a computer can do for them, or scarcity of the internet services

This study further found out that twenty nine point four percent (29.4%) of the institutions had twenty percent (20%) students using some of their time to browse the internet. Eleven point eight percent (11.8%) of the students were spending between twenty one to forty percent (21 – 40%) of their time in the internet. Only five point nine percent (5.9%) of them were found to spend between forty one and fifty nine percent (41-59%) of their time in the internet. Fifty two percent (52%) students were not using internet services. This may be due to the fact that most of them did not have the basic computer skills; others did not have the interest while others were not aware of the importance of the internet.

Only two (2) respondents seemed to know the kind of connection that was serving them. 1 said that they have dial up system while the other one indicated that they are connected via a leased line.

Only three (3) respondents seemed to know what a bandwidth is. One indicated that their institution is served by sixty five to one hundred and twenty eight (65 – 128) MB bandwidth while 2 indicated that theirs is 128 MB.

4.3.6 ICT Concerns for Teacher Trainers

The researcher sought to get the Teacher Trainers concerns regarding ICT to address objective two (2) and three (3).

The concerns were categorized as significant concern, some concern and no concern.

The biggest concern was need to upgrade the ICT skills with ninety seven percent (97%) stating that it caused them significant concern. The Access to ICT facilities for tutors own professional use caused significant concern to ninety point nine percent of the tutors. Keeping up with new developments in ICT caused significant concern to ninety point nine percent (90%) of the Tutor and access to ICT facilities for students caused significant concern to seventy eight point eight percent (78.8%) of the tutors. The need to

change the teaching style caused significant concern to seventy eight point one percent (78.1%) Lack of training caused significant concern to fifty six point three percent of (56.1%) the tutors. The tutors who felt they did not have key board skills were forty point six percent (40.6%) and those who were significantly concerned that they were far too behind were eighteen point two percent (18.2%) only three point two percent had a significant concern that ICT does not improve learning. The attitude is favourable to integration of ICT in teaching and learning. See table 7.

Table 7 : The concern of Teacher Trainers on ICT

		2= Significant concern	1 = Some Concern	0 = No Concern
a	The ongoing need to up skill myself in using new software packages	97.0%	3.0%	
b	Access to equipment for my own professional use	90.9%	9.1%	
c	Access to equipment for my students' use	78.8%	18.2%	3.0%
d	Equipment breakdown/ technical problems	62.5%	31.3%	6.3%
e	The need to change my teaching style	78.1%	18.1%	3.1%
f	Not knowing how to include the use of ICT in my teaching programs.	51.5%	27.3%	21.2%
g	Keeping up to date with new developments	90.9%	9.1%	
h	Lack of time to cope with it all	36.4%	48.5%	15.2%
i	Lack of support	25.0%	65.6%	9.4%
j	Too much change, too quickly	27.3%	54.5%	18.2%
k	Lack of training	56.3%	21.9%	21.9%
l	My suspicion that they don't actually	3.2%	19.4%	77.4%

	improve learning			
m	Unexpected changes to the daily timetable	21.9%	40.6%	37.5%
n	Feeling already too far behind	18.2%	51.5%	30.3%
o	Lack of keyboard skills	40.6%	21.9%	37.5%

4.3.7 ICT Training Mode attended by Teacher Trainers

The respondents indicated that they benefited from training on information communication technology in the following ways. 39% had participated in after school training, 23% had trained in service training, those that had participated in workshops and holiday courses were 15% consecutively. Only 8% of the respondents had acquired ICT professional development through online studies. See the table below

See table 7.

Table 8: ICT professional development attended

Professional Development Activity	Percentage of Tutors who participated
After School Session	38%
In service Course	23%
Holiday Course	15%
Workshop	15%
On line course	8%

4.3.8 Training Mode preferred by Tutors

To achieve objective two (2) the researcher requested the Teacher Trainers to state what mode of training they would prefer. The preference was rated from strong preference, preference, no view either way and would rather not work this way. On their own with written support material forty five point five percent (45.5%) had a strong preference, thirty nine point four percent (39.4%) had a preference, six point one percent (6.1%) had no view either way and nine point one percent (9.1%) would rather not work that way

On one to one with a tutor forty two point five percent (42.5%) strongly preferred, forty five point five percent (45.5%) preferred, six point one percent (6.1%) had no view either way and six point one percent (6.1%) would rather not work that way.

Thirty three point three percent (33.3%) would strongly prefer working regularly with a partner, fifty four point five percent (54.5%) had a preference for that mode nine point one (9.1%) had no view either way and three percent (3%) would rather not work that way. Those who strongly preferred to work in a small group were eighteen point two percent (18.2%) fifty point five had a preference (50.5%), twenty seven point three percent (27.3%) had no view either way and three percent (3%) had rather not work that way. No tutor strongly preferred being trained in a large laboratory situation and nine point one percent (9.1%) had a preference and the same figure had no view either way while eighty one point eight percent (81.8%) would rather not work that way. Training in a large laboratory situation was the most unpopular mode of training

Table 9: Preferred ICT training modes

No		3 = strong preference	2 = a preference.	1 = no view either way.	0 = would rather not work this way
a	On my own, with written support material	45.5%	39.4%	6.1%	9.1%
b	One to one with a tutor	42.4%	45.5%	6.1%	6.1%
c	Working regularly with a partner	33.3%	54.5%	9.1%	3.0%
d	In a small Group	18.2%	51.5%	27.3%	3.0%
e	In a large group i.e. lab situation		9.1%	9.1%	81.8%

4.4 National Strategy to Enhance ICT

To meet objective 4 the researcher requested the respondents to indicate what they would propose to be done as a national strategy to enhance ICTs in all the Kenyan Teacher training colleges and here are the responses:

14% of the respondents indicated that the government should provide computer free to all the training institutions.

18.6% said that the Government need to support the ICT by giving grants in appropriate way and let the ministry policy makers plan for it.

37% of the respondents indicated that ICT training should be made a compulsory examinable subject

13% indicated that the Ministry should have a policy to ensure that enough ICT facilities are installed

5% sited that qualified tutors of ICT should be employed in all the colleges.

2.4% indicated that ICT training content should be more practical than theory

4% of the respondents indicated that trained ICT tutors should be posted by Teachers Service Commission (TSC) to teach in the college

6% Indicated that training materials (textbooks covering the syllabus) to be provided.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of findings

The main focus of this study was to analyze the use of ICT for the teaching and learning selected Kenyan Teacher Training Colleges; identify factors that promote use of ICT for teaching and learning and identify factors that hinder use of ICT for teaching and learning in selected teacher training institutions; and to recommend a possible mitigation strategy towards increasing the use of ICT for teacher training in Kenya.

The Researcher used Questionnaires, interview and observation method to gather the data and the methods are explained in Chapter three. The data analysis was done using statistical package for social scientists and the findings are presented in Chapter 4. Chapter two had explored views of other authors and it is against these views that the researcher will discuss the findings in this chapter. The second and third objective were overlapping because though the resources to encourage use of ICT were there they were quite minimal for this reason the Researcher merged objective two and three to show the exact strengths and limitations to encourage ICT use.

Table 10 below shows the objectives of the study and the findings

Table 10: Objectives and findings

Objectives	Findings
Extent of ICT use for teaching and learning	41.2% had not blended ICT in learning 5.9% had all or almost all of the units taught using ICT. 47.1% always used ICT to record student marks and grades 17.6% never used ICT for recording student marks and grades

	<p>9.6% of the students used ICT daily or almost daily for learning while 27.87% did not find ICT applicable in learning</p> <p>35.3% of the institutions use twenty percent (20%)ICT facilities to maintain student's academic records.</p> <p>11.8% of the institutions used 60 – 79% ICT to maintain student records</p>
<p>Factors that encourage use of ICT in TTC</p>	<p>The Teacher trainers were of the view that ICT improves learning only 3% were concerned that it does not improve learning</p> <p>The tutors ICT skills were found to be of some basic standard with 84.5% able to use ICT for teaching one or two units</p>
<p>Factors that hinder use of ICT in TTCs</p>	<p>18% of the teacher training institutions had between 50 to 100 personal computers</p> <p>82% had less than 50 personal computers.</p> <p>47.1%,of the institutions had 1 computer laboratory</p> <p>35.3% had 2 computer labs</p> <p>17.6% had no computer lab</p> <p>The institutions that had computer laboratory lacked enough working computers and the rooms were found to be very small to accommodate the high number of students.</p> <p>66.7% of the institutions computers</p>

	<p>had a processor speed of 300 – 400 Hz. 6.7% had 401 – 600 Hz were sixteen point (16.7%) had above 1000 Hz</p> <p>75% of the institutions had 1 server the 12.5% of the institutions had 3 servers. All the institutions had less than 10 printers.</p> <p>(97%) of the tutors were significantly concerned about the need to upgrade their skills.</p> <p>The Access to ICT facilities for tutors own professional use caused significant concern 90.9% of the tutors.</p> <p>Access to ICT by students caused 78.8% of the tutors significant concern</p>
<p>Recommended National Strategy to enhance use of ICT in TTCs</p>	<p>14% that the government should provide computer free to all the training institutions.</p> <p>18.6% said that the Government need to support the ICT by giving grants in appropriate way and let the ministry policy makers plan for it.</p> <p>37% of the respondents indicated that ICT training should be made a compulsory examinable subject</p> <p>13% indicated that the Ministry should have a policy to ensure that enough ICT facilities are installed</p> <p>5% sited that qualified tutors of ICT should be employed in all the colleges.</p>

	<p>2.4% indicated that ICT training content should be more practical than theory</p> <p>4% of the respondents indicated that trained ICT tutors should be posted by Teachers Service Commission (TSC) to teach in the college</p> <p>6% Indicated that training materials (textbooks covering the syllabus) to be provided.</p>
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5.2 Discussion of findings

This section will look at the research finding and compare with other authors findings to see whether they concur or their findings were different.

The researcher will look at the findings according to the objectives.

As the finding show integration of ICT in teacher training institutions has not yet been embraced . According to Anouk et al (2002) ICT is considered as a medium whenever it is used to support teaching and learning. However use of ICT as a medium is not common in Africa This is in line with the research findings where the use of ICT as an aspect and object is prevalent but not so as a medium.

The use of ICT for teaching and learning is not limited by lack of ICT skills as clearly shown by the ICT activities which Tutors and Students could participate in but a great number of Tutors were concerned about access to facilities for personal development, access by their students and also the need to upgrade their skills. This concurs with

Karsenti (2001) who asserts that the major problem in African training Institutions is poor infrastructure and big auditoriums thus hindering effective use of ICT for teaching and learning.

The tutors were also concerned about the lack of training on ICT integration this is in line with Gakuu 2006 findings where he found that the ICT skills are there but the integration with pedagogy is lacking in most training institutions.

The use of ICT for students learning activities was 26.6% at least once or twice a week. Considering that most institutions had one laboratory that is expected, however the processor speeds were quite low with a majority of them being between 400-600HZ and this would discourage them from using ICT. This has been discussed by Jacobsen et al where he said that most students consider ICT activities an event and they find the Computers too old thus getting discouraged.

The tutors also felt concerned about the need to change their teaching style if ICT is integrated into teaching and learning. This is in line with Beaudin and Hadden's 2004 findings where they state that the traditional style of teaching will be threatened by ICT and it would cause tension. Jacobsen 2001 has also stated that new ways of assessment and classroom relations have to be invented with ICT integration in teaching and learning. A shift in thinking is required for teacher preparation that is similar to that needed in professional development for pre service teachers (Clifford et al 2001). This means that the teacher trainers must figure out what to do with these new tools, and create meaningful learning opportunities for students. Learning how to teach and learn in new ways with technology requires imagination, intellect, creativity, and a lot of courage. The Rate at which ICT will be used for teaching and learning will be dependent on the factors sated by the authors and the findings concur because these were raised as concerns by teacher trainers.

The factors that would encourage use of ICT were the tutors view that it enhances learning and the ICT skills of the tutors but as stated above integration requires rethinking if it is to be meaningful.

The factors that hinder use of ICT for teaching and learning were stated as poor infrastructure, Poor accessibility and lack of training to upgrade skills.

Clifford et al (2004) agrees that traditional models of professional development, like workshops and courses, have not been particularly successful in helping teachers and university faculty find ways to integrate technology into their teaching. Faculty members and classroom teachers are not comfortable with this state of affairs. They often feel bad about not knowing how to use technology for teaching and learning. Anouk 2002 says that the biggest challenge to ICT integration in teaching and learning in the East African Region is lack of trained ICT integration tutors, poor infrastructure and inadequate curriculum.

The SRI (2001) evaluation of the World Links' programs reported, 'despite the significant progress that World Links has made, particular barriers persist. For example, in the nations of both Latin America and Africa, teachers reported that the lack of computers, inadequate hardware/software, unreliable Internet access, and the scarcity of time constituted the major barriers keeping them from using computers in their teaching'. A smaller number of teachers in selected countries also indicated a need for more technical support in integrating ICT into the curriculum and stronger national policies on the role of technology in student learning. This concurs with this research findings.

The Panafrican research Agenda 2006 noted that institutions in most African countries have failed to integrate ICT in pedagogy because of insufficient funds, lack of teachers with ICT skills, teachers inability to integrate the computer into different subject areas and lack of appropriate microcomputer teaching programs. However the biggest problem is the high cost of equipments and. low Internet connection in most institutions.

The strategies that were recommended to enhance ICT use for teaching and learning were that the Government gives Computers to all institutions, that Teachers service Commission posts qualified ICT tutors to all colleges and that ICT be made a compulsory examinable subject.

It is clear from these responses that ICT is considered as a separate subject and this cannot enhance teaching. All subject areas must learn how to use ICT the recommendation should be retraining and restructuring of the curriculum as Anouk 2002 had recommended. UNESCO 2001 report and MOEST sessional paper 2005 recommended a coordinated effort to equip public schools and colleges with ICT facilities and the findings concur with the recommendation.

5.3 Conclusions

The researcher concludes that ICT is used in teacher training institutions in Kenya, however its use for Teaching and learning is limited. The factors that make ICT not be used for teaching and learning range from accessibility, poor infrastructure and the need to change the teaching style. Other factors were inability to keep up with the new developments in ICT which affected the confidence in using ICT. It is also clear that most tutors have had ICT training through holiday workshops. The tutors will not be able to apply use of ICT in teaching and learning because they were trained to use the traditional teaching methods. Furthermore the graduates being rolled out will still have gone through the same traditional training method. This means that the Curriculum has to be addressed and the Teacher trainers be retrained.

5.3 Recommendations

There is need for retraining of teacher trainers to ensure that they are responsive to use of ICT in teaching and learning and that they use ICT for application not only for presentation but for all the other teaching and training needs. This seems to be a goal that KIE is aiming to meet since they now have curriculum development in E-content.

Secondly teacher training curriculum should be redone to reflect ICT use as a medium for teaching and learning in every subject area. This can be done with the assistance of ICT experts and educationists.

Thirdly there is need for a policy on the ICT usage in teaching and learning in teacher training institutions so that it guides the principals on how to integrate ICT in teaching and learning.

The fourth recommendation is that the Ministry of Education should coordinate efforts of the civil society and private sector to equip schools with ICT infrastructure. This would ensure that there is no duplication of efforts and the ministry could give specifications of the ICT infrastructure that is best suited to facilitate learning so that ICT equipments that are defective are not dumped in our teacher training institutions.

The fifth recommendation is the need to equip the primary and secondary schools with the ICT facilities so that what Student teachers learn during their training can be practiced once they start teaching.

ICT change too fast and therefore refresher courses should be sponsored by the Government to ensure that the teaching fraternity remains abreast with all the development in ICT for teaching and learning.

Lastly it is recommended that a research be done to establish how ICT can be integrated in teaching and learning and how the transition from the traditional learning to ICT would affect the education system.

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APPENDIX 1: THE QUESTIONNAIRE

A QUESTIONNAIRE TO ESTABLISH THE STATUS OF USE OF ICTs IN TEACHER TRAINING INSTITUTIONS

This questionnaire is designed to generate information on the status of use of ICTs in the teaching and learning processes in institutions that provide teacher training programs.

Individual responses will be kept strictly confidential to the researcher and her research assistants, though the results of statistical and other analyses of the data may be published in non-attributable and aggregated form.

The survey is in 3 Parts. Please complete the relevant sections.

1. Schedule A: For the Principal or his/her representative
2. Schedule B: For a Teacher Trainer
3. Schedule C: For the Student Teacher.

APPENDIX 2 SCHEDULE A: THE PRINCIPAL OR A REPRESENTATIVE

DEMOGRAPHICS

College:

**Current position(s) of
responsibility**

No. years teaching experience: 0-2 yrs 3-5 yrs 6-10 yrs 11-15 yrs
 16-20 yrs 21-25 yrs 26-30 yrs 30+ yrs

Gender Female Male

A.1. ICT infrastructure in the institution

Number of Personal computers	<50	51-100	101-250	251-500	500>
Average Processor Speeds of the Personal Computers (Hz)	300 - 400	401 - 600	601 - 800	801 - 1000	1000>
Number of Servers	1	2	3	4	5>
Number of Printers	<10	10 - 20	21 - 30	31 - 50	50>
Number of Computer Labs	1	2	3	4	5>
b. Internet Access and Connectivity (Bandwidth)					
Percentage of staff that use the internet?	< 20%	21-40%	41-59%>	60-79%	80% >
Approximate percentage of students that use the internet?	< 20%	21-40%	41-59%>	60-79%	80% >
What is the type of your Internet Connection?	Dialup		Leased Line		VSAT
What is the total bandwidth of the Institution?	< 16 MB	17 – 32 MB	33 – 64 MB	65 – 128 MB	128 MB >

A.2. Current use of ICTs for planning, preparation and administration in the institution.

a. Please indicate the frequency with which you and your teaching staff use ICT as part of your planning, preparation and presentation of classroom materials.

Enter a rating 1,2,3,4 or 5 in the box on the right.

5 = Always 4 = Often 3 = Sometimes 2 = Rarely 1 = Never

a	use of Word Processors or a Desktop Publishing package to produce task sheets, tests, handouts etc.	
b	accessing the internet to find and collect lesson ideas.	
c	accessing the internet for assessment items	
d	accessing the internet to get official documents from the Ministry,	
e	getting lesson content materials from electronic encyclopaedias on CD ROM.	
f	producing lesson materials using digital cameras, video editing, digitizing, scanning etc	
g	accessing the internet for professional readings, subject association newsletters etc.	
h	Other use of ICT for planning, preparation etc. Specify.	

b. How frequently do you and your teaching staff currently use ICT for the following administration purposes?

Enter a rating 1,2,3,4 or 5 in the box on the right.

5 = Always 4 = Often 3 = Sometimes 2 = Rarely 1 = Never

a	Recording or calculating assessments, marks and grades.	
b	Recording students' learning records.	
c	Accessing staff notices.	
d	Email correspondence with colleagues on administrative matters	
e	Writing Reports for parents.	
f	Recording absences.	
g	Other (Please specify)	

A.3. Current use of ICTs with students

- a. Please tick the box that best describes the overall extent to which you have integrated ICT into your classroom program for students.

<input type="checkbox"/>	have not yet blended the use of any computer-based technologies into my student learning activities.
<input type="checkbox"/>	have once or twice included an ICT based learning activity into units of work that I plan.
<input type="checkbox"/>	including an ICT learning activity into several of the units of work that are planned.
<input type="checkbox"/>	Most units of work that taught contain learning activities which involve student use of ICT tools.
<input type="checkbox"/>	All or almost all units of work that are taught contain learning activities which involve some student use of ICT tools.

A.4. Which factors do you think would enhance the use of ICTs in teaching, planning and administration in your institution?

A.5. Which factors hinder a wider use of ICTs in your institution?

A.6. What would you propose as the national strategy to enhance the use of ICTs in all the teacher training colleges in Kenya?

Thank you for taking your time for this interview. I appreciate the attention you have given it.

APPENDIX 3: SCHEDULE B: TEACHER TRAINER

DEMOGRAPHICS

College:

Current

position(s) of responsibility

No. years teaching experience: 0-2 yrs 3-5 yrs 6-10 yrs 11-15 yrs
 16-20 yrs 21-15 yrs 26-30 yrs 30+ yrs

Gender Female Male

B.1. Professional development in ICTs

a. Please list any scheduled ICT professional development activities you have participated in during the last 12 months.

e.g: night classes, in-service courses, after school sessions, holiday courses, online courses, tertiary papers etc.

B.2. How do you prefer to learn new computer skills?

Please rate each option in the right hand box as it applies to you. Enter a 3,2,1 or 0 rating.

3 = strong preference. 2 = a preference. 1 = no view either way. 0 = would rather not work this way

a	On my own, with written support material	
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b	One to one with a tutor	
c	Working regularly with a partner	
d	In a small group	
e	In a large group <i>ie. lab situation</i>	
f	Other (specify)	

B.3. Please rate each of the following as it applies to you, on a 0-2 scale..

2 = significant concern 1 = some concern 0= no concern

Rating (0-2)

a	The ongoing need to upskill myself in using new software packages	
b	Access to equipment for my own professional use	
c	Access to equipment for my students' use	
d	Equipment breakdown/ technical problems	
e	The need to change my teaching style	
f	Not knowing how to include the use of ICT in my teaching programs.	
g	Keeping up to date with new developments	
h	Lack of time to cope with it all	
i	Lack of support	
j	Too much change, too quickly	
k	Lack of training	
l	My suspicion that they don't actually improve learning	
m	Unexpected changes to the daily timetable	
n	Feeling already too far behind	
o	Lack of keyboard skills	
p	Other concerns. Please specify :	

B.4. Current ICT Skills

Please note that this is a study to ascertain usage of ICT in teacher education institutions on a national basis. You are not necessarily expected to have much or any experience in the particular activities outlined below, and certainly not **all** of them.

- a. Please indicate your current level of achievement in each of the following ICT competencies. Tick the boxes which best reflect your current level of knowledge/skill attainment.

IF YOU CURRENTLY DO NOT USE A COMPUTER AT ALL, PLEASE TICK THIS BOX & PROCEED TO NEXT STEP

Frequency of computer usage among Tutors

<input type="checkbox"/>	Use of computer to teach one or two subjects
<input type="checkbox"/>	use of computer for own personal development.
<input type="checkbox"/>	learning new computer skills on my own
<input type="checkbox"/>	handling the basic administration of at least two computer programs
<input type="checkbox"/>	creating and saving teaching documents on the computer.
<input type="checkbox"/>	sourcing for learning and teaching materials on the internet.
<input type="checkbox"/>	creating own folders to keep files organized on the computer.
<input type="checkbox"/>	moving files between folders and drives.
<input type="checkbox"/>	occasionally using a word processing program for simple documents.
<input type="checkbox"/>	using a word processor for much of the written professional work <i>ie. memos, tests, activity sheets and home communication.</i>
<input type="checkbox"/>	using spreadsheet in teaching.
<input type="checkbox"/>	understanding use of a spreadsheet and navigating within one. create simple spreadsheets and charts/graphs.

<input type="checkbox"/>	using spreadsheets for a variety of record-keeping tasks. i.e use labels, formulas, cell references and formatting tools in my spreadsheets. I choose charts which best represent my data.
<input type="checkbox"/>	confidence in the creation of complex spreadsheets with multiple formulae and circular references.
<input type="checkbox"/>	do not use a database.
<input type="checkbox"/>	understanding the use of a database. locating information from a pre-made database.
<input type="checkbox"/>	creating my own databases.
<input type="checkbox"/>	creating complex databases with extensive search and analysis facilities.
<input type="checkbox"/>	using graphics teaching presentations.
<input type="checkbox"/>	opening/creating and placing simple pictures into documents using a drawing program and/or clipart and/or a scanner.
<input type="checkbox"/>	creating and enhance graphic images using simple editing tools eg. resizing, recolouring, cropping, rotating.
<input type="checkbox"/>	capturing and edit images from a wide variety of sources eg. scanner, digital camera, Internet.
<input type="checkbox"/>	using the World Wide Web (internet).
<input type="checkbox"/>	accessing Internet websites to find information. following links from these sites to various other resources.
<input type="checkbox"/>	have an e-mail account.
<input type="checkbox"/>	have an e-mail account but I rarely use it.
<input type="checkbox"/>	sending and receiving e-mail messages and I check my e-mail regularly.
<input type="checkbox"/>	confidence in the use of e-mail. using attachments to exchange learning materials with other colleagues.
<input type="checkbox"/>	ability to use PowerPoint program for teaching presentation.

B.5. Which are some of the factors that prevent you from using information technologies more often than you currently do?

B.6. Which are some of the factors that would promote more use of the information technologies for teaching in this institution?

Thank you for taking your time for this interview. I appreciate the attention you have given it.

APPENDIX 4 SCHEDULE C : STUDENT TEACHERS

DEMOGRAPHICS

College: _____

Course and year of study _____

Gender Female Male

C.1. Please indicate the average frequency (using the 1-5 scale below) with which have done any of the following during your lessons over the last year.

NB: Only put an entry in frequency section if you HAVE used ICTs for such purposes. If you have not, then leave that activity blank.

Key to frequency entries:

*5 = Daily or almost daily 4 = Avg. 1-2 times a week 3 = Avg. 1-2 times a month
2 = Avg 1-2 times a Term 1 = 1-2 times over the year*

Freq. (1-5)

Frequency of ICT usage among student Teachers

a	Composing, editing and presenting creative work using Word Processors &/or graphics packages	
b	Composing, editing and presenting 'project' or content-based work using Word Processors &/or graphics packages	
c	Accessing or searching for information on the internet	
d	E-mailing other students or experts about a current topic or problem	
e	Presenting your learning in the form of computerized slide shows (mainly or exclusively text & pictures)	

f	Editing and composing multimedia presentations or videos using computer software (ie: including sound and moving images)..	
g	Working through content or concept simulations on computer	
h	Practicing skills or reinforcing knowledge using content specific Drill and Practice programs (eg: Maths Games, Reading Games etc)	
ij	Learning from a computer based tutoring program	
k	Writing computer programs or scripting interactive presentations	
l	Accessing or searching for information on electronic encyclopaedias (eg: on CD ROM)	
m	Designing and/or creating web-pages to present learning	
n	Recording, calculating and analyzing data using Databases or Spreadsheets.	
o	Faxing or phoning other students or experts about a current topic or problem	
p.	Using the electronic catalogue to find appropriate reading in the library	
q.	Other (specify)	
r.	Other (specify)	
s.	Other (specify)	
t.	Other (specify)	

C.2. Which factors would enhance the use of ICTs in your learning that you would recommend to this institution?

A.3. What are the factors that hinder a wider use of ICTs in your institution?

Thank you for completing this questionnaire. I appreciate the attention you have given it.

UNIVERSITY OF NAIROBI
EAST AFRICANA COLLECTION