TUTORS’ PERCEPTIONS AND USE OF MULTIMEDIA COMPUTER LABORATORIES IN SELECTED PUBLIC PRIMARY TEACHER TRAINING COLLEGES IN KENYA

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN CURRICULUM STUDIES IN THE SCHOOL OF EDUCATION, KENYATTA UNIVERSITY

OCTOBER 2017
DECLARATION

I declare that this thesis is my original work and has not been presented in any other university/institution for consideration. The thesis has been complemented by referenced sources duly acknowledged. Where text data (including spoken words), graphics, pictures or tables have been borrowed from other sources, including the internet, these are specifically accredited and references cited in line with anti-plagiarism regulations.

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DEDICATION

This thesis is first and foremost dedicated to the Creator, the Almighty God who gave me the physical and mental strength to undertake and complete it successfully.

Secondly, the work is dedicated with total respect and appreciation to my loving parents: Francis Nderitu and LydiahWanjiru who nurtured and educated me. They gave me moral support through prayers during the highly challenging moments that resulted in this work.
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I wish to absolve any person wrongly mentioned in this acknowledgement. For any error committed, I take sole responsibility.
ABBREVIATIONS AND ACRONYMS

BECTA  British Educational Communications and Technology Agency
CEMASTEA Center for Mathematics, Science and Technology in Africa
CT  Computer Technology
DLP  Digital Learning Program
GDD  Global Digital Divide
ICT  Information and communication technology
KICD  Kenya Institute of Curriculum Development
KIE  Kenya Institute of Education
LCD  Liquid Crystal Display
MCL  Multimedia Computer Laboratory
MoEST  Ministry of Education, Science and Technology
NACOSTI  National Commission for Science, Technology and Innovation
NICTP  the National Information and Communication Technology Policy
NISET  National ICT Strategy for Education and Training
PTE  Primary Teacher Education
PTTCs  Primary Teacher Training Colleges
PPTTCs  Public Primary Teacher Training Colleges
SITE  Society for Information Technology and Teacher Education
SPSS  Statistical Package for Social Sciences
UNESCO  United Nations Scientific, Educational and Cultural Organization
VCR  Video Cassette Recorder
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ABSTRACT

Teacher training has over the years used chalk and talk as the main delivery method but in the recent past, it has attempted to integrate new approaches such as the use of Computer Technology (CT). Towards this end, the Kenya government with assistance from Belgian Government has equipped public primary teacher training colleges (PPTTCs) with Multimedia Computer Laboratories (MCLs). Research has shown that availability of CT infrastructure without considering the perceptions and capacity of the user cannot yield the desired results. It is in this context that this study was done in a bid to find out how tutors perceived and used the MCLs. The study objectives were: 1. to examine tutors’ perceptions of MCLs, 2. to investigate tutors’ use of MCLs, 3. to assess factors related to tutors’ perceptions and use of MCLs, 4. to examine tutors’ views about benefits of MCLs and 5. to identify challenges tutors encounter when using the MCLs. The study was guided by Rogers’ Diffusion of Innovations Theory which explains why one teacher embraces the use of computers for instruction while another one resists. The study adopted a descriptive survey design. The target population consisted of 845 tutors from PPTTCs selected from diverse geographical regions. Purposive sampling was used to select a total of 108 tutors of Education, Science and Mathematics subjects. Research instruments included a questionnaire for tutors and an interview guide for deans of curriculum. A pilot study was done to determine and enhance the validity and reliability of the instruments. Test-retest technique determined consistency by calculating Spearman’s correlation coefficient which was 0.74. Validation was done by the supervisors and lecturers in CT. Quantitative data was then coded and analyzed by the use of Microsoft office excel package and the statistical package for social sciences which generated percentages, means and frequencies. Qualitative data was organized in themes according to the research objectives. The study revealed that tutors had positive perceptions of the MCLs. Actual use of the MCLs was found to be minimal. The study found challenges facing use of MCLs to be: inadequate supply of CT resources, lack of adequate CT pedagogical training and inadequate administrative and technical support. The benefits of using the MCLs for instruction were found to be: access to online literature, increasing students’ motivation and interest for learning, making work easier, and enhancing learning. The implication was that if MCLs are used adequately, they could improve the quality of instruction. The study recommended decentralisation of computers and their accessories from the MCLs to the classrooms. In addition, tutors in all subject areas should be adequately serviced with the necessary skills for effective use of CT in teaching and learning. For further research, the researcher recommended a survey of tutors’ perceptions and use of MCLs in other subject areas that have not been included in this study. A study of the extent to which use of CT has contributed to better quality of education is also recommended.
CHAPTER ONE

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 Introduction

This chapter presents the background to the use of Computer Technology (CT) in public primary teacher training colleges, detailing why and how it has been adopted for pedagogical purposes at global and national levels. It puts into perspective educators’ perceptions and use of CT in learning institutions. It is from this background that the problem has been defined, research objectives, questions and hypotheses formulated. The chapter also presents the significance, limitations and de limitations, assumptions, theoretical and conceptual frameworks, and operational definition of key terms in the study.

1.2 Background to the study

A multimedia computer laboratory is a curriculum delivery room comprising of computers and computer accessories including ‘Avidanet’ software which enable multimedia instruction. Mayer (2005) defines multimedia instruction as use of two or more senses to stimulate learning. The importance of multimedia learning is underpinned on the principle advanced by Mayer (2005) in his cognitive theory of multimedia learning. He argues that people learn better when they see and hear
than when they hear alone. In the MCL, instruction involves use of text, sounds, graphics, animations and videos which according to UNESCO (2013) promotes attentiveness, participation, understanding and retention among learners.

Research indicates that although current teaching practice welcomes technology into the curriculum, teachers’ perceptions about it play an important role in its adoption (ChanLin, 2005). Steketee (2005) points out that the potential for CT to enhance teaching and learning cannot be realized unless teachers think analytically about their teaching. Opati (2013) studied use of CT by lecturers in teaching and learning at Makerere University and reported lecturers’ perceptions as a key factor influencing use of CT. Gulbahar (2007), in a study on technology planning in Turkey, reported that although heavy educational investments had been made, there was hardly any proof of CT adoption which he attributed mainly to negative perception by teachers. In connection to those findings, this study sought to investigate how tutors in PTTCs in Kenya perceived and used the MCLs.

Having recognized the need for students to be skillful, creative and confident in the use of Computer Technology (CT), education stakeholders have employed various approaches to integrate it in teaching and learning. Jung (2005) in a worldwide survey of CT integration in teacher training identified four main approaches of integrating CT in pre service teacher training.
One of the training approaches Jung identified is training teachers on application of CT in the classroom as a pedagogical tool in specific subject areas. This approach is also highlighted by Steketee (2005) in a literature review on integration of CT in pre-service teacher training, as an essential component of any teacher education program. Similarly, Jung (2005) cites Singapore’s only teacher training institute, the National Institute of Education that developed a curriculum to promote CT use in every curricular subject. Other training approaches that literature review reveals include; using CT to facilitate only some aspects of teacher training and using it as the core method of teacher training (Jung, 2005).

The approach of using CT as a pedagogical tool for all subject areas is one of the objectives of introduction of the MCLs. For effective use, tutors were trained on how to use the MCLs to carry out curriculum implementation activities such as; internet search for subject matter, drawing schemes of work and lesson plans, presenting lessons using Avidanet software, teaching using digital content and assessment using edumatic exercises (Republic of Kenya, 2010). The current study investigated how tutors utilized the MCL user guidelines for lesson preparation, presentation and evaluation.

Research has shown linkage between how educators view CT and how they apply it in curriculum delivery. Rogers’ (2003) in his theory, ‘diffusion of innovations’, explains that people who view an innovation positively will adopt it while those who view negatively will reject. Rogers’ views have been complemented by
Simonson (2004) who conducted a research to determine how perceptions of CT correlate with application in real classroom situations. Simonson found that teachers who perceived CT as a useful pedagogical tool used it in teaching while those that perceived negatively barely used. Similarly, Drent and Meelissen (2008) studied factors influencing the innovativeness of CT application among 210 teachers in Holland and found that the tutors’ perceptions directly and positively influenced the innovative use of CT.

The linkage between teacher’s perceptions and actual computer use is reported by other research studies (Enos, 2013; Buabeng, 2012; Jones, 2012; Mwalongo, 2011; Delfino et al, 2007; Dexter & Anderson, 2006, Jung 2005; & Drenoyianni & Selwood 1998). However, these reports differ from reports by Korte et al (2007) who in their survey of 27 European countries found low adoption of CT among teachers despite the excitement of its introduction in teaching and learning. Similarly, Buabeng (2012) in a survey of Ghanaian second cycle schools found teachers’ perceptions with regard to use of CT in learning as positive but adoption was low. The contrasting views imply that there are underlying factors inhibiting pedagogical use of the computers in spite of the positive perception by teachers and trainers. Past studies reveal possible factors to be; personal characteristics, training on CT use, access to CT and support on CT use (Isleem, 2003 & Less, 2003). This study sought to investigate the afore mentioned factors in relation to tutors’ perceptions and use of the MCLs in the PTTCs in Kenya.
Perceptions and capacity of educators are important in determining educational interventions. In connection to this, African countries just as the rest of the world are paying attention to professional development of teachers to facilitate effective application of CT in lesson preparation, presentation and evaluation (Hennessey, Harrison & Wamakote, 2010). Steketee (2005), in a literature review of integrating CT in pre-service teacher education programs advises on careful scrutiny of the training courses that teacher trainees undergo during pre-service. In concurrence, Jung (2005) concludes that a carefully designed teacher training program is key to successful application of CT by today’s teachers. On that base, the current study sought to find out tutors’ views about the usefulness of MCLs as instructional resources.

Reviewed studies show that some teachers who would be willing to integrate CT are discouraged by lack of commitment from the administration, inadequate access to CT and inadequate technical support. Ang’ondi (2013) in a survey of ICT champions in a school in Poland reported how school administration would frustrate the teachers by keeping the computer room under lock and key and sometimes even accuse teachers of vandalism. Tella et al (2007), point at lack of technical support in the schools as one of the prominent factors hindering readiness and confidence in using CT among Nigerian secondary school teachers. The current study examined the administrative and technical support given to tutors as they used the MCLs.
The worldwide use of CT in classroom instruction can be attributed to the numerous benefits arising from such integration. A survey of teachers’ use of computers in six European countries, showed that a large number of participants was of the opinion that the use of computers and especially laptops was significant as it impacted positively on learning by promoting individual learning and enabling students to study after the timetabled hours (EU School net, 2010).

Positive impact of CT integration has been reported in developing countries as well. Buabeng (2012) did a survey of teachers’ competences and attitudes in use of CT in Ghana and reported that CT improved learning by promoting learner-oriented instruction, critical and creative thinking. Similarly, findings of a study on classroom practices about use of CT in pre service teacher colleges in six Asian countries (Singapore, China, Korea, Thailand, Vietnam and Philippines) revealed that, the students benefited from diverse sources of subject matter and not just textbooks. The case studies found that CT had special effects that appealed to the senses of sight and hearing which in turn improved learning (UNESCO, 2013). Literature reveals advantages of using graphic presentations over the traditional methods that deal with real life situations. Van Joollingen and DeJong, (2008) in a literature review highlighted practical reasons to use graphic presentations: safety cost and time. Other researchers have found that computers are a tool that makes work easier for the teacher (Hennessy et al 2010, Tella et al 2007 and Sime et al 2005).
The main objective of introduction of the MCLs was to improve the quality of teaching and learning in PTTCs in Kenya. Further, having been trained using CT it is expected that the graduating student teachers would use it in their own classes. This could assist the current Jubilee Government that is implementing Digital Learning Program (DLP) in primary schools across the country. During the 5th international conference on TVET at the Rift Valley Technical Training Institute, the then Cabinet Secretary, Dr. Fred Matiang’i said,

The rolling out of DLP will bring about a change from the traditional classroom chalk and talk approaches to the state of the art Smart classroom. (Kaluoch, May 2016).

Research indicates that despite the enthusiasm about CT integration in teaching and learning among policy makers, low adoption by the implementers is a major concern. Ertmer, (2005) observes that in spite of apparent success in CT application in teaching as seen in the availability of computers, acquisition of computer skills as well as encouraging policies, the rate of adoption is still low.

Literature review shows that across Africa and most developing countries, inadequate facilities are a challenge in the use of CT in the education process. A synthesis of literature review of factors influencing classroom use of CT in Sub-Saharan Africa identified limited technology infrastructure as a leading cause (Hennessy et al, 2010). Research studies agree that lack of adequate time hinders effective implementation of CT. Kozma, et al, and (2004) point out that too often the curriculum in developing countries is rigid and overloaded, leaving little time for innovative classroom practices. Similar reports and in addition poor internet
connectivity and inadequate electricity supply have been done by researchers in various parts of the world (Bingimlas 2009, Maruti 2010, Khan, 2012 & Mwaniki 2013).

Introduction of MCLs in PTTCs was an effort by the Kenya Government towards application of CT in classroom instruction. The impetus was provided by the realization of the important place of CT in the modern society that saw the government put in place a policy framework to guide implementation of CT in education (Republic of Kenya, 2005). Consequently, the National ICT Strategy for Education and Training (NISET) was developed to guide implementation of ICT interventions. As a result, Televic NV, a Belgian company equipped PTTCs along with some secondary schools with multimedia computer laboratories. It was a pilot project that would be extended to other learning institutions. The aim was that all target learning institutions would integrate CT in their delivery so as to enhance access to learning opportunities and improvement of the quality of curriculum instruction (Republic of Kenya, 2006). According to a report by the Ministry of Education, all the equipment for the laboratories of the then 18 public primary teacher training colleges targeted were received by the Ministry as planned and installation of the equipment followed successfully (Republic of Kenya, 2011).

The intent by the Government of Kenya to fast track application of CT in classroom instruction is embedded in critical documents such as Sessional Paper
no.14 of 2012, Kenya Vision 2030 and its second Medium Term Plans, Jubilee Coalition Manifesto and the National Education Sector Support Program (NESSP) 2013-2018.). Monitoring and evaluation of interventions such as CT application in education is essential in providing information to stakeholders with the aim of improving implementation of such interventions (World Bank, 2007). Since MCL project was among the first projects of its kind in the education sector, there was need to investigate how it was being perceived and implemented.

1.3 Statement of the problem

The National Information and Communication Technology Policy (NICTP) highlights investment in computer laboratory equipment as a fundamental element for instruction in the 21st century (Republic of Kenya, 2006). It is against this background that the Ministry of Education in collaboration with the Government of Belgium in the year 2010 equipped all the 18 public primary teacher training colleges in Kenya with multimedia computer laboratories to facilitate integration of CT in training of pre service teachers (Republic of Kenya, 2011). Research has shown that availability of CT infrastructure is not an end in itself as the perceptions and capacity of the tutor to use it play a critical role (Erickson, 2005). Monitoring and evaluation of interventions such as CT application in instruction is essential in providing information to stakeholders with the aim of improving implementation of such interventions (World Bank, 2007). On its part, the
Government of Kenya has reiterated its commitment to promote CT as a tool for training but has pointed at inadequate assessment of educators’ perceptions and utilization of ICT in learning institutions as a challenge (Republic of Kenya, 2012). It is in this context that this study was done in a bid to find out how tutors perceived and used the MCLs.

1.3.1 Purpose of the study

The purpose of the study was to investigate tutors’ perceptions and use of MCLs in public primary teacher training colleges in Kenya. Findings would guide stakeholders towards effective use of the MCLs in teacher training.

1.3.2 Objectives of the study

The study was guided by the following objectives:

1. To examine tutors’ perceptions of Multimedia Computer Laboratories in public primary teacher training colleges;
2. To Investigate tutors’ use of the Multimedia Computer Laboratories in training of primary school teachers;
3. To assess factors related to tutors’ perceptions and use of the Multimedia Computer Laboratories in training of primary school teachers;
4. To examine tutors’ views about benefits about use of the Multimedia Computer Laboratories in primary teacher training; and
5. To identify challenges tutors encounter when using the Multimedia Computer Laboratories in public primary teacher training colleges.
1.3.3 Research questions

Arising from the above stated objectives, the study sought to answer the following questions;

1. What are tutors’ perceptions about the use of Multimedia Computer Laboratories as an instructional resource in PTTCs?
2. How do tutors use the Multimedia Computer Laboratories to train primary school teachers?
3. In what ways do tutors use the Multimedia Computer Laboratories in training of primary school teachers?
4. What are the factors related to tutors’ perceptions and use of the Multimedia Computer Laboratories as an instructional resource in the training process?
5. What are the tutors’ views about the benefits of using Multimedia Computer Laboratories as an instructional resource?
6. What challenges do tutors encounter when using the Multimedia Computer Laboratories in PTTCs?

1.4 Significance of the study

The findings of this study may be useful to curriculum developers at the Kenya Institute for Curriculum Development (KICD) who are able get up to date information on how tutors perceive and use the MCLs. This information can help
to engineer re-evaluation of capacity building in a bid to make tutors more effective in the use of the MCLs.

Quality Assurance and Standard Officers, and even the researcher herself as a curriculum specialist are expected to benefit from the findings of this study. Problems cited and recommendations made could help them to come up with different solutions that might help improve the perceptions and use of the MCLs.

Findings may be useful to the ruling Jubilee Government of Kenya which has one of its flagships being provision of laptops for learning to all Standard One pupils in public primary schools to facilitate Digital Learning Program (DLP);

...Improve the quality of teaching and learning by working with international partners to provide solar powered lap-top computers equipped with relevant content for every school age child in Kenya. (Jubilee Manifesto, 2013: 26).

This study has given insight on the level of computer use preparedness of the primary school teachers. The study has shown gaps in the utilization of CT in PTTCs and suggested ways of addressing them. Issues and lessons raised in this study could be used by stakeholders to utilize CT in such a way that pre service teachers are able to emulate and use in their own classes in the primary schools as they implement DLP.

The research provided an opportunity to the tutors to express their views regarding utilization of the MCLs in teaching and learning. The interaction with
the questionnaires and the researcher during the interviews could make tutors re-examine their approaches and attitudes towards the MCLs.

The study raises issues and challenges on CT use in PTTCs which might be a base for further research by other students and scholars interested in CT integration in education. The underlying factors hindering effective utilization of CT in PTTCs could be studied in more depth.

The published findings may also be of value to organizations such as the Televic NV of Belgium whose agenda is to assist developing countries by supplying and installing MCLs to facilitate application of CT in classroom instruction. The organizations are able to gauge the usefulness of their effort.

1.5 Limitations and Delimitations of the Study

This section presents the limitations and delimitations of the Study:

1.5.1 Limitations

The following were the limitations of the study:

Tutors’ opinions and perceptions of the MCLS were assessed through self-reported assessment. That was a limitation because people have a tendency to be more sensitive when disclosing what they feel than what they know. A study of perceptions such as the current one is likely to encounter responses that may not be truthful or failure to respond at all to the questions by some respondents.
There was limited literature in the area of perceptions and use of CT in education in both Kenya and Africa in general, hence the researcher found it necessary to review much literature from sources outside Africa.

The opinions of student teachers and the teachers who have graduated would have enriched the study but it was not possible to cover them. Including them would have required considerable finances, time and other logistical resources which were beyond the reach of the researcher.

1.5.2 Delimitations

Integration of CT in teaching and learning in PTTCs is a wide subject. This study was limited to the investigation of tutors’ perceptions and use of multimedia computer laboratories in six of the eighteen PTTCs in Kenya.

The study confined itself to tutors in public teacher training colleges which were the beneficiaries of the multimedia laboratories. Private teacher training colleges were excluded since they were not part of the MCLs project.

1.6 Assumptions

The study was conducted under the following assumptions:

All PTTCs were provided with MCLs for the purpose of integrating CT in teacher training. It was therefore assumed that CT was being applied in the learning process in public PTTCs and that indeed the laboratories were still in place.
Installation of multimedia computer laboratories in PTTCs was done on the basis that they would improve training of teachers. It was assumed that application of CT in teacher training would continue to be important in primary teacher education curriculum.

Innovations diffuse through a process whereby some teachers adopt and others fail to adopt the innovations. It was assumed that some tutors failed to adopt CT because they encountered challenges while applying CT in training of primary school teachers.

Multimedia Computer laboratories had a significant pedagogical role to play in education and that using the laboratories could and would result in better educational outcomes.

Some respondents might not respond truthfully for fear of being seen as unprofessional or weak based on their demography or being negative to MCLs and not using them while some might not answer at all. The researcher however assured them of confidentiality and anonymity and that the data collected would only be used for the purposes of research.

Appropriate interventions could change tutors’ perceptions and use of the MCLs leading to improvement in classroom practice.

1.7 Theoretical and conceptual frameworks of the study
This section presents the theoretical and conceptual frameworks upon which the study was based.

### 1.7 Theoretical and conceptual frameworks of the study

The following section presents theoretical and conceptual frameworks upon which the study is based.

#### 1.7.1 Theoretical framework of the study

The study was guided by Rogers’ (2003) “Diffusion of Innovations Theory” which explains how innovations diffuse among people. The theory explains why some people adopt an innovation while others do not. To adopt an innovation is to decide to make “full use of an innovation as the best course of action available” and to reject is a decision “not to adopt an innovation” (2003:176). The following are five steps that Rogers outlines with regard to diffusion of an innovation.

Rogers (2003) calls the first stage knowledge stage. This is the stage where the individual gets to know the presence of an innovation and tries to find out more about it. The next step, persuasion step, occurs when the individual has a negative or positive attitude toward the innovation, but “the formation of a favourable or unfavourable attitude toward an innovation does not always lead directly or indirectly to an adoption or rejection” (Rogers, 2003: 177). This is the stage where this study, as regards to the use of MCLs in PTTCs, found most tutors to be. Evidently they had positive perceptions, yet they did not utilize the available CT resources.
The next step according to Rogers (2003) is the decision stage where the individual chooses to adopt or reject the innovation. The decision stage is then followed by the implementation stage where an innovation is put into practice. Rogers indicates that the implementer may need technical assistance from change agents. He also says that reinvention may happen at the implementation stage where an innovation is changed or modified by a user. Rogers states that the more reinvention takes place, the more rapidly an innovation is adopted and becomes institutionalized. According to him, as innovations, computers are the tools that consist of many possible opportunities and applications, so computer technologies are more open to reinvention (Rogers, 2003). In this connection, the current study recommends decentralization of the computers and their accessories from the MCLs to the classrooms in order to increase access by specific subject tutors.

The final stage according to Rogers (2003) is the confirmation stage. This is the stage where the individual looks for support for his or her decision. This decision can be reversed if the individual is exposed to conflicting messages about the innovation. Depending on the support for adoption of the innovation and the attitude of the individual, later adoption or discontinuance happens during this stage. Discontinuance may occur if the individual rejects the innovation to adopt a better innovation to replace it or the individual rejects the innovation because he or she is not satisfied with its performance (Rogers, 2003). The current study has explored the factor of support in relation to perceptions and use of MCLS.
Inadequate technical, administrative and policy support systems were found wanting hence hindering adoption of the innovation.

Rogers (2003), describes the course by which innovations diffuse as a means of reducing uncertainty. He says that there are certain elements of an innovation that increase adoption of an innovation: relative advantage, compatibility, complexity, trialability, and observability. He further states that an individual’s perceptions of these attributes predict the rate of adoption of innovations. He cautions that a new idea does not get accepted easily despite having recognizable benefits, so the usefulness of those elements of an innovation is catalysts of the course by which innovations diffuse.

Introduction of the multimedia computer laboratories in PTTCs is an innovation geared towards improving teaching and learning. However, individual tutors can either accept it or reject. Rogers’ (2003) theory explains that accepting and adopting an innovation is a process characterized by various intervening variables. This study, therefore, found it crucial to examine factors that are related to perceptions and adoption or failure to adopt multimedia laboratory technology.

A review of research studies indicates that physical factors including education policy, availability of computers, training of tutors in CT and support of tutors on computer use are critical factors in adoption of CT in training of teachers (Drenoyianni, 1998; Steketee, 2005; ChanLin, 2005; Hollow, 2009; Hennessey et al, 2010; Maruti, 2010; Wang’ang’a, 2012; Opati, 2013, khan; 2012 and Mwaniki,
2013). Furthermore, the said studies do indicate that equally important are the characteristics of the tutor: gender, age, and years of experience and professional qualifications which this study investigated.
1.7.2 The Conceptual Framework

**Figure 1.1 Own conceptualized relationship between tutors’ perceptions, use of MCLs and intervening variables**

The conceptual framework illustrates the relationship of the research variables which are: the independent variable (tutors’ perceptions of MCLs), the dependent variables (adopting or rejecting use of MCLs) and intervening variables (factors related to tutors’ perceptions and use of the MCLs). Research has demonstrated that educational innovations are realized in the teachers’ way of thinking before they become practice (Drenoyianni, 1998). Yet, that way of thinking is influenced by external factors, referred to as intervening variables in the above conceptual framework. An individual tutor, who has a positive perception of the MCLs, will most likely adopt the use of the MCLs while the one whose perception is negative will reject. This argument is advanced by Rogers (2003) in his theory ‘Diffusion of innovations’ which states that a person who perceives an innovation positively
will adopt it while the one who perceives negatively will reject. Literature review confirms the linkage between an individual’s perceptions of CT and use. For example, Drent and Meelesen (2007) in Netherlands found that teacher educators who perceived CT positively used it for instruction while those who perceived it negatively did not use. Opati (2013) reported a similar linkage in study among teacher educators in Makerere University, Uganda.

The framework also shows that tutors’ perceptions of MCLs are related to factors such as: training in CT, access to MCLs, and support in use of MCLs. When those factors are in place, adoption of the innovation will be realized but if they are lacking rejection is likely to occur. The implication, which is confirmed by this study, is that an individual tutor could have a positive perception of MCLs yet reject use due to the intervening variables.

Finally, the conceptual framework illustrates that when the MCLs have been adopted for instruction, the teaching and learning processes are improved. On the other hand, if the MCLs are rejected the teaching and learning processes remain unchanged.
1.8 Operational Definition of Key Terms

**Avidanet:** Refers to presentation software that facilitates use of multimedia instruction in the MCLs.

**Digital content:** Refers to any information that is published or distributed in electronic form including text, sound recordings, photographs and animations.

**Edumatic:** Refers to an authoring computer tool for developing exercises and tests that cater for different levels of the cognitive domain.

**Computer Technology:** Refers to the use of the computers and computer accessories for instruction in primary teacher training colleges.

**Multimedia Computer Laboratory:** Refers to a curriculum delivery room equipped with computers and computer accessories such as video projector, Video Cassette Recorder (VCR) for recording audio visual sounds.

**Perceptions:** Refers to the individual tutor’s attitudes and beliefs about the multimedia computer laboratories in PTTCs as a tool of improving training of teachers.

**Pre service teacher education:** Refers to the training of primary school teachers before they are accepted as professionals in education.

**Use:** Refers to conducting lessons in the MCLs and the various ways tutors use MCLs for instructional purposes.
CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The study was set to investigate tutors’ perceptions and use of multimedia computer laboratories (MCLs) in primary teacher training colleges (PTTCs) in Kenya. This chapter presents general literature review of integration of CT in learning institutions under the following major headings in line with the objectives of the study:

1. Brief background of pedagogical use of CT in PTTCs
2. Educators’ perceptions about use of CT in teaching and learning;
3. Uses of CT in teaching and learning;
4. Factors related to perceptions and use of CT: characteristics of the teacher, training in CT, access to CT, support in use of CT and benefits of using CT in teaching and learning;
5. Benefits of use of CT into teaching and learning; and
6. Challenges in use of CT in teaching and learning.

2.2 Brief background of use of CT in PTTCs

Farrant (1993) in his book, ‘Principles and practice of education’ observes that teacher colleges have not been renowned for innovation. He notes that in the past, the colleges were often content to provide each student with an enhanced general
education and sufficient practical training to enable them to teach competently the syllabuses used in the schools. As a result;

…..many teachers in primary schools taught their children just what they learned in college. They dictated the notes they were given (Farrant 1993: 5)

Farrant (1993) says that the manner of teacher training is changing in response to the new roles that teachers have to play in the face of socio-economic, political and technological developments. Indeed, changes in teacher education have been necessitated by the dynamic and transitional nature of society-education must meet the growing demands of the society (Thungu, Wandera, Gachie & Alumande 2008).

Sessional Paper No. 1 of 2005 (Republic of Kenya, 2005) and later sessional Paper no, 14 of 2012 (Republic of Kenya, 2012), provided a structure guiding the use of technology in education in Kenya. Effort was made towards equipping PTTCs with the necessary infrastructure and human resource to facilitate teaching ICT as a subject following its inclusion in the Primary Teacher Education PTE syllabus in 2005 (Kenya Institute of Education, 2004). One such effort is the establishment of Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) with the aim of providing in-service education and training for Mathematics and Science teachers. CEMASTEA pedagogical model is student centred teaching and learning and it is the foundation of CT-integrated lesson plans.
In the year 2006, the Government through the sector of education established the National ICT Strategy for Education and Training in order to guide operationalization of ICT interventions. Indeed, in consistence, the Ministry of Education launched the ICT Policy for Education and Training in August, 2006. It went on to collaborate with Televic NV, a Belgian company, in equipping primary teacher training colleges with multimedia computer laboratories (MCLs). According to a report by the Ministry of Education, all the equipment for the laboratories of the 18 public primary teacher training colleges targeted were received by the Ministry as planned and installation of equipment followed successfully (Republic of Kenya, 2011).

The Kenya National ICT Policy noted that the application of ICT within the classrooms in Kenya was still in its infancy (Republic of Kenya 2006). New initiatives were dominated by technical hitches. This study investigated challenges tutors experienced while using the MCLs to integrate CT in teacher training.

The PTE syllabus does not make provision for mainstreaming CT in all subjects on claims that doing so would not adequately prepare the trainee teachers (Kenya Institute of Education, 2004). The syllabus recommends that ICT department in PTTCs should function as both a teaching department and also as a service department for other departments in the college. It further advises the tutors on exemplary classroom practices using CT to enable the graduating teachers to
effectively use the new tools in their own classes. This study investigated how tutors of Education, Mathematics and Science subjects perceived and used the MCLs as well as factors that influence perceptions and use.

2.3 Perceptions towards CT in teaching and learning.

Overall, reviewed studies reveal that a teacher’s own beliefs towards methodological inventions are key determinants to use of CT in their classes. Pedagogical innovations are primary facilitators to teacher use of technology in the classroom (Hennessy, et al, 2010). Mumtaz (2000), in an earlier study, claimed that a teacher’s attitude toward using computers to teach is an integral part of technological application. Similarly, Dexter, et al (2006) point out that the way the teacher thinks is key in determining his or her instructional style. In the interviews of the said study, the teachers made it clear that a transformation in teaching approaches resulted from careful reasoning about what works and what doesn’t work in the classroom. In their conclusion, Dexter et al (2006) report that the teachers studied saw themselves as having made decisions about how best to teach.

Research shows that successful application of CT in education programs is hinged on how the teacher perceives it. Research has shown that a teacher who does not recognize how CT satisfies his or her desires or even those of the students will not consider applying any CT related approaches (Hew and Brush, 2007; Keengwe
and Onchwari, 2008). This notion is in agreement with Rogers’, (2003) observation that if the teacher perceives positively the use of CT, then adoption and integration into the teaching and learning processes becomes easy.

Using a quantitative approach (Simonson, 2004) explored attitudes of primary school teachers on using CT for instruction. The study was a correlation between how the teacher perceived and used CT in the lessons. Similarly, Drent, et al (2008) studied factors that influenced the inventive application of CT by 210 tutors in Holland and found a positive correlation between how the tutors perceived and use CT.

Similarly, in a case study of teachers’ perceptions of CT implementation in a primary school in Hongkong Ngan Ling Ma (2001) found that the four participating interviewees in the school understood that CT would play an increasingly important role in human learning. The four were willing to learn computer skills and try to integrate them into classroom teaching.

A survey of factors affecting classroom use of computers by teachers in Sub-Saharan Africa reports that “teachers who perceive the use of CT as enhancing recall of previous learning, providing new stimuli, activating the learner’s response, and providing systematic and steady feedback will utilize it.” (Hennessy et al, 2010:43). Tella, Toyobo, Adika, and Adeyinka (2007) agree with this linkage between perception of usefulness and use of CT. They report in their
study that teachers who use computers are prompted by the recognition of the benefits arising from CT application and that perceived usefulness was also strongly linked to those intentions.

The linkage between perceived benefits of computer use in the classroom and actual use was also reported by Yuen and Ma (2003). They stated that computers were valuable as long as the setting was appropriate and as long as the teacher was conversant with computer pedagogical approaches. Similarly, Ang’ondi (2013) in a literature review revealed that although the majority of teachers perceive CT as having the capability to advance classroom teaching, a large number of teachers still did not recognize the value added by computers or the best way to use them in order to get the desired results.

Indifference towards computer use was also reported by Buabeng (2012) who studied Ghanaian second cycle schools. Ironically, teachers in the study regarded computer use in teaching as beneficial but did not use it. Studies by Korte and Husing (2007) and Korte and Oldfield (2010) also found a conflict between teachers’ attitudes and use of computers. They reported that despite the enthusiasm among teachers upon receiving computers in the school, there was no evidence of use probably because they did not see the value. The revelation of positive perception not leading to use contrasted with studies that reported existence of a relationship between teachers’ perceptions and use of CT (Opati, 2013, Mwaniki 2013 & Minae 2014).
From a different perspective, Mulwa & Kyalo (2013) found negative attitude towards integration of CT in conducting lessons as the main hindrance to the effectiveness of an e-learning project in the New Partnership for Development (NEPAD) in secondary schools in Kitui County in Kenya. A similar observation is by Ang’ondi (2013) in a survey of “Teachers Attitudes and Perceptions on the use of ICT in teaching and learning as observed by ICT champions in Poland”. In his report, ICT champions observed that many teachers felt that use of CT was an unnecessary addition because they already felt overburdened. They claimed that “these teachers would make technical appearances during the training sessions, come late for the training and sometimes even fail to show up completely for training. After the training ended, these teachers would be seen in the computer room but only reading the local daily on the internet or playing games on the machines.” (Ang’ondi, 2013: 40). The conduct of those teachers was an indication of negative perceptions of CT among teachers who did not want to be bothered by teaching differently. In line with those observations, this study surveyed the case of Education, Mathematics and Science tutors’ perceptions towards MCLs in PTTCs.

Thomas, Tyrrell and Bullock (1996), from their case study on use of ICT in Mathematics suggest that the teachers' transition to a positive view of computer use needs to develop from their experiences and this requires time. Five years since the introduction of multimedia laboratories in PTTCs had gone by and yet a
study of the tutors’ perceptions about them and also their use had not been investigated. This study used a survey to find out how tutors perceived and used the MCLs as a means of integrating CT in Primary teacher education curriculum.

Research studies have demonstrated that a teacher’s perceptions of CT are fundamental in effecting change in classroom practice. A survey done among teachers in the UK shows that “change will not occur by simply adding a course or recruiting a new faculty member who understands technology but rather what is required is a transformation of the teacher’s perceptions” (Drenoyianni, 1998: 88). This view is supported in a case study of two classrooms in an elementary school in New Zealand (Ryba and Brown 2000). The researchers reported that teachers’ personal philosophies about teaching and education generally determine the place of computers in their classroom practices, concluding that a teacher who believed in student centered teaching approaches used computers in the instruction process.

Review of literature indicates that tutors’ beliefs about the benefits of integration of CT can influence how they perceive and use it. Grossman (2008), reports that many teachers are unsure of the benefits of using computers in class. He suggests that in such cases, it might be better to avoid the use of CT because teachers who feel forced will not deliver better lessons because they might use it for comical reprieve and not for the intended pedagogical use.
Some teachers believe that CT is not as effective as the traditional ‘chalk and talk’ on the basis of time spent. Grossman (2008) reports that some teachers feel that undertaking a task by writing down as the lesson goes on is an effective time saving approach considering the time spent moving to and from the computer laboratory.

Ertmer (2005) is of the opinion that a scientific examination of beliefs is crucial as they are not more readily observed. This study investigated what beliefs tutors had towards the multimedia computer laboratories and how those beliefs influenced their use of the laboratories.

2.4 Use of CT in teaching and learning.

This section presents a review of literature on use of CT in teaching and learning. Many studies show a variety of education delivery possibilities using CT. An example is the Society for Information Technology and Teacher Education (SITE) which names three fundamental principles for effective CT use in teacher training (Carstens and Pelgrum 2006). The first principle advanced by SITE is that technology should be infused into the entire teacher education program. The second principle is that CT applications should not be taught as separate topics but rather should be used where applicable across all courses of the teacher education program. The third of the key principles is that students should experience innovative technology-supported learning environments in their
teacher education program. This last principle requires that students should see their lecturers engaging in technology to present their subjects, for example, utilizing PowerPoint or simulations in lectures and demonstrations (Carstens and Pelgrum 2006).

A review of research studies shows that these principles have been used to impart knowledge and skills in different ways including basic computer operations and higher level mathematical operations within the existing subjects or new subjects (Tanui, Kiboss, Walaba and Nassiuma, 2008). The main objective of the installation of the MCLs in PPTTCs was to use CT across all subject areas as proposed by Tanui et al (2005).

Some studies reveal that institutions have come up with their own computer based training resources. Jung (2005), for example, studied cases of CT application in teacher training and gives examples of training resources found to be effective for training pre-service teachers. One of them is ‘Captured Wisdom’ (2005) which is a resource for training teachers in United States of America (USA). In the said resource, the Compact discs of read-only memory (CD-ROMs) contain video descriptions and demonstrations of how technology is used in classrooms with examples of real educators and learners using successful practices of technology to support instruction and learning in their classrooms.
Jung (2005) further gives a detailed description of a course designed for Singapore’s only pre-service teacher training institute. He explains that there are three kinds of computer courses for student teachers: basic ICT- skill (word processing, power point, internet literacy and other technical skills), a 30-hour ICT foundation course (effective use of instructional technologies in the classroom) and a 26-hour elective course (design and production of computer based instruction). Besides this, the student teachers are also expected to undertake a five week practicum. In addition, there was 6-12 hours of ICT integration into each curricular subject.

UNICEF has developed a course called ‘Teachers Talking About Learning’ that is intended for worldwide partnership among teachers in Third World countries by use of the internet and television (Meyer and Rodriguez, 1999). It offers access to teacher training resources and useful links and supports conversations among teachers.

In the developed countries like USA and Canada there are well designed courses both for virtual training as well as teacher training institutes (Jung, 2005). The idea of specially designed courses for teacher training is gradually penetrating the developing countries. However, in a case study by Wabuyele (2003), results indicated that computer use in learning institutions in Kenya was then still in its initial stages. Wabuyele found that other countries in the world reportedly had up
to 41% CT use by teachers in the classrooms but the percentage remained considerably low in African countries such as Kenya.

In addition, the Kenya National ICT Strategic Policy (Republic of Kenya, 2006) recognizes that in spite of the existence of many innovative interventions in CT with regard to supporting sound and efficient provision of the curriculum in learning institutions. However, the policy points out a substantial technology gap in the use because most institutions still use archaic systems that are incapable of exploiting the educational possibilities of the upcoming technologies.

The Kenya Vision 2030 concurs as it points a challenge in teacher training colleges being the need to modernize it to reflect changing technologies and delivery methods (Republic of Kenya, 2008). Similarly, the National ICT Strategy for Education and Training aims at aiding procedures in learning establishments to keep up-to-date technologies to improve instruction, and acquisition in line with the demands of the present era (Republic of Kenya, 2006).

The desire to embrace modern technology in education in Kenya is evident. Odera (2011) in a study on computer utilization in Nyanza Province schools reports that Kenya being a growing country has a fast growing number of learners that demands an enhanced approach to teaching and learning. It would therefore be important to have tailor made digitized content that appeals to different settings of
the Kenyan community if the Ministry of Education (MOE) is to actualize implementation of CT in learning (Republic of Kenya, 2006).

Customization of use of CT has been done elsewhere for example, Guatemala where the Learn Link project has customised CT by developing socially suitable digital resources to train teachers in the local Mayan language (Meyer and Rodriguez, 1999). In Kenya, the ‘Intel Corporation Teach program’ is presently assisting teachers to incorporate CT in the existing teaching approaches at various levels of learning aiming at aligning them to global trends (Karsenti, 2009). A ‘train the trainer’ tool is given to selected participants from teacher training colleges, Centre for Mathematics, Science and Technology Education in Africa (CEMASTEIA), Kenya Institute of Curriculum Development (KICD) and Kenya Education Management Institute (KEMI), to work on the production of digital materials (Republic of Kenya, 2011). While the main content of ICT as a subject in PTTCs is computer literacy, tutors are advised to be exemplary in the use of CT in their own classes. (Kenya Institute of Education, 2008).

Research indicates that a lot of emphasis is still on CT literacy rather than pedagogical use. Padraig and Lawler (2007) in their study of ‘investing CT in educational institutions in developing countries; an evaluation of their impact in Kenya’, found that computer laboratories were dedicated more to Computer Studies than other subject areas in the curriculum. In addition, the study revealed
that acquisition of basic computer skills was given more attention than skills on integration of the technology into teaching and learning. They reported that 90-94% of the students found computer lessons more interesting than other subjects. This implies that if that interest was tapped by integrating CT in other subjects as a pedagogical tool most probably better educational performance would be realized.

Nevertheless, research studies indicate that as a pedagogical tool, the computer should not substitute the teacher or the natural environment. Grossman (2008) in his study, ‘Supplementing textbooks with computer based resources in primary classrooms’, points out that the computer should never be used as substitution for real life interaction with the environment, “children should paint with real paint, dance real dances and collect real flowers rather than just doing these things on a computer screen!” (Grossman, 2008 pg. 32)

In PTTCs in Kenya, digitized curriculum content is developed by Kenya Institute of Curriculum Development (KICD) which has so far developed a curriculum for Mathematics and Science subjects (Republic of Kenya, 2011). The Avidanet software available in the multimedia computer laboratories also enables tutors to develop their own digitized materials as well as customize online teaching materials (Republic of Kenya, 2010). The PTE Syllabus Guide states that tutors should learn how to incorporate CT into their own subjects (Kenya Institute of
Education, 2008). It is upon the tutor to design how to apply CT appropriately and this study sought to find out how it was done.

2.5 Factors related to perceptions and use of computer technology in education.

A review of literature shows some common factors influencing perceptions and use of CT in education that have been studied by various researchers. Isleem (2003) studied how much computers were used for instruction by teachers in public schools in Ohio. The factors that Isleem selected for the study included “expertise, access, attitude, support, and teacher characteristics” which the study found to significantly influence how much teachers used the CT.

Less (2003), in a quantitative research investigated how the faculty adoption of CT for instruction in the North Carolina Community College applied CT based on their individual characteristics (age, gender, race/ethnicity, teaching experience, and highest degree attained). The study found the selected characteristics to significantly influence the use of CT. Less found no significant difference existing between users and non-users in demographic characteristics of age, gender, race/ethnicity, teaching experience and highest degree attained.

Guided by past studies, the current study investigated demographics of tutors as well as physical characteristics of the PTTCs to determine tutors’ perceptions and use of MCLs. The specific factors included: tutor characteristics, access to
computers, training in CT, support of tutors in computer use and benefits of CT integration in teaching and learning.

This study reviewed research mainly done in educational institutions in the western world where CT integration has been in existence much longer than Kenya (Hennessy et al, 2010). The factors are analyzed here below.

2.5.1 Tutor characteristics

Tutors and teachers are encouraged to take up and use CT in their lessons but the overall characteristic of the tutor or teacher is the greatest determinant to effective use and not the sheer existence of computer equipment in the classroom (Jones, 2010). Schiller (2003) reported a significant relationship between educators’ demographic characteristics and use of CT. Among the demographic characteristics that literature review has exposed are gender, age bracket, teaching experience and professional qualifications. Following is a discussion of those characteristics:

There is some evidence pointing to the existence of correlation between gender of a teacher and the usage CT: A survey of European schools (European Commission, 2003), noted that gender was a factor which determined how teachers used CT. The survey indicated that while 77% of male respondents used a computer off-line, female teachers were 66%. Further the report noted a wider
gap in the use of the internet where male teachers who used were 56% compared with female teachers at 38%.

Similarly, Markauskaite (2006) investigated gender differences in the use of CT among first year pre service teachers and revealed significantly higher scores among males than females in technical CT capabilities. In the same light low levels of computer use among female teachers was attributed to factors such as limited access to CT, inadequate skill, and lack of interest by Kay, (2006) in a literature review.

Gender position against CT use as reported in Mid-Western US basic schools by Breisser (2006) indicated improved technological skills among female teachers compared to the male teachers. Yukselturk and Bulut (2009) reported that the gap in the use of computer technologies between males and females had reduced over the past years.

In contrast, other studies have reported that gender factor is not a clear predictor of usage of CT in teaching (Norris, Sullivan, Poirot and Soloway, 2003). In agreement with that view is a study done by Kay (2006) who reported that there was no difference in computer attitude and ability between males and females with regard to use of CT in classroom practice.

Genc, Sahin and Kahveci (2011) in a survey of demographics in relation to computer perceptions by teachers in Turkey found gender as a key demographic
characteristic. Apparently, most of the studies on the relationship between gender and CT competences have been conducted in the developed countries. Therefore, in the interest of finding out how gender influences perceptions and use of MCLs, this study looked at the distribution of male and female participants.

A review of some past studies shows lack of correlation between teaching experience and the use of CT technology in teaching. Granger, Morbey, Lotherington, Owston and Wideman (2002) in a qualitative survey of factors backing effective application of CT in Canadian schools did not find any significant association between teaching knowhow and capabilities in using CT. Jong and Kim, (2008) reported lack of readiness among long serving Korean teachers to use CT in their lessons. On a similar note, U.S National Centre for Education Statistics, (2000) found less experienced teachers having a higher tendency of using computers in the teaching process compared to the more experienced ones. The said report indicated that as years of teaching experience went up, time spent by the teachers in using CT went down. The explanation for the negative correlation could be that new teachers had, during pre-service been exposed to CT as one of the units in their course unlike the older ones.

In contrast though, some other studies show that teaching experience determines effective use of CT in teaching and learning. For example, Wong & Li, (2008), Giordano (2007) & Gorder (2008) reported that teacher experience is significantly correlated with the actual use of technology.
Lau and Sim (2008) who studied the degree of CT acceptance in Malaysia using a sample of 250 secondary school teachers also found experienced teachers regularly using CT to conduct lessons compared with less experienced teachers more than the younger ones. The authors’ speculation for that trend was that due to teachers’ experience in various teaching approaches, older ones are able to easily and effectively apply CT in their lessons. A similar view is held by Russell, Bebell, O’Dwyer, and O’Connor, (2003) who reported that new teachers despite having high skills in computer use compared with older failed to use CT in actual classroom practice. The said researchers argued that new teachers were likely to focus on how to use CT and not how to teach with it. Besides, the researchers noted that new teachers could be more involved in familiarizing themselves with different general aspects of the new career rather than specific aspects such as curriculum delivery methods. In view of these contrasting trends, this study investigated if teaching experience was a factor that influenced tutors’ perceptions and use of the multimedia computer laboratories.

### 2.5.2 Access to computers

Becta (2004) explains that lack of access could refer to physical lack of resources, poor quality of available resources, resources being inaccessible due to poor organization or teachers being unable to access the computers for lesson preparation. Plomp, Anderson, Law & Quale (2009) argue that access to computers and their accessories in schools and colleges influences how CT is
integrated in classroom teaching. In addition they say that if teachers have no access to computers and up to date software, effective use of CT will be elusive.

In relation to the factor of access to computers, Pelgrum (2001) conducted a global study of the hurdles facing the incorporation of CT in curriculum delivery, and reported that the most commonly stated obstacle was inadequate number of computers available to them. Interesting to note is that even with the passage of time; access is still an issue even in later years. For example, Becta (2004), in a survey of use of CT in Britain acknowledged lack of hardware as a hindrance to integration of CT.

In the same note, in a quantitative study among high school teachers of English language in Syria involving gathering their opinions on computer qualities, Albirini (2006) found that more than half (57%) of the teachers used CT at home and only 33.4% accessed it at school. That finding indicated that teachers lacked enough hardware for effective use of CT.

Linkage between successful use of CT in teaching and learning and access to the computers has been reported by (Usluel, Askar and Bas, 2008) in a study of 814 faculty members in higher education in Turkey. The study showed that many participants (82.5%) had access to computers. Yildrim (2007) also found a relationship between access to computers and pedagogical use of CT among teachers in Turkey.
Some studies have shown existence of a relationship between access to CT and pupils’ achievements in national tests. Results of a survey by Becta (2004) indicated that those schools which were well equipped with computers and their accessories tended to perform better in examinations compared to those that had inadequate equipment. It is therefore evident that inadequacy of computer equipment deters access, consequently affecting performance negatively.

Cuban et al. (2001) observed that an obstacle to access and use of computers is the strict time schedules and departmental boundaries, which reduce the sharing of information among members of a department or with other departments. The researchers observed that in a small number of classes where teachers shared information and planned together pedagogical innovations such as use of computers, emerged. From a related perspective, the Becta (2004) survey reported poor organization of computer resources in those schools where such resources were few and therefore an impediment to access. The study recommended careful thought to be given to location of computer resources to facilitate effective use.

Becta (2004) recommended that every teacher needed individual access to computers for adequate planning of lessons. The study found that a teacher who used computers often gained confidence in CT use consequently viewing CT as a crucial instructional resource material. In connection to access in relation to use, this study investigated accessibility of MCLs in PTTCs to tutors and students.
Studies of access to CT in the developing countries show inadequate access as overriding in inhibiting its adequate application in education and training. For example, Kessy, Kaemba, and Gachoka (2006) and Ford (2007) discussed some factors underlying low utilization of CT in teaching and learning in Africa, among them being inadequate computers due to the cost of acquiring hardware and software coupled with that of maintenance and repair of facilities which in their view is often prohibitive for developing nations. Maruti (2010) in a survey of e-learning among public PTTCs in Kenya assessed the availability of CT infrastructure in PTTCs in Kenya. He reported that colleges lacked adequate infrastructure and were poorly connected to the internet and he recommended that funding for CT equipment in colleges be increased.

Research review has shown that lack of access to technology is inevitably a major barrier in its integration to teaching and learning, but the question is, ’does availability necessarily translate into use?’ This study sought to find out if introduction of MCLs had resulted in a change in delivery methods.

2.5.3 Training in the use of CT

Training in CT is expected to empower the teacher with computer competences. Van Braak et al. (2004) define computer competence as being able to handle a variety of computer applications for various purposes which in this case of this study is pedagogy. Grossman (2008) suggested that prior to long standing
resolutions of investing in computer hardware and software, it is crucial for a teacher to be equipped with computer competences. Research reveals that availability of computer hardware and software resources is not an end in itself. Hennessy et al (2010) state that computers themselves do not come pre-packaged with relevant teaching content—teachers were provided with a ‘professional ICT toolkit’ comprising of multimedia materials; a laptop, digital audiovisual equipment and accessories and teachers had to device ways of using them. Similarly, Eriksson et al (2005) state in their study of the European approach to utilizing computer labs that for innovation to work, the creative process of humans is crucial because innovation is created by humans, not by systems.

In addition, research has revealed that acquisition of CT skills influences a teacher’s attitudes towards computers (Hew et al, 2007; Keengwe et al 2008 and Muller et al 2008). The same opinion is held by (Plair, 2008) in a study of 400 pre-service teachers which revealed that professional development is one of the greatest determinants of successful CT integration besides assisting teachers recognize the role of technology in student learning. In a qualitative multiple case-study on the use of CT during practicum in five European countries, Peralta and Costa (2007) reported procedural and pedagogical skills among Italian teachers to be significant factors for effective implementation.

Similarly, past studies report that to be skilled and knowledgeable is the key to effective implementation of CT in teaching and learning (Dexter, Anderson, and
Becker, 2006). Of the same view were Hennessy et al. (2010) who reported that teachers who lack understanding of operating and maintaining computer equipment, lack the drive to utilize CT in the instructional process. This agrees with a remark by the education secretary in Kenya that ‘you cannot use old methods to teach new concepts’ (Koech, 2013: 7). This means that for tutors to effectively train teachers on how to use CT in teaching and learning, they need to have acquired those skills themselves.

Research further indicates that integration is hampered by inadequate training of teachers. Hennessy et al (2010), in a synthesis of research literature on use of CT in education in Sub-Saharan Africa, reports that training programs were rare resulting in poor technical knowhow in using CT.

It is evident from past studies that inadequate training has resulted into a feeling of inadequacy among teachers in using instructional technologies. In a study by Peralta et al, (2007) on Italian teachers’ knowhow and confidence regarding the use of CT in classrooms, teachers’ technical competence with technology was found to be a factor of improving confidence among teachers in the use of CT.

Lack of confidence is demonstrated in a case study of teachers’ perceptions on CT implementation in a primary school in Hongkong (Ngan Ling Ma 2001). Veteran teachers in the study, were more reluctant to abandon traditional teaching methods and adopt CT in classroom teaching. They were afraid of using computers and
were less competent in integrating CT in teaching. One of them said that when he knew the principal required all teachers to use CT for teaching, he felt frightened and was afraid of his ability to handle lessons using it. This could be because in spite of their long teaching experience, they had not interacted much with computers. Peralta and Costa (2007) agree in their report that “teachers with more experience with computers have greater confidence in their ability to use them effectively.” pg. 60

In the same light, a study by (Balanskat, Blamire, and Kafal, 2007) cited lack of ICT knowledge as a factor contributing to teachers’ lack of confidence for utilization of CT in their teaching. In concurrence, Becta (2004) survey reported that many teachers who felt inadequately skilled in using CT felt anxious at the thought of using it in a class that was likely to be more competent in CT skills than they were.

Some studies attempt to show that lack of competence can adversely affect teaching. For example Futurelab, (2003) states that teachers who have not acquired computer literacy feel their authority insecure from imagined loss of class control in that, students may already have computer skills hence challenging the teacher’s role as the custodian of subject matter.

Olakulehin, (2007: Pg.130) recommends professional development activities for teachers to, “learn how to manage their classrooms more effectively and to use the
technology to create a more stimulating learning environment.” Wabuyele (2003) conducted a study on understanding perceptions of teachers and administrators towards computer use in Kenyan classrooms and argued that adequate training of teachers before and during service is essential for effective utilization of CT in teaching and learning. Wabuyele’s study went on to recommend that the Kenyan government needed to review teacher training with the aim of incorporating CT in classroom practice.

In a study on complementing course books with CT in the classroom, Otellini (2008) in his manual for teaching CT in Kenyan Schools concurs with the idea that tutors must stay current in technological skills in order to assist learners acquire computer skills for the age of knowledge. He says that tutors must therefore be equipped with knowledge and skills for permeating computer use in the whole teacher training program and not just a single subject.

Efforts towards empowering the teacher to integrate CT in teaching and learning in Kenyan education systems are evident. For instance, the Intel Corporation Teach program supports change from predominant use of ‘chalk and talk’ method to embrace emerging technologies in the teaching process. Kenya is transiting from traditional teaching methods by educating teachers on how to integrate CT (Karsenti, 2009). In connection to this, MOE has offered training courses on the use of MCLs. However, there has been limited study to assess the tutors’ perceptions and pedagogical use of the MCLs. The Government of Kenya has
pointed at inadequate assessment of educators’ perceptions and utilization of ICT in learning institutions as a challenge (Republic of Kenya, 2012). This study investigated if tutors had the capacity, in terms of attitudes and skills to utilize the multimedia computer laboratory in PTTCs.

### 2.5.4 Support of tutors in computer use

Support in this study refers to technical, moral and professional assistance given to tutors in accepting to use and actual use of CT in the teaching and learning. The support may be given by a computer laboratory technician, colleague with expertise, institution administrators and educational policies and documents.

#### Technical support

Tutors may have received basic CT skills but still require support in advanced skills as well as technical support for the upkeep of the computer equipment. Becta, (2004) explains how computers can break down, and therefore interfere with effective flow of the lesson. The Becta survey reports how apprehensive some teachers are that they opt not to use the computers even before the potential faults could occur. The survey goes on to report that actual breakdown of equipment coupled with lack of technical support in the institutions, leads to grounding of computers.

Need for adequate technical support is also reported by the National Council for Technology in Education (NCTE 2005) census on CT facilities and resource
materials in Ireland. Among priorities cited, 85.3% of schools mentioned technical support and maintenance. Concurring, Yilmaz (2011) assessed CT integration in the Turkish education system and found provision of technical support in terms of repair and maintenance to be crucial for the continued use of CT in schools. Similarly, Husing (2007) argued that CT support in schools mitigates against time wastage in troubleshooting.

Many studies indicate that provision of technical support is necessary for effective application of CT in classroom instruction. This need is demonstrated by Butler and Sellbom (2002), where a teacher in the study reported how replacement of a “burnt out projector bulb” took a period of three weeks to be done. This, the authors state, was clearly unacceptable as it interfered with utilization of the technology.

In a survey of secondary school teachers in Nigeria by Tella et al (2007) inadequate technical support in the schools is reported as one of the major hinderances for a teacher to use CT. This view was reported years earlier by Snoeyink and Ertmer (2001:90) who reported “that teachers who tried to carry out a task on a computer, but who were unsuccessful due to technical problems, would then avoid using the computer for several days.” Clearly, there is a close relationship between breakdowns of computers that actually occur or potential ones and teachers’ perception where teachers are more likely to shun the use of CT.
Leach, Ahmed, Makalima, and Power (2005), suggest that teachers using computers in the classroom should not act in isolation from each other - they need peers who are also developing their own pedagogies and resources. This study investigated the availability of technical support from MCL technicians and colleagues with expertise to specific subject tutors in the use of the MCLs.

**Moral and material support**

Research further indicates that school management has a crucial role to play in supporting CT integration morally and materially. Cox, Webb, Abbot, Blakeley, Beauchamp, and Rhodes (2003) in a review of the research literature in CT found that leadership style and attitudes of the head teacher to CT use in teaching and learning is a major influence on the successful integration.

Hennessy et al (2010) point out that the negative attitude among school leaders towards computers is a challenge to application of CT into teaching and learning. On the other hand, in an earlier study, Yee (2000) observed that a leader who implemented technology plans and also shared a common vision with the teachers stimulated them to use CT in their classes.

Research studies have reported a relationship between leadership and use of CT in teaching and learning. Yuen et al (2003) did a case study of 18 integration model schools in Hong Kong and reported that the school principal was the key agent of change. Similarly, Anderson & Dexter, (2005) found various levels of leadership
such as administrative and technology leadership contributing to successful use of
CT in schools.

There is evidence that commitment from the administration motivates some
teachers to use CT in teaching. Ang’ondi (2013) reported how school administrators
would ironically lock up the computer room and even accuse teachers of vandalism
which displeased some teachers who resigned in the belief that there was no need
for confrontations with the administration. Ang’ondi (2013) concludes that many
teachers would not want to mess with the status quo thus they would rather do things
the way they have been used to.

Research has shown that in spite of many teachers and student teachers becoming
personal users of computers, that knowledge unfortunately does not simply transfer
to teaching practices (Player-Koro, 2007) as moral support is required to expedite.
This study assessed support that tutors get, morally and materially with specific
reference to the administration which is a key change agent.

**Education policy and documents**

Research studies indicate that world over, education policies are stressing on reforms
on the existing curriculum of learning institutions because among other things
this is believed to be the key to economic progress (Zamfir, 2008). One of the
findings of SITES 2006 was that almost all participating countries had a policy
on the use of CT in its educational system (Law, Pelgrum, and Plomp,
2008), but only a few of them had reached a stage where policy was really implemented into the educational system. Therefore, the question was: why was technology not used to the extent that could be expected?

Drenoyianni et al (1998) in their study on teachers’ perception to computers among teachers in UK concluded that undoubtedly educational policies and requirements directed and to a certain degree determined the status of education. One of the findings of the said study was that education being a social system involves many individuals each of who interprets the policies formulated differently from the other. This study therefore found it necessary to investigate how interpretation of education policy and curriculum support documents influenced perception and use of multimedia computer laboratories by tutors.

The Kenya National ICT Policy, promulgated in 2006 aims at guiding implementation of ICT in the country (Republic of Kenya, 2006). It gave rise to a National ICT Strategy for Education and Training (NISET) aimed at controlling and directing the sector in the adoption of CT across all levels of teaching and learning. An ICT PTE syllabus was therefore put in place in 2004 (KIE, 2004). The syllabus does not make provision for mainstreaming CT in all subjects even though it points out that it should be integrated in the entire curriculum. The syllabus points out that the ICT department in a college should function both as a teaching department and also as a service department in the TTC (Kenya Institute
of Education, 2004). This implies that the process of integration of CT in teacher training is not quite clear and it is upon the tutor to devise ways of implementing.

Teachers are being impressed upon by the education leadership to embrace CT. The then acting education secretary, for example, while addressing education officials during selection of 2013 teacher trainees said that teachers must advance their skills to develop the crop of students required to realize Kenya’s economic forecast as proposed for vision 2030 (Koech, 2013:7). Indeed the current ruling Jubilee Government came to power on the platform of digitizing learning in primary schools and it is out to make good its promise (Jubilee Manifesto, 2013).

Kozma et al (2004) in their study ’closing the digital divide’ pointed out that there were gaps in the national policies. Such gap was demonstrated in Quebec where policy was transferred into the actual education system in a manner contrary to what was intended. CT was not seen as a teaching tool, even though the policy was apparently clear about it (Karsenti et al, 2008). Kozma et al (2004) recommended that national policies should be more committed to help fit in computer technologies into syllabuses for effective implementation.

Similarly, Grossman (2008) suggests that education authorities should consider helping the teacher to acquire CT pedagogical competences without making an assumption that teachers are as computer compliant in pedagogy as they might be computer literate. This study was expected to inform the Jubilee Government of
Kenya whose leaders were on record claiming that primary school teachers are already computer literate and therefore would effectively implement the ‘digital learning program’ in primary schools.

Education policy and directives also guide the workload of teachers. Some studies have revealed that use of CT in teaching and learning is influenced by workloads. Samarawickrema and Stacey (2007), for instance used a case study to investigate factors related to the use of learning management system in a large multi-campus urban university in Australia. Respondents reported that their work increased because they then had to perform tasks such as maintaining and upgrading the course, reading and replying to students’ emails and search for sustainable CT based teaching strategies. Increased workload is also mentioned by (Neyland, 2011) who did a quantitative and qualitative research in Sydney on factors influencing the integration of online learning. The study reported an ‘alarming’ increased workload of teachers.

Abuhmaid (2011) found overloading as an impediment to effective use of computers. He did a study of Jordanian education system on the conduct and effectiveness of CT training courses using a sample population of 115 teachers and 12 school principals. In an interview, one principal mentioned that teachers were too overloaded to cope with the pressure from CT training. Still on overloading of teachers, Fullan, (2005) advanced an argument that teachers can only implement new initiatives, if their workload is lessened. The current study
used the survey method to investigate if the college timetable factored the use of MCLs and also if the tutors’ workload influenced their perceptions and use of MCLs.

2.5.5 Benefits of using CT in teaching and learning

Review of the benefits of using CT in teaching and learning is intended to show that it is worthy integrating it. Some of the key benefits of using CT in teaching and learning include;

- improved educational outcomes
- enhancement of critical and creative thinking
- promotion of active learner participation which enhances understanding
- increase in learner motivation
- making work easier
- preparing the students for the knowledge-based society and economy

Below is a detailed discussion of these benefits.

Some studies on the use of CT in teaching and learning show that it improves learning outcomes. Hennessy et al (2010) found that application of CT in teaching and learning demonstrated indication of affirmative effects with regard to enhanced ability in reading, writing and number work numeracy and scientific skills among the learners.

In concurrence is Odera (2011) in a study on utilization of computers in secondary schools in Nyanza Province who reported improved learning outcomes
as a result of heightened interest linked to learning with computers. Hollow and ICWE (2009) studied 147 e learning practitioners from 34 African countries and reported that introducing CT improved student attainment, and consequently increased value of education amongst the community. Grossman (2008) however, is critical and wonders if a method which is used only occasionally as in the case of computers has any impact on pupils’ achievement.

It is expected that introduction of computer laboratories will enhance educational attainment in Kenya. The National ICT Policy points out that effort towards improving computer laboratories and empowering teachers with computer pedagogical skills are measures that can enhance remarkably educational outcomes at the PTTCs (Republic of Kenya, 2006).

Concerning the benefit of increased critical and creative thinking, (Jung, 2005) states that in Singapore, the foundation course called ‘Instructional Technology’ offered to teacher trainees encourages creativity through engagement in CT tasks including organization and management of learning experiences using appropriate computer resources. Zamfir (2008) proposes that the role of the teacher should be to ensure that learners are guided towards productive, reflective and creative learning using the CT tools with the aim of enhancing educational achievements. Literature reveals that use of CT in teaching and learning increases motivation which promotes student attainment. Zamfir (2008) in his study on the impact of computer applications noted that computer based learning (CBL) increases the
students’ motivation and interest for learning. Zamfir found that when students are motivated, they develop the skill of thinking critically and are able to solve different case studies for the 21st century society where computers have become an integral part of daily life.

Similarly, a research on teacher trainees’ reflection on use of CT, reported that during an assessment of a Mathematics lesson “the children were very keen and seemed to enjoy” (Sime et al 2005:37). The researchers concluded that lessons in which CT was incorporated successfully in well thought out actions were observed as interesting and appealing to learners and therefore having higher possibilities of understanding and retaining knowledge. It is therefore important that tutors prepare the student teachers to enhance their lessons by employing CT to make them lively and motivating.

According to Hennessy (2010), computers are a tool that makes work easier for the teacher but the latter has to be crafty and adequately equipped to harness that. Sime et al (2005) gives an example of one classroom observed during their research where the computer was used quite a lot by one boy who had extreme difficult in writing things off the board. The boy typed and printed his work making it possible for him to keep up with the rest of the class. Similarly, Tella et al (2007) examined how secondary school teachers used CT and propositions for further progress of CT use in schools using a sample of 700 teachers and most teachers affirmed that CT is very useful and as makes instruction simpler.
The benefits of CT go beyond the apparent higher academic attainment to the economy of the wider society. In the foreword of the Trainer of Trainers Manual (Republic of Kenya, 2006), the then acting education permanent secretary recongnized that CT is a tool that is firmly embedded in modern society. Teachers are duty bound to embrace the technology which she claims can play a crucial role in transforming the country’s development. The same view is captured by Zamfir (2008) who says that it is apparent from research that using computer applications prepares students for the knowledge-based society and economy.

Many studies have therefore revealed positive effects of computer applications but Zamfir (2008) goes further to say that there is need for more advanced research aimed at improving and generalizing the effects of computer applications in education and eliminating the negative practices. He says that this could lead to better learning and teaching processes. The researcher hoped to expose some negative perceptions and computer practices which would need to be mitigated against in order to hopefully realize even higher student attainment.

2.6 Barriers of integration of CT in teaching and learning

An exposition of barriers that might hinder effective application of CT in the teaching and learning process is considered to be necessary in informing mitigation towards better teaching practice. Zamfir (2008) found that when computer applications do not work properly, or not work at all in some cases, they
might lead to the wrong results. Zamfir reports that both students and teacher could feel frustrated because they all had certain expectations at the beginning of the lesson. Below are some reviewed barriers to effective application of CT in the teaching and learning process.

Literature shows that the computer could distract students from the real learning content when they see it as a playing tool. Zamfir (2008) from his study reported that the Romanian students who were under investigation were focused on learning how to play with the computer applications instead of how to interpret the results of these applications. It is therefore necessary that teachers teach the students how to fully benefit from using computers because computer technological interventions do not by themselves change the process of learning – they are only tools the teacher has to manipulate to facilitate teaching and learning (Kozma, McGhee, Quellmalz, and Zalles, 2004).

Studies show that computers are mechanical devices that can break down and interfere with the flow of a lesson. Becta (2004) survey, reports that mechanical breakdown of computer equipment can lower levels of CT use by teachers. Cuban et al. (2001) explain that if technical hitches occur frequently, user confidence in the value of the technology is eroded translating into apathy among teachers with regard to up take of CT. Compounding the issue, according to the said study, is inadequate technical support which is likely to make to teachers avoid using CT
fearing occurrence of a fault that cannot be remedied rendering the affected lesson unsuccessful.

Research indicates that in many developing economies including Africa, there are many limitations encountered in attempting to bring CT into the education process. Hennessy et al (2010) identified a range of physical dynamics that influence computer use by teachers, including unreliable electrical power supply, inadequate computer resources (internet access, hardware and software provision). In this study, the researcher sought to find out if despite the installation of the multimedia laboratories, there are other infrastructural issues that might undermine effective integration of CT in the teaching and learning process.

One of the biggest obstacles in the use of computers for teaching as identified by teacher participants in the 1998-1999 survey evaluating the ‘World Links schools program’ was inadequate time (Kozma, et al, 2004). The study pointed out that quite often the curriculum in developing countries was not flexible besides being overloaded, hardly making time for inventive curriculum delivery practices. Similarly, Lankshear and Snyder (2000) claimed that despite computers having high possibilities of enhancing education, teachers are unable to actualize it to the full because time does not allow sufficient preparation and researching of materials required for the lesson. From another perspective, adequate time is necessary for teachers to be better accustomed with computer hardware and
software (Becta, 2004). This study sought to find out how tutors planned their lessons to use the MCLs within the time available.

Research indicates that another challenge facing CT integration in classroom instruction is lack of computer literacy and know how on integration in teaching among teachers. Hennessy et al (2010) explain that the effective incorporation of CT into the teaching and learning hinges on the capability of teacher to organize their learning environments to suit computer pedagogical approaches. With regard to tutors’ preparedness to impart computer skills, Wilhelmsen, Ørnes, Kristiansen, and Breivik (2009) found that four in every ten pre service teachers thought that they were not being adequately trained on how to utilize CT in classroom instruction. Similarly, in a survey of both Oslo University College and Sør-Trøndelag University College, student teachers felt that they did not get enough courses on pedagogical use of computer (Rizza and Enochsson, 2009). Those findings agreed with previous ones, such as Hetland and Solum (2008) who stated that the digital proficiency of the tutor was inadequate and apparently there was need for more courses to enhance training.

An emerging barrier to use of CT could be the negative effect it has on the sight of the user. Wambugu (2013) lamented that with the world gone digital, long hours of using of computers has led to short sightedness. This is, the author says, an eye defect where near objects are seen clearly but far away objects are blurred. The researcher saw the eye defect as of great concern particularly bearing in mind
that the current jubilee Government planned to ensure that laptops were introduced in government schools to enhance learning.

On the other hand literature review also shows that CT counters health side effects of real experiences. Van Joolingen and DeJong, (2008) in a literature review highlighted practical reasons to use graphic presentations. They highlighted safety because there are aspects of real experiments, which cannot be conducted safely in educational settings such as when studying the properties of radioactive material or viruses.

Cultural mindset is a factor that could affect perception towards an innovation as review of literature reveals. (Becta, 2004) reports existence of cultural mind set among teachers whereby they have a tendency to resist change from the teaching methods they are used to and adopt new ones. With reference to the current study, this would refer to resisting change from mere use of chalk and talk method to use of emerging computer approaches. According to the Becta report, the resistance goes beyond individuals to institutions whereby some set ups are not easy to rearrange in order to accommodate emergent infrastructural resources and new approaches. That finding had been found earlier by Cuban et al., (2001.) and later by Zamfir (2008) who concurred, that even though use of CT in classroom instruction had shown remarkable academic outcomes, transforming from one approach to another is a perplexing procedure. The Becta survey (Becta, 2004) further alludes that often, teachers are wary of different ways of doing things with
a tendency to embrace only if there is tangible evidence of its value. An example of this is found in a study where a teacher explained in an interview that she “wished to remain comfortable with her teaching, and although this may have kept her from adopting the best teaching methods, being comfortable was important to her.” (Snoeyink et al 2001, pg. 40),

Similarly, Grossman (2008) in his study that concluded one of the major barriers in the use of CT applications in classroom instruction is opposition, (often sub consciously) by many teachers about invasion by computer based teaching approaches that are yet ambiguous and portend to change considerably traditionally recognized and reputable approaches. In connection to past research the current study investigated possible barriers in the use of multimedia computer laboratories in PTTCs in Kenya.

2.7 Chapter summary

Training of teachers is changing in response to the new roles that teachers have to play in the face of socio-economic, political and technological developments of the 21st century. The introduction of multimedia computer laboratories is an innovation aimed at improving the quality of education delivery techniques in PTTCs in line with the needs of the 21st century. The Government of Kenya has reiterated its commitment to promote CT as a tool for training but has pointed at inadequate assessment of educators’ perceptions and utilization of ICT in learning
institutions as a challenge. It is in this context that this study was done in a bid to find out how tutors perceived and used the MCLs.

Although, tutors may perceive CT positively, they may not know how to use it to achieve maximum results. Studies reveal a gap in transmission of pedagogical skills by teacher trainers. This study sought to find out how the Education, Mathematics and Science tutors go about their task of integrating CT in their lessons. Findings may also be resourceful for effective implementation of the laptop project currently being rolled out in public primary schools by the current Jubilee Government of Kenya.

Despite tutors and teachers being encouraged to take up and use CT in their lessons, research highlights various intervening variables that could hinder implementation. Those variables include: demographic characteristic of the tutor or teacher, access to computers and computer accessories, training in CT use and support in CT use. This study has assessed how those factors are related to perceptions and use of MCLs in PPTTCs.

Many studies have revealed positive effects of computer applications but also suggest need for more advanced research aimed at improving and generalizing the effects of computer applications in education and eliminating the negative practices. This sentiment arises from research findings of barriers that hinder effective implementation. This study set out to identify challenges that could
hinder effective use of the MCLs with the hope of finding ways to mitigate against in order to hopefully realize higher student attainment.
CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter is a description of the methodology of the study and focuses on eight main elements: study design and locale, target population, sampling procedures and samples, research instruments, piloting, data collection procedure and analysis procedures, ethical and logistic considerations.

3.2 Study design

The study, guided by its goal of describing the status of tutors' perceptions and use of MCLs, adopted a descriptive survey design. According to Anderson (1997), descriptive survey designs are appropriate in carrying out research in sciences as they enable description of the characteristics of a given group of people. Good, (1992) in concurrence states that survey designs secure evidence of the existing situation. Since the use MCLs in PTTCs is a recent intervention, descriptive survey design was found to be appropriate for describing how tutors perceive and use them.

In choosing the design, the researcher considered that in contrast to exploratory survey, whose variables are usually not well known, descriptive survey is useful when variables are known. In this study, the design was found relevant because
the variables for investigation are known. Literature review has highlighted variables that are related to perceptions and use of CT in classroom practice and which this study surveyed. These variables include: “expertise, access, attitude, support, and teacher characteristics” Isleem (2003:34). Other factors are: “age, gender, race/ethnicity, teaching experience and highest degree attained” (Less, 2003:27). In addition, surveys are also cost effective and have the advantage of reaching a large number of individuals in a short time (Orodho, 2008).

3.2.1 Variables

According to Anderson (1997), all research in education should be carried out by finding out, categorizing and describing in detail the research variables. The main independent variable of this study is tutors’ perceptions of multimedia computer laboratories. Other independent variables, also referred to as intervening variables were; training in the use of MCLs, access to the MCLs, support in the use of MCLs and tutor characteristics (gender, age, teaching experience and professional qualifications). The main dependent variable is tutors’ use of the MCLs. Other dependent variables are the benefits resulting from the use of the MCLs which include; improved educational outcomes, enhanced critical and creative thinking, enhanced understanding, increased learner motivation, making work easier and preparing the students for the knowledge-based society and economy. The indicators of tutors’ perceptions and use of the MCLs were conducting of lessons in the MCLs and adherence to expected procedures of lesson preparation,

3.3 Location of study

This study focused on public primary teacher training colleges (PPTTCs) selected from the 47 counties of the Republic of Kenya. The counties selected were: Elgeyo-Marakwet, Garissa, Kiambu, Machakos, Migori and Mombasa. The study considered the homogeneity nature of PTTCs on the basis of uniformity of the MCLs, students as well as tutors. The implication is that all the 18 PTTCs had similar characteristics and therefore stood an equal chance of being selected. For even distribution and to give the study a national outlook, selection of locale was done on the basis of geographical regions of Kenya: Coastal plains, Nyika Plateau, Highlands, Rift valley, Lake Region and Northern plains (Kenya Institute of Education, 2008).

3.4 Target population

Chandran (2004) describes population in research as human and or non-human items that are being investigated. The unit of analysis for this study is tutors in public primary teacher training colleges whose perceptions and use of the MCLs were investigated. The target population for this study was therefore 18 public primary teacher training colleges (PPTTCs) which were the beneficiaries of the
MCLs (Republic of Kenya, 2006). This study specifically targeted tutors and deans of curriculum. The population of the deans of curriculum was 18 while that of tutors was 827. The target population of the study was therefore 845.

3.5 Sample and sampling procedures

The field research was carried out in six PPTTCs (33.33%), sampled from the 18 PPTTCs in Kenya then. Purposive sampling procedure was used in the selection, ensuring that the PPTTCs were in different geographical regions: Coastal plains, Nyika Plateau, Highlands, Rift valley, Lake Region and Northern plains (Kenya Institute of Education, 2008). Different geographical regions were focused on to enable the researcher determine tutors’ perceptions and use of MCLs from a national perspective. Coastal and Northern plains had one PPTTC each, so no sampling was needed. Simple random sampling of tossing a dice was used to select one PPTTC from the Highlands, Nyika plateau, Lake and Rift Valley regions which had four PPTTCs each. Simple random sampling helps to avoid bias since all members of the target population have an equal chance of being selected (Orodho, 2008).

Purposive sampling was also used to obtain a sample of 108 (13.30 %) tutors of the target population of tutors of specific subject areas (827). The researcher used the principle of seeking the section of the population that has the largest potential of advancing the understanding of the research objectives as Palys (2008) advises.

In this study, the purpose was to understand tutors’ perceptions and use of the
MCLs. Only two subject areas (Mathematics and Science) had digitized content by the time of the study (Republic of Kenya, 2011). A third subject, Education, was selected because it is the core subject in imparting of knowledge, skills and desirable attitudes on the nature and practice of teaching in PTTCs and so technology is largely used (Thungu et al, 2008). Moreover, purposive sampling ensured equal distribution across the three subject areas as well as representation of both genders. According to Mugenda and Mugenda (1999) who concur with Gay (1992), a sample of 10% of a small target population is representative enough. This sample of 13.30% was, therefore, considered reasonable for the study. All the six deans of curriculum of the sampled colleges participated in the study. They were expected to be well versed with contemporary issues relevant to primary teacher education. In particular, they were the overseers of the implementation of the MCLs in their respective colleges.

The selected tutors were expected to bring on board various perspectives that would enable the researcher make generalizable conclusions. Table 3.1 presents the distribution of the sampled colleges, tutors and subject areas.
Table 3.1 Distribution of selected tutors by subjects and gender

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<tr>
<td>Total</td>
<td>17</td>
<td>19</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>Grand total</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 3.1 shows the distribution of male and female participants of the study drawn from the three selected subject areas: Education, Mathematics and Science in six PPTTCs. There were 55 male tutors and 53 female ones making a sample total of 108.

3.6 Research instruments

This study used two types of data collection instruments namely a questionnaire and an interview schedule. The formulation of items in each of the instruments was guided by the objectives of the study as well as the research questions. A combination of two instruments not only enriched the data collected but also allowed data from one source to be triangulated with another. Olsen (2004) explains that triangulation in social sciences involves mixing approaches to get two or three viewpoints in order to validate claims made. Drenoyianni et al (1998)
used a combination of such instruments to investigate teachers’ perceptions and use of computers in UK. They state, ‘To identify, describe and interpret teachers’ perceptions concerning computer use can only be achieved by questioning them and listening to what they had to say’ pg. 89. Maruti (2010) used similar instruments to investigate e-learning readiness among public PTTCs in Kenya and concluded that the colleges were not ready for e-learning. The choice of questionnaires and interview guides as research instruments for this study was, therefore, informed by the fact that such instruments have been successfully used in related studies before.

3.6.1 Tutors’ questionnaire

This instrument was used to collect data from the tutors. Bird (2009) asserts that questionnaires are fundamental tools for acquiring information on participants’ knowledge and perceptions especially where the respondents are literate. Other researchers have used questionnaires to investigate computer education related issues. Wang’a (2012) used a questionnaire to develop a framework for integrating CT in the teaching and learning process in PTTCs in Kenya. Chanlin (2005) used a questionnaire containing 29 items based on Likert scale to find out factors that teachers felt were important to their approach to technology integration.

The questionnaire in this study was used to solicit data about tutors’ perceptions and use of MCLs. It gathered data on the extent to which tutors’ perceptions and
use of the MCLs were influenced by individual tutor characteristics, training, access to, support received and perceived benefits of CT integration. It was also used to gather data on tutors’ use of the MCLs as well as challenges that were encountered in the use of MCLs. The questionnaire had four sections based on the objectives of the study as well as research questions. The questionnaire consisted of 26 items which included four-point Likert scale, open and close ended type questions. With regard to the nature of items in a questionnaire, Bird (2009) states that a combination of closed and open ended questions provides quantifiable and in-depth results. The first part of the questionnaire was on demographic characteristics including age, gender, professional qualifications and years of experience. The second part was on tutors’ perceptions of the MCLs; the third part had items on factors influencing perceptions and use of MCLs (training, access, support and curriculum documents) and the fourth part was on uses of the MCLs in teaching and learning.

3.6.2 Interview schedule

This tool was used to collect data from deans of curriculum of the sampled colleges. The office of the dean of curriculum coordinates academic matters and in particular had worked closely with the Ministry of Education (MOE) officials in the installation of the MCLs and training of tutors on how to use the MCLs (Republic of Kenya, 2006). According to Robson (2002), interviews are widely used in social science research and the common types include structured, semi-
structured and unstructured interviews. Selection of the type of interview depends on the depth of the response sought. Unstructured interview type was adopted in this study as it allowed the respondents to say whatever they liked on the broad topic thus giving insights on tutors’ perceptions and use of the MCLs. Besides, unstructured interview type enabled the researcher to probe further for clarifications and explanations where necessary as Orodho (2009) advises. The interview schedule was organized in themes around the research objectives and research questions.

3.7 Piloting of instruments

When piloting, the researcher sought to ensure that the research instruments fully addressed the objectives of the study. Bryman (2001) proposes that the pilot study should be conducted before the actual research in order to ensure that all the research instruments give the information needed. Similarly, Orodho (2009) observes that, piloting helps to detect deficiencies in research instruments. Piloting was done in one teacher training college which was not part of the sampled colleges.

Six questionnaires were administered to tutors in each of the three selected subject areas and one interview with each of the deans of curriculum conducted. The findings of the pilot study were used to refine the data collection tools and procedures. Piloting revealed some unnecessary questions that had to be removed. The researcher had left the questionnaires behind for the tutors to fill but on going
back to collect them on the agreed date, the questionnaires had not been filled but were actually filled as she waited. The researcher then decided that during the actual field work, it made more sense, to have the questionnaires filled on the same day they were issued.

3.7.1 Validity of the research instruments

Annabel (1992) refers to validity as the extent to which the contents of an instrument measure what they are supposed to measure. In checking the validity of the research instruments the researcher sought to determine the degree to which the results from the collected data actually represented the phenomenon under investigation (Orodho, 2009). Validity of the instruments of this study was determined through triangulation: use of more than one method of data collection (interview and use of questionnaires) and combining qualitative and quantitative approaches. Further, the researcher discussed with the supervisors and lecturers in CT about the content validity of the instruments. Their recommendations were adopted in order to improve the validity of the instruments. Among the recommendations made was aligning the questionnaire and interview schedule items to the research objectives and research questions. Items that were found to be ambiguous were eliminated and others were restated to ensure that they elicited relevant responses.
3.7.2 Reliability of the research instruments

According to Wiersma (1980), reliability refers to the degree to which a particular measuring procedure gives equivalent results over a number of repeated trials. The test-retest method was used to determine the degree to which the same results received from the questionnaires could be obtained with repeated measure of accuracy in order to determine the reliability of the instrument. First the questionnaires were given to eighteen subjects identical to the ones sampled for the study. The responses were coded and analyzed manually. After a period of two weeks the same questionnaires were administered to the same group and the results analyzed as the previous ones. A comparison of the two sets of results was made using Spearman’s product moment formula. The correlation coefficient was computed to show the magnitude of the relationship between the two results. The calculated Spearman’s correlation coefficient was 0.74. The relationship of the two results was deemed to be sufficiently high and so the instrument was reliable. According to Wiersma (1980), a correlation coefficient of 0.5 or more indicates sufficient reliability of the instrument. Figure 3.2 below shows the calculation of the reliability using Spearman rank order formula.
3.8 Data collection

The research methods used in this study included library research and a field survey. Library research involved review of documents such as educational policy documents, government reports, research findings and relevant publications on education. The field survey was conducted as described below.

Data collection was preceded by obtaining authorization to carry out research from Kenyatta University Graduate School. A research permit was obtained from the Ministry of Education, Science and Technology through the National Commission for Science, Technology and Innovation (NACOSTI). Further
authorization was obtained from the Teachers Service Commission County Directors of the respective counties where the PTTCs are located.

The researcher then undertook a familiarization visit to each of the sampled public primary teacher training colleges. During those visits, relevant authorities were requested to verify the official permits allowing the research to be carried out in their institutions. The purpose of the study and the significance of the data collection exercise were explained to the sampled tutors and the deans of curriculum. Consent of the respondents was sought and obtained. The researcher then made arrangements with the respondents on when it would be appropriate to carry out the data collection exercise. On the agreed dates, the researcher and the research assistant, a fellow student administered the research instruments, each going to three colleges. The respondents filled the questionnaires as the researcher and the assistant waited and assisted those who needed clarification. The researcher then collected the questionnaires ensuring that they were fully filled.

Using the interview schedule, the researcher and her assistant interviewed the deans of curriculum on the same day the questionnaires were administered in a given college. According to Chandran (2004), interviews can be classified in two categories namely, face to face and by phone. For Chandran, face to face interviews have the advantage of allowing comprehensiveness of answering questions. This study exclusively used face to face interview as it allowed probing for adequate and detailed descriptions as needed. Brief notes were made with the
permission of the respondents and where allowed, electronic recording of the interview was done. Training of the research assistant and the data collection exercise was conducted in the months of April to June 2015. In the course of the exercise, the researcher encountered some challenges.

First, the researcher had to deliver the questionnaires in person to the colleges which are located far from where the researcher was based and it was constraining in terms of time and cost. This was compounded by the fact that the researcher had to obtain official permission for several days from her work place which was not readily given.

Secondly, it was not easy to get full attention of the deans of curriculum for the interviews as their offices were busy with students and tutors calling in every now and then. This could affect thought flow and therefore the interviews took much longer than had been anticipated.

3.9 Data analysis

Data collected in this study was both quantititative and qualitative. The responses obtained from the questionnaires as well as the interviews were classified into the following categories:

i) Views concerning tutors’ perceptions of MCLs;

ii) Tutors’ use of the MCLs;

iii) Factors that influence tutors’ perceptions and use of the MCLs;
iv) Views concerning challenges encountered in the use of the MCLs;

v) Views on benefits of using the MCLs;

vi) Recommendations on how to address the challenges; and

vii) Demographic information

The data collected using questionnaires was transferred into coded sheets and then keyed into a computer using the Statistical Package for Social Sciences (SPSS) program. It was then edited to check its accuracy. The interview data comprised of notes made by the researcher and the assistant during the interviews. The notes were responses and observations recorded as the respondents answered specific questions. The researcher then organized the interview notes around themes based on the research objectives and analyzed manually. Excerpts were used to enrich information from the quantitative data.

According to Chandran (2004), there are four main measures for analyzing statistical data: measures of central tendency, measures of dispersion, measures of correlation and measures of association. This study used measures of central tendency (percentages and frequencies) to analyze quantitative data.

On the other hand, according to Vogel (2005), qualitative data analysis entails classifying original material to extract the meaning and implications to reveal patterns that are stitched together to make a coherent narrative. Hayos and Bernes (2012) with Vogel, state that data analysis involves generation of general categories from the data and establishing how they help to explain the phenomena.
under study. In this study, analysis of qualitative data was based on the research objectives. Bhattacherjee (2012) advises that categories are needed to reduce the amount of concepts the researcher must work with in order to build a “big picture” of the issues to give a deeper and wider understanding of the social phenomenon under investigation. Accordingly, the researcher went through the data generated by the research instruments severally and came up with trends around the research questions.

3.10 Logistical and ethical considerations

The following are logistical and ethical factors that were put into consideration before the commencement of the study.

3.1.1 Logistical considerations

The researcher obtained a letter of introduction from the Graduate School, (Kenyatta University) for the National Council of Science, Technology and Innovation (NACOSTI) to issue a research permit. The researcher then sought authority from the respective county education offices to visit and conduct research in the colleges selected in the county. Institutions where research was to be carried out were notified and the purpose of the study clarified.

3.1.2 Ethical considerations

The consent of informants was sought and obtained before data collection commenced. The respondents were treated with dignity and they voluntarily
provided the requested information. The respondents were asked not to write their names or any information that would reveal their identity during the study in order to ensure privacy and confidentiality. Respondents were assured of confidentiality and assured that data was to be used only for the stated purposes. The researcher acknowledged all writings and research work cited in the study. As such, this eliminated plagiarism and upheld the integrity of the research process.
CHAPTER FOUR

FINDINGS, INTERPRETATION AND DISCUSSION

4.1 Introduction

The purpose of this study was to investigate tutors’ perceptions and use of Multimedia Computer Laboratories (MCLs) in public primary teacher training colleges (PTTCs) in Kenya. This chapter presents findings, interpretation and discussion of findings from the data collected during field research in six PTTCs in Kenya. To begin with, this chapter presents the respondents’ profile therefore attempting to give a description of the composition of the sample of the study. Subsequently, the findings of this study are presented and discussed according to themes under the following research objectives:

1. To examine tutors’ perceptions of Multimedia Computer Laboratories in public primary teacher training colleges;

2. To investigate tutors’ use of the Multimedia Computer Laboratories in training of primary school teachers;

3. To assess factors related to tutors’ perceptions and use of the Multimedia Computer Laboratories in training of primary school teachers;

4. To examine tutors’ views about benefits about use of the Multimedia Computer Laboratories in primary teacher training; and
5. To identify challenges tutors encounter when using the Multimedia Computer Laboratories in public primary teacher training colleges.

4.2 Demographic information of the respondents

This section presents the distribution of tutors according to gender, age bracket, years of experience and highest level of professional qualification. The data in this section gives characteristics of the participants of the study. Figure 4.1 shows the distribution of tutors by gender.

Figure 4.1 Distribution of tutors by gender

Figure 4.1 shows that the total number of tutors in all the colleges was 103. Overall, the female respondents were 52 (50.5%) while male respondents were
51 (49.5%). There was a slight difference between the number of male and female tutors who participated in the study. Studies have shown that gender consideration is important in understanding teachers’ perceptions and use of CT. Genc, Sahin and Kahveci (2011) in a survey of demographics in relation to computer perceptions by teachers in Turkey found gender as a key demographic characteristic. Therefore, in the interest of finding out how gender, as a tutor characteristic, influences perceptions and use of MCLs, this study looked at the distribution of male and female participants.

Tutors were also asked to indicate their age by choosing from four age brackets namely, 50s and above, 40s, 30s and 20s. Table 4.1 presents the age brackets of the respondents.

**Table 4.1 Tutors’ age bracket**

<table>
<thead>
<tr>
<th>Colleges</th>
<th>≤50 count</th>
<th>40s count</th>
<th>30s count</th>
<th>20s Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>10</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>9</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
<td><strong>52</strong></td>
<td><strong>8</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

Table 4.1 shows that more than half 52 (50.5) of the respondents were in the 40s age bracket. Those in the 50s and above age bracket were about one third, 43
(41.7%) of the total. Those in the 30s age bracket were only 8 (7.8%) while the age bracket of 20 years and below had none. Therefore majority of the participants in the study were in the upper age bracket of 40 years and above. This would mean that most tutors had used traditional teaching method of chalk and talk for long. Studies show that as age increases, the number of teachers using CT decreases. Genc et al (2011) in a study of Turkey secondary school teachers found that majority of the teachers were in the upper age bracket of 40s and above and on being asked if they used CT for teaching, they answered in the negative. In regard to this trend, this study found it important to find out the distribution of the participants according to age to assist determine perceptions and use of the MCLs.

Tutors were also required to indicate their years of experience in PTTCs. The results are in Table 4.2.

**Table 4.2 Tutors’ years of experience**

<table>
<thead>
<tr>
<th>College</th>
<th>16 and above</th>
<th>11-15</th>
<th>6-10</th>
<th>5 and below</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 (2.9%)</td>
<td>7</td>
<td>5</td>
<td>3 (2.9%)</td>
</tr>
<tr>
<td>B</td>
<td>6 (5.8%)</td>
<td>6</td>
<td>5</td>
<td>1 (0.9%)</td>
</tr>
<tr>
<td>C</td>
<td>7 (6.8%)</td>
<td>5</td>
<td>4</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>D</td>
<td>5 (4.9%)</td>
<td>6</td>
<td>3</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td>E</td>
<td>4 (3.9%)</td>
<td>7</td>
<td>3</td>
<td>3 (2.9%)</td>
</tr>
<tr>
<td>F</td>
<td>5 (4.9%)</td>
<td>8</td>
<td>3</td>
<td>2 (1.9%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30 (29.13%)</strong></td>
<td><strong>39 (37.86%)</strong></td>
<td><strong>23 (22.33%)</strong></td>
<td><strong>11 (10.68%)</strong></td>
</tr>
</tbody>
</table>
The results show that more than half of the tutors 69 (66.99%) had served as tutors for over 11 years. Only 34 (33.01%) had served for 10 years and below. Majority of the tutors in the sample therefore had long experience in teaching. Studies show that the output of a teacher corresponds with the years of experience in the profession, for example (Russell, 2003). In this study, it was found necessary to investigate the years of experience among tutors and find out if they were a determinant factor in their perceptions and use of MCLs in PTTCs.

Finally, tutors were asked to give their highest level of professional qualifications. Figure 4.2 presents tutors’ highest professional qualification.

![Figure 4.2 Tutors' professional qualifications](image)

Figure 4.2 Tutors' professional qualifications
Figure 4.2 shows that majority of the respondents across all the colleges in the study 43 (46%) were Bachelor of Education holders and the minority were holders of Diploma in education and PhD. The study found that all the respondents were professionally trained and therefore expected to be conversant with good teaching practices. The composition of the respondents in this study shows that they had the necessary qualifications to enable them utilize emerging innovative teaching approaches such as the use of MCLs, a claim supported by earlier studies. Plair (2008) studied 400 pre-service teachers and found professional qualification as one of the greatest determinants of successful CT integration because it enabled teachers to recognize how emerging technology tools are important in the learning process. Similarly, Minae (2014) in a survey on access and pedagogical integration of ICT in secondary schools in Kenya reported that teachers who had higher professional qualifications used CT approaches in teaching more than those who had lower.

4.3 Tutors’ perceptions of MCLs.

The first objective of this study was to examine tutors’ perceptions of the MCLs in the colleges. This study has defined perceptions as the individual tutor’s beliefs about the MCLs as an instructional resource. Measurement of beliefs of tutors about MCLs was done by use of Likert scale. Tuckman (1975) says that attitudes and beliefs are typically measured by the use of scales such as Likert scale where the test taker is given a series of attitude statements and responds by choosing one
of the given choices: strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD).

Tutors in this study were given statements to rate their beliefs about MCLs. Tutors who strongly agreed or agreed with the statements were interpreted to have positive perceptions while those who strongly disagreed or disagreed were interpreted to have negative perceptions. First, tutors were asked if they believed that MCLs were useful instructional resources in PTTCs. Table 4.3 shows the results.
Table 4.3 Tutors’ rating of MCLs as useful instructional resources in PTTCs

<table>
<thead>
<tr>
<th>Colleges</th>
<th>SA count</th>
<th>SA %</th>
<th>A count</th>
<th>A %</th>
<th>D count</th>
<th>D %</th>
<th>SD count</th>
<th>SD %</th>
<th>Total count</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7</td>
<td>38.89</td>
<td>5</td>
<td>27.78</td>
<td>5</td>
<td>27.78</td>
<td>1</td>
<td>5.56</td>
<td>18</td>
<td>100.00</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>35.29</td>
<td>8</td>
<td>47.06</td>
<td>3</td>
<td>17.65</td>
<td>0</td>
<td>0.00</td>
<td>17</td>
<td>94.44</td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>29.41</td>
<td>7</td>
<td>41.18</td>
<td>3</td>
<td>17.65</td>
<td>2</td>
<td>11.76</td>
<td>17</td>
<td>94.44</td>
</tr>
<tr>
<td>D</td>
<td>11</td>
<td>68.75</td>
<td>4</td>
<td>25.00</td>
<td>2</td>
<td>11.76</td>
<td>0</td>
<td>0.00</td>
<td>16</td>
<td>88.89</td>
</tr>
<tr>
<td>E</td>
<td>6</td>
<td>35.29</td>
<td>5</td>
<td>29.41</td>
<td>5</td>
<td>29.41</td>
<td>1</td>
<td>5.88</td>
<td>17</td>
<td>94.44</td>
</tr>
<tr>
<td>F</td>
<td>5</td>
<td>27.78</td>
<td>5</td>
<td>27.78</td>
<td>5</td>
<td>27.78</td>
<td>2</td>
<td>11.76</td>
<td>18</td>
<td>100.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>38.83</strong></td>
<td><strong>34</strong></td>
<td><strong>33.01</strong></td>
<td><strong>23</strong></td>
<td><strong>21.36</strong></td>
<td><strong>6</strong></td>
<td><strong>5.83</strong></td>
<td><strong>103</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

The results in Table 4.3 show that majority of the respondents 74 (71.84%) either strongly agreed or agreed that MCLs were useful instructional resources in PTTCs. Only a quarter 29 (27.19%) of the respondents strongly disagreed or disagreed that MCLs were useful instructional resources in PTTCs. The researcher interpreted that response to mean that most tutors had a positive perception of MCLs as a resource for teaching and learning in PTTCs. That interpretation was further confirmed by tutors’ rating of two other statements as shown in Figures 4.3 and 4.4. Figure 4.3 shows the results of tutors’ rating that MCLs should be used only for Computer Studies.
Figure 4.3 Tutors’ rating on MCLs being used only for Computer Studies

Results in Figure 4.3 indicate that a big majority of 95.15% either strongly disagreed or disagreed that MCLs should be used only for Computer Studies. The implication is that most tutors perceived MCLs as useful for all subject areas and not just Computer Studies. The researcher interpreted that response to mean that majority of the tutors had positive perceptions of MCLs. The tutors’ response was in agreement with the requirement of the ICT PTE syllabus which points out that CT should be integrated in the entire curriculum (Kenya Institute of Education, 2004). Moreover, the MCL manual states that one of the main objectives for the installation of the laboratories was to enable all subject tutors to integrate CT in teaching (Republic of Kenya, 2010).
Similarly, tutors as shown in Figure 4.4 perceived MCLs positively as majority (88.35%) either strongly disagreed or disagreed that using MCLs was a waste of time. The rating of the three statements therefore indicates that most tutors perceived MCLs positively.

The researcher further analyzed the response on whether the MCLs were useful instructional resources or not in relation to the demographic characteristics of the tutors. The results for each of the demographic characteristics in relation to perceptions are shown in the tables that follow. The first to be presented is the
characteristic of gender in relation to perceptions and results are shown in Table 4.4.

**Table 4.4 Tutors’ perceptions of the MCLs by gender**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Positive perceptions</th>
<th>Negative perceptions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>count</td>
<td>%</td>
<td>count</td>
</tr>
<tr>
<td>Male</td>
<td>38</td>
<td>36.9</td>
<td>13</td>
</tr>
<tr>
<td>Female</td>
<td>36</td>
<td>35</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>71.9</td>
<td>29</td>
</tr>
</tbody>
</table>

Considering gender, Table 4.4 shows that majority 74 (71.9%) of both the male and female participants had positive perceptions of the MCLs. Results also show that the difference between the number of male and female tutors with either positive or negative perceptions was very small (1%). That finding was in agreement with earlier studies which show that gender gap on perceptions of CT had reduced over the past years (Yukselturk and Bulut 2009). Similarly, Breisser (2006) did an experimental study of Mid-Western US basic schools and reported improved female teachers’ perceptions about technology competency, similar to their male counterparts. The implication is that gender may have been a factor influencing how CT in teaching and learning is perceived in the past but by the time of the current study that influence had gone down. Table 4.5 shows tutors’ perceptions of MCLs by age bracket.
Table 4.5 Tutors’ perceptions of MCLs by age bracket

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>Positive perceptions</th>
<th>Negative perceptions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>count</td>
<td>%</td>
<td>count</td>
</tr>
<tr>
<td>50s</td>
<td>28</td>
<td>27.18</td>
<td>15</td>
</tr>
<tr>
<td>40s</td>
<td>41</td>
<td>39.81</td>
<td>12</td>
</tr>
<tr>
<td>30s</td>
<td>7</td>
<td>6.80</td>
<td>0</td>
</tr>
<tr>
<td>20s</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>73.79</td>
<td>27</td>
</tr>
</tbody>
</table>

On the characteristic of age, Table 4.5 shows that more than three quarters of tutors across all age brackets (76, 73.79%) had positive perceptions of MCLs. The minority, 27 (26.21%) who had negative perceptions fell in the age bracket of the older tutors (50s and 40s). No tutor in the 30s and 20s age bracket had negative perceptions of MCLs. The explanation for that could be twofold: one is that those in the lower age bracket were numerically fewer than the older ones. Secondly, some of the older tutors could be resisting change due to their perceptions of traditional methods which they had used for a long time and saw them as effective.

However, it is also evident from Table 4.5 that majority of the tutors in the upper age brackets of 40s and 50s were more in the positive perceptions, 69 (66.99%) than negative, 27 (26.21%). The implication is that age did not necessarily influence tutors’ perceptions of MCLs. This finding is not in agreement with
some earlier studies that show older teachers being apprehensive about using CT in teaching compared to the younger ones. For example, Grossman (2008) who studied computer integration among pre service teachers in Sub Saharan Africa, reported that some older teachers rejected use of CT as they did not perceive it as effective as the traditional ‘chalk and talk’ method.

On the other hand, a much earlier study reported older teachers using CT more than the younger ones, arguing that the rich experience in teaching makes it possible for older teachers to easily integrate CT into their teaching (Russell, Bebell, O’Dwyer, and O’Connor, 2003). The current study, however, concluded that the age of a tutor was not a determinant factor in his or her perceptions of computer integration particularly use of the MCLs as instructional resources since nearly all the respondents across different age brackets had positive perceptions. Table 4.6 shows tutors’ perceptions by years of experience.
Table 4.6 Tutors’ perceptions of MCLs by years of experience

<table>
<thead>
<tr>
<th>Years of experience</th>
<th>Positive count</th>
<th>Positive %</th>
<th>Negative count</th>
<th>Negative %</th>
<th>Totals count</th>
<th>Totals %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 16</td>
<td>25</td>
<td>24.27</td>
<td>5</td>
<td>4.85</td>
<td>30</td>
<td>29.13</td>
</tr>
<tr>
<td>11 to 16</td>
<td>28</td>
<td>27.18</td>
<td>11</td>
<td>10.68</td>
<td>39</td>
<td>37.86</td>
</tr>
<tr>
<td>5 to 10</td>
<td>17</td>
<td>16.5</td>
<td>6</td>
<td>5.83</td>
<td>23</td>
<td>22.33</td>
</tr>
<tr>
<td>below 5</td>
<td>6</td>
<td>5.83</td>
<td>5</td>
<td>4.85</td>
<td>11</td>
<td>10.68</td>
</tr>
<tr>
<td>Totals</td>
<td>76</td>
<td>73.79</td>
<td>27</td>
<td>26.21</td>
<td>103</td>
<td>100</td>
</tr>
</tbody>
</table>

Results in Table 4.6 show that among the tutors who had taught in the colleges for a longer time (11 years and over), there were more tutors with positive perceptions of MCLs 53 (51.45%) than those who had negative 16 (15.53%) perceptions. The same trend was observed among tutors with fewer years of experience where tutors who had positive perceptions were more than those who had negative.

A review of the literature revealed contrasting findings with regard to the correlation between teaching experience and perceptions of CT. For example, Wong et al., (2008); Giordano, (2007) and Gorder (2008) have reported a significant relationship between teaching experience and teachers’ attitudes. However, Granger et al. (2002) in a study in Canada found no relationship between teachers’ years of experience and beliefs of CT. These contrasting findings imply that teaching experience in relation to teachers’ perceptions of CT is complex. This study demonstrated that the number of years in teaching is not a clear predictor of a tutor’s positive or negative perceptions of pedagogical
approaches such as the use of MCLs. Table 4.7 shows tutors’ perceptions of MCLs by their professional qualifications.

Table 4.7 Tutors’ perceptions of MCLs by their professional qualifications

<table>
<thead>
<tr>
<th>Professional qualification</th>
<th>Positive</th>
<th></th>
<th>Negative</th>
<th></th>
<th>Totals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>count</td>
<td>%</td>
<td>count</td>
<td>%</td>
<td>count</td>
<td>%</td>
</tr>
<tr>
<td>PhD</td>
<td>3</td>
<td>2.91</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2.91</td>
</tr>
<tr>
<td>MED</td>
<td>32</td>
<td>31.07</td>
<td>3</td>
<td>2.91</td>
<td>35</td>
<td>33.98</td>
</tr>
<tr>
<td>PGDE</td>
<td>3</td>
<td>2.91</td>
<td>1</td>
<td>0.97</td>
<td>4</td>
<td>3.88</td>
</tr>
<tr>
<td>BED</td>
<td>30</td>
<td>29.13</td>
<td>18</td>
<td>17.48</td>
<td>48</td>
<td>46.60</td>
</tr>
<tr>
<td>Diploma</td>
<td>8</td>
<td>7.77</td>
<td>5</td>
<td>4.85</td>
<td>13</td>
<td>12.62</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>73.79</td>
<td>27</td>
<td>26.21</td>
<td>103</td>
<td>100</td>
</tr>
</tbody>
</table>

Results in Figure 4.7 show that on the whole, tutors with positive perceptions were more than those who had negative. It is also evident that most of the tutors who had negative perceptions of MCLs had lower professional qualifications notably Bed. and diploma at 23 (22.33%). Tutors with higher professional qualifications tended to be more positive towards MCLs than those with lower. The explanation for that disparity in perceptions could be that the exposure to CT use while undertaking the higher degrees may have demystified the approach. The finding was in agreement with a study of 400 teachers by Plair (2008) which showed that higher professional training assists teachers recognize how new technology tools are significant in student learning.

In general, this study found that most of the tutors had positive perceptions about MCLs, implying that with the right environment in place, majority of the tutors in
PTTCs could use the MCLs as an instructional resource. This implication is in line with the Rogers’ Diffusion of Innovation Theory that people who perceive an innovation positively adopt it while those who are negative reject (Rogers, 2003). The MCL manual supports this view by pointing out that one of the crucial requirements for successful use of the MCLs is supportive teachers’ attitudes towards use of computers for instruction (Republic of Kenya, 2006).

4.4 Tutors’ use of MCLs

The second objective of the study was to investigate tutors’ use of MCLs. Use in this study referred to conducting lessons in the MCL and the various ways tutors used MCLs for instructional purposes. Firstly, tutors were asked if they conducted lessons in the MCLs. They were to indicate yes or no and the results are in Table 4.8.

<table>
<thead>
<tr>
<th>Colleges</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>96</td>
</tr>
</tbody>
</table>

Table 4.8 Tutors’ response on whether they conducted lessons in the MCLs

N=103
Table 4.8 indicates that nearly all tutors 96 (93.2%) did not conduct lessons in the MCLs. Only seven tutors (6.80%) of the sample indicated that they conducted lessons in the MCLs. This is in spite of a large number 76 (73.79%) indicating that MCLS were a useful instructional resource (see Table 4.2). This finding was a deviation from Diffusion of Innovations theory (Rogers, 2003) which states that a positive perception leads to adoption of an innovation. Also, Drent et al (2008) in a survey of teacher educators in the Netherlands found a link between teacher educators’ perceptions about computers and their innovative use of the computers. However the finding is consistent with reports by Korte et al (2007) who in their survey of 27 European countries found low adoption of CT among teachers despite the excitement of its introduction in teaching and learning. In agreement with findings aforesaid is Buabeng (2012) who in a survey of Ghanaian second cycle schools found teachers’ perceptions with regard to use of CT in learning as positive but adoption was low. The contrasting views imply that there are underlying factors inhibiting pedagogical use of the computers in spite of the positive perception by teachers and trainers.

The few tutors 7 (6.80%) who stated that they conducted lessons in the MCLs were then asked to indicate how frequently they utilized the MCLs to carry out various activities related to integration of CT. These activities are internet search for subject matter, drawing schemes of work and lesson plans, presenting lessons using Avidanet software, teaching using digital content and assessment using
edumatic exercises. The tutors were asked to choose the level of frequency from very frequently, not frequently and never used.

One of the uses of the MCLs is internet search for subject matter. The MCL user manual, (Republic of Kenya, 2006) highlights internet search as one of the advantages of using the lab; ‘to identify, locate and collect internet information that is relevant to the curriculum’ pg. 33. Tutors’ rating of using MCLs for internet search for subject matter is shown in Figure 4.5.

![Figure 4.5 Tutors’ rating of using MCLs for internet search](image)

Results in Figure 4.5 show that over half 4 (57.7%) of the tutors who reported using the MCLs to search the internet for subject matter either very frequently or frequently. The implication of these results is that some tutors had recognized the need to incorporate internet subject matter in training of teachers and were
making effort to access it. However, almost half of the respondents (42.9) did not search the internet frequently. This was partly explained by the responses across all colleges in the study on the open ended question on challenges as well as the deans of curriculum in the interviews that internet connectivity in the MCLs was poor. One of the deans, for example said, ‘Wi-Fi is available but very slow hence frustrating because loading takes forever’

Another use of the MCLs is using the technology for lesson preparation. The MCL user manual explains in detail how lab users should scheme and plan for their lessons. A sample scheme of work and lesson plan is given in Appendix 3 of this study. Results of tutors’ rating of using the MCLs for lesson preparation are shown in Figure 4.6.

![Bar chart showing tutors' rating of using MCLs for lesson preparation]

N=7

Tutors' rating of using MCLs for lesson preparation:
- VF: 0%
- F: 0%
- NF: 57.10%
- NU: 42.86%
Figure 4.6 Tutors’ frequency of using MCLs for lesson preparation

Figure 4.6 indicates that no respondent either very frequently or frequently used CT resources in the MCLs to prepare for their lessons. On the other hand, more than half of the respondents 4 (57.1) did not do so frequently while nearly half never did so. Apparently, most tutors did not utilize CT for lesson preparation.

In contrast to the apathy described above, a study done by the Education Department in Ireland (2007) on promoting the quality of learning found that majority of post-secondary teachers made some use of CT in lesson planning and preparation. The same study went on to suggest that all teachers should exploit the benefits to be gained from CT in their lesson planning and preparation; draw, store, retrieve, share and even update schemes of work and lesson plans. The implication is that there is a gap between the developed countries like Ireland and Third world ones such as Kenya in the use of CT in lesson planning and preparation. This study found that many tutors (99.96%) even the few who claimed to use the labs were yet to utilize the benefits of CT to prepare schemes of work and lesson plans for use in the MCLS.

A major use of MCLs is lesson presentation using Avidanet software. Avidanet is software that enables use of different multimedia presentations: text, graphics, sound, animation and video (Republic of Kenya, 2006). Figure 4.7 shows the results.
Figure 4.7 Tutors’ rating of using Avidanet Software in the MCLs

Results of Figure 4.7 show no indication of use of Avidanet software either very frequently or frequently. A small percentage 1(14.3%) indicated they did not frequently use Avidanet software to present lessons while majority 6 (85.71%) of the respondents indicated they never used. It emerged from the interviews with the deans of curriculum that the recommended software for lesson presentation in MCLs (Avidanet) was not used. One dean on being asked about the use of Avidanet in lesson presentation said simply; “The software is not used because it requires tutors to be really familiar with CT and mostly they are not.” The implication of that remark was that use of the MCLs required more training than was provided.
Interestingly, lack of adequate use of CT in lesson presentation is reported even in developed countries. Ireland Education Department (2007), for example reported that only 18% of the post-secondary lessons observed by the inspectors involved a CT-related activity.

One of the key objectives of the installation of MCLs was to make learning more interesting and effective using multimedia presentations facilitated by Avidanet software. However, the study found from the interviews with the deans of curriculum that the MCLs were not used as intended according to the MCL 2010 manual. The devices that go together with the Avidanet software including headphones for every student using the laboratory, analogue to digital converter which allows the broadcasting and the digitization of audio and video learning materials, DVD player, satellite television, and infra-red devices for the audio and video sources, were no longer in place and were not being used. The implication is that the teaching and learning process did not benefit from the availability of the MCLs in the PTTCs.

Another use of the MCLs is use of digital content. Digital content in this study refers to any information from the World Wide Web (WWW) or digitized learning materials developed by KICD. The MCL 2010 user manual indicates that the tutor must consider the availability of the digital content when preparing for a lesson in the MCL. Figure 4.8 shows the results of tutors’ use of digital content in the lessons conducted in the MCLs.
Figure 4.8 Tutors’ rating of use of digital content

Figure 4.8 shows that use of digital content was among the least applied among the CT uses provided in the questionnaire. Only one respondent (14.3%) indicated using digital content for instruction and not frequently. The rest of the respondents 6 (85.71%) never used digital content at all. In connection to use of digital content, one dean of curriculum said:

….we still so much use the text books we have been using over the years. Even the CDs from KICD are barely used. Digital content is a new concept which in my opinion I think would make instruction easier and interesting but we require more awareness about it.

This finding shows a willingness among tutors to adopt pedagogical changes but capacity to do so is inadequate. That finding agreed with Maruti (2010) in a study on e-learning in PTTCs in Kenya who reported that students rarely communicated with tutors over academic issues or even exchange with their
colleagues academic materials via the internet. Maruti added that no tutor posted academic content on websites for access by students. This finding is consistent with the observation by Farrant (1993) in his book, 'Principles and practice of education', that teacher colleges are often content to provide each student with just general education and sufficient practical training to enable them to teach the syllabuses used in the schools. The current study found that by the time this study was carried out, there had been very little departure from past practices as far as exposing student teachers to wide reading is concerned.

Another use of the MCLs is assessing acquisition of content by administering edumatic exercises to the students. Edumatic program is an authoring tool for developing exercises and tests that cater for different levels of the cognitive domain. It involves the tutor browsing through the exercise trees available in the online edumatic authoring tool and selecting a relevant one to develop a test for the topic done. (Republic of Kenya, 2010).
Results in Figure 4.9 indicate that only a small percentage 1(14.3%) used edumatic exercises but not frequently while the rest 6 (85.71%) never used edumatic exercises. Apparently, only the one who used digital content in teaching also used edumatic exercises. This study revealed that those exercises just as the rest of the digitized content were not given to students. The interviews revealed that assessment of students’ learning was programed for specific times of the term. It was also revealed that projects and term papers involving research from the internet or any other form of assignment using CT in the MCLs were not given to the students. That finding differed from other studies which reveal use of CT tools that support the assessment and evaluation process: assessment tools such as “multiple-choice and short answer tests, essays and other written tasks,
oral discussions, teacher observations, class participation, and student projects, portfolios, and performances” (McTighe & Wiggins, 2005 pg. 48).

However, the Department of Education and Science (2007) reported lack of assessment using CT in Irish post primary schools and recommended that teachers could for example, use CT to measure, track and examine learners’ advancement by the use of suitable software. This study found that most of the tutors in PTTCs failed to use the assessment tool (edumatic exercises) implying that tutors were missing out on an opportunity that was likely to improve the quality of teacher training.

4.5 Factors related to tutors’ perceptions and use of MCLs

The third objective of this study was to assess factors related to tutors’ perceptions and use of the MCLs in teacher training. Reviewed literature revealed factors that influence perceptions and use of CT in education: training in CT, access to computers and support of tutors in computer use (Hennessy et al, 2010 and Drenoyyiani et al, 1998). This study investigated those factors in relation to tutors’ perceptions and use of MCLs in PTTCs in Kenya. Following is a report of how each of the factors influenced the use of the MCLs.

4.5.1 Training in the use of the MCLs

First, tutors were asked to indicate if they had undergone in-service training on use of Multimedia Computer Laboratories. Figure 4.10 shows the results.
The results in Figure 4.10 show that nearly three quarters of tutors (71.84%) in the study had undergone in-service training on the use of MCLs. The rest, about a quarter of the respondents had not undergone any in-service training on the use of MCLs. Results therefore show that a significant number of tutors had undergone in service training on the use of MCLs. In connection to the training, tutors were asked to indicate the duration of the courses they underwent. Table 4.9 shows the duration of those courses.
Table 4.9 Duration of computer training courses on use of MCLs

N=103

<table>
<thead>
<tr>
<th></th>
<th>Two weeks and over</th>
<th>1 week</th>
<th>1 day or less</th>
<th>Untrained</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count.</td>
<td>%</td>
<td>count</td>
<td>%</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
<td>0.00</td>
<td>6</td>
<td>33.33</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>0.00</td>
<td>6</td>
<td>35.29</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0.00</td>
<td>6</td>
<td>35.29</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0.00</td>
<td>4</td>
<td>25.00</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>0.00</td>
<td>5</td>
<td>29.41</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0.00</td>
<td>6</td>
<td>33.33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0</td>
<td>0.00</td>
<td>33</td>
<td>32.04</td>
</tr>
</tbody>
</table>

Results in Table 4.9 indicate that majority 41 (39.81%) of the tutors were trained for one day or less. From the interviews, it emerged that the training that took place in one day or less was facilitated by Heads of Departments (HODs) who had previously been trained by MOE officials. MOE had trained only the HODs and heads of subjects. The deans of curriculum in the interviews explained that the training sessions facilitated by the HODs were not well programmed. Some HODs chose to take a day for the training while others only took an afternoon and still others had not done it even by the time this data was being collected. In regard to the training by HODs, one dean said,

….there was an induction… about Avidanet by some HODs for members of their departments. It was done according to arrangements made in the departmental meetings. Some departments took a day for the training while others took only an afternoon. Other departments are yet to induct their members.
According to the deans of curriculum and the responses to the open ended question on challenges, the MOE officials did not make a follow up of the training on the use of the MCLS. Consequently, the training offered was inadequate as asserted by one of the deans ‘tutors never got to internalize the concepts.’ In fact, results indicate that some respondents 5(27.78%) did not get any training. That assertion of inadequacy was confirmed by responses to a related question where tutors were asked if the training they received on the use of MCLs was helpful in integrating CT in their teaching subjects. Table 4.10 shows the results.

**Table 4.10  Rating helpfulness of the training acquired in teaching**

<table>
<thead>
<tr>
<th>Colleges</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
<th>UT</th>
<th>Count.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>27.78</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>41.18</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>6</td>
<td>35.29</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>11.76</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>27.78</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>9</td>
<td>28</td>
<td>33</td>
<td>29</td>
<td>28.16</td>
<td></td>
</tr>
</tbody>
</table>

Results show that more than half of the respondents 61(59.22%) indicated that they either disagreed or strongly disagreed that the training they received was helpful. The implication is that the training offered to tutors did not help them to use the MCLs for teaching. That finding was further confirmed by one tutor who
stated in the open ended question on challenges encountered, “The main obstacle to integration of CT is me because I am computer illiterate!”

The inadequacy of the training was also expressed by one dean of curriculum on being asked if he knew how to use Avidanet software (the main software of MCL),

No, no, I have not heard of any such software. The ICT tutor might know. ICT is taught by trained ICT tutors. They use a syllabus developed by KIE. (handing over a course outline). Here is an outline of the topics they handle.

Apparently, the dean of curriculum was ill equipped to use the MCL let alone guiding other tutors in using it for teaching and learning. He seemed to distance himself from matters of ICT which for him should be the concern for the ICT tutor. That finding demonstrated a gap in computer training as tutors were not adequately enabled to use the MCLs to integrate CT in their specific subject areas. This finding agrees with a report by Hennessy et al (2010) that training opportunities in Sub-Saharan Africa are limited and inconsistent. On the other hand Olakulehin, (2007) found Ghanaian teachers who were appropriately and consistently trained using computer technology effectively.

This study found that a one off in-service training was provided for the HODs and heads of subjects when the MCLs were introduced. The expectation was that those who were trained would conduct in-college training for the rest of the
members of various departments. Very little in-college training was done because it seems to have been left for individual departmental heads to organize. There has been no MOE oversight to ensure effective training of those tutors who were in colleges when the MCLs were launched and even for those coming into the colleges since. This study concluded that the training received on use of the MCLs was inadequate and inconsistent and could not facilitate their effective use. That conclusion finds support in Farrant (1993) where he explains that acquisition of knowledge and skills is not a onetime activity but is realized through practice.

### 4.5.2 Access to the MCLs

In this study, access referred to availability and adequacy of MCL facilities and resources for use by subject tutors and their classes. A cross-national survey on policies and practices in education revealed that access to CT infrastructure and resources in schools and colleges is a necessary condition to its integration in education (Plomp et al, 2009). In concurrence with that finding is a study by Yildrim (2007) which found access to technological resources to be one of the effective ways to teachers’ pedagogical use of CT in teaching in Turkey. Table 4.11 shows tutors’ access to MCLs.
Table 4.11  Tutors’ access to the MCLs

<table>
<thead>
<tr>
<th>Colleges</th>
<th>Yes</th>
<th>No</th>
<th>Don’t use the MCL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>count</td>
<td>%</td>
<td>count</td>
</tr>
<tr>
<td>A</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
</tbody>
</table>

With regard to access, results indicate that all the respondents who conducted lessons in the MCLs 7 (6.80%) did not use the MCLs with their classes whenever they needed to. It emerged from the interviews with the deans of curriculum that the MCLs were largely used by ICT tutors. The deans went on to explain that other subject tutors had to make special arrangements to use the MCLs. Considering that in each college there are thirteen curriculum subjects (KIE, 2004) entitled to use the one or two MCLs, the researcher found them to be inadequate for effective use. In confirmation, one dean of curriculum when asked what he thought about the adequacy of the labs said:

They are not enough. As a matter of fact 2 labs for so many students and so many subjects make tutors just use the classrooms to avoid collisions. In fact one of the labs is not functional and is only a store of dead computers.
The implication is that the MCLs were inaccessible and so majority of the respondents 96 (93.20%) did not use them altogether.

In a related question, tutors were also asked if the college timetable enabled them to access the MCLs and they all responded in the negative. In addition, the interviews with the deans revealed that the timetable only allocated time for ICT subject which was carried out in the MCLs. This implied that other subject tutors would have to use the facility outside the official working hours. Alternatively, they would make arrangement with the ICT tutor to take a given ICT lesson in the classroom so that the MCLs would be free.

That finding concurred with research findings of a study in Ireland on promoting the quality of learning (Department of Education and Science, 2007). The said study reported that effective use of CT was hampered by packed timetables which restricted access to the computer room.

On the whole, studies of access to CT in the developing countries show inadequate access as overriding in inhibiting its adequate application in education and training (Kessy et al, 2006 and Ford, 2007). Maruti (2010) assessed the availability of CT infrastructure in PTTCS in Kenya and reported that colleges lacked adequate infrastructure and in particular computer labs. Five years later, by 2015 when this research was conducted, the status had not changed.
4.5.3 Support in the use of MCLs

Support in this study referred to technical, moral and professional assistance given to tutors in accepting to use and actual use of MCLs in the teaching and learning process. The support may be given by a computer laboratory technician, a colleague with expertise, institution administrators and educational policies and documents. The study investigated each of the factors and the results are described in the paragraphs that follow.

Firstly, tutors were asked to indicate whether their colleges had computer technicians who could be consulted about computer related questions and problems. The study found that all colleges had a computer technician who could be consulted about computer related questions and problems encountered in the course of using the MCLs. In the interviews with the deans of curriculum it emerged that computer technicians were available in all the colleges and that basically their work was to maintain the laboratory equipment. However, it was also reported that a lot of computer equipment was in a state of disrepair and therefore not used. This could imply that the technicians lacked commitment in their mandate or lacked up to date technical knowhow or the equipment had become obsolete and could not be salvaged.

The apparent lack of support by the technicians was echoed by one dean of curriculum who on being asked if the computer laboratory technician was helpful said that he had heard tutors complaining that the technician was ‘slippery’ when
they sought for his help. The implication is that help was not readily available when need arose. However, another dean said that the technician was very helpful and was even in the process of interlinking college departments. He added that the technician assisted those tutors who sought his help in computer application issues. The implication of those responses is that computer laboratory technicians had technical knowhow but required capacity building on how to relate with tutors of different subject areas on the use of the MCLs.

In a related question, tutors were asked if there was a colleague with enough expertise and was willing to solve computer related questions and problems encountered while using the MCLs. Figure 4.1 shows tutors’ response on whether they received support from a colleague with expertise or not.

Figure 4.11 Responses on availability of a colleague with expertise
Results show that more than two third of the tutors (71%) across the colleges in the study claimed there was a colleague with computer expertise who was ready to help. The deans of curriculum in the interviews confirmed that ICT tutors collaborated with other subject tutors who used the MCLs. Literature review indicates that tutors may have received basic CT skills but still required support in advanced skills as well as technical support for the upkeep of the computer equipment. Researchers have reported need for technical support in application of CT. In Ireland, a census on ICT infrastructure showed technical support as a major element requiring priority (NCTE, 2009). In the same light, Tella et al (2007) point at lack of technical support in the schools as one of the prominent factors hindering readiness and confidence in using CT among Nigerian secondary school teachers. The current study concluded that collaboration between specific subject tutors and computer experts was evident but needed to be strengthened for effective use of the MCLs.

In a related question, tutors were asked if college principals supported them by giving them moral and material support with regard to using the MCLs. Figure 4.12 shows the responses.
The results of figure 4.12 show that nearly two thirds (71.8%) of the respondents affirmed that the college principals gave moral and material support with regard to using the MCLs. The interviews with the deans of curriculum however, revealed that the support that college principals gave was largely insufficient. One dean said that the support by college principals was mere rhetoric during staff meetings because in reality the instruments of integration were inadequate and besides tutors were not supported to acquire technical knowhow. “Computers and their accessories are not enough because of what the administration always calls ‘financial constraints’. Another dean of curriculum asserted that the administration is supportive because every department in the college had an official laptop. He however added that the laptops were for administrative work but the administration urges them to use them for teaching as well. This does not usually happen due to logistical reasons according to some tutors in their

Figure 4.12 College Principals’ support for CT integration

[Pie chart showing 71.8% Yes and 28.2% No]
highlights of obstacles encountered. One tutor lamented; “How can nine tutors use one laptop and anyway it is always under lock and key by the head of department!”

Reviewed studies show that some teachers who would be willing to integrate CT are discouraged by lack of commitment from the administration. Ang’ondi (2013) in a survey of ICT champions in a school in Poland reported how school administration would frustrate the teachers by keeping the computer room under lock and key and sometimes even accuse teachers of vandalism.

The current study therefore revealed a gap in the college principals’ role as the chief executives by showing their inability to translate their verbal utterances into action. For example, as revealed by the interviews, though the principals urged tutors to use CT in teaching and learning, they did not organize for college based in service training. It was also found that there was no administrative intervention to guide on how collaboration between ICT and other subjects should be.

The study further sought to find out if the PTE syllabus guided use of MCL or not. Table 4.12 shows tutors’ response on the question whether the current PTE syllabus (2004) guided use of MCLs or not.
Table 4.12 Tutors’ response on PTE Syllabus as a guide in use of MCL

<table>
<thead>
<tr>
<th>Colleges</th>
<th>Yes</th>
<th>No</th>
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<td>count</td>
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<tr>
<td>A</td>
<td>0</td>
<td>0.00</td>
<td>18</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>5.88</td>
<td>16</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0.00</td>
<td>17</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>6.25</td>
<td>15</td>
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<td>0.00</td>
<td>17</td>
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<tr>
<td>F</td>
<td>1</td>
<td>5.56</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>2.91</td>
<td>100</td>
</tr>
</tbody>
</table>

Results of Table 4.12 indicate that nearly all tutors in the study 100 (97.09%) indicated that PTE Syllabus, did not guide them in the use of MCL. An analysis of the ICT syllabus showed that it did not make provision for mainstreaming CT in all subjects even though it points out that it should be integrated in the entire curriculum. (Kenya Institute of Education, 2004). This implies that the process of integration of CT in teacher training is not quite clear and it is upon the tutor to devise ways of implementing it.

In the area of policy, tutors were asked if education policy guided them in the use of MCLs. Table 4.13 shows the results of tutors’ response on education policy guiding use of MCLs.
The results show that all the tutors 7(6.80%) who used the MCLs indicated that education policy did not guide them on how to use MCLs to integrate CT in specific subject areas. This is in agreement with other studies which indicate that ideally education policies should guide teaching realities but have failed. According to (Law et al, 2008) almost all countries in the study had a policy regarding the use of CT in the educational system but only a few countries had reached a stage where policy was really transferred into the educational system.

The study shows that tutors are not guided by a clear cut policy on how to integrate CT in their specific teaching subjects. Education officials are on record impressing upon teachers to embrace CT. The then acting education secretary, for example, while addressing education officials during selection of 2013 teacher trainees said that teachers must upgrade their skills to develop the crop of students required to actualize Kenya’s economic projection as envisioned in vision 2030.
(Koech, 2013:7). Indeed the current Jubilee government came to power on the platform of digitizing learning and it is out to make good its promise (Jubilee Manifesto, 2013). This study has shown that that was mere rhetoric with little consequences on the ground.

The study concluded that tutors were not properly guided by the PTE syllabus in using the MCLs for integration of CT. This vital curriculum document was therefore not effective in moving curriculum implementation in the policy direction.

4.6 Benefits of using MCLs.

The fourth objective of the study was to find out the tutors’ views about the benefits of using the MCLs in teacher training. The question was an open ended one that was directed to the tutors who used the MCLs and required them to indicate the benefits of using the MCLs. Since this was an open ended question, tutors gave multiple responses. The researcher then grouped the responses into four groups: accessing online information, increasing student motivation, making work easier and enhancing learning. Following is a presentation, interpretation and discussion of each of the groups. Figure 4.13 shows the responses on access to online information.
Figure 4.13 Tutors’ responses on MCLs enabling access to online tools

Figure 4.13 indicates that in the group of access to online tools, access to online books/journal was mentioned by all the tutors who used the MCLs 7(100%). Other benefits that were mentioned in that category were ability to do research and access to online dictionary. The response about online information was also mentioned by the deans of curriculum in the interviews. One of the deans on being asked about the benefits of MCLs said;

‘Since there is Wi-Fi in the lab, both tutors and students are able to access more and current information which enriches the content of their subjects.’

That response was in agreement with findings of other studies. UNESCO (2013) in a study of Edith Cowan University (Australia) reported that most pre-service teachers identified CT as an information tool that provided diverse source of
easily accessible information for students to explore issues of interest to them. The implication of access to online information is that the MCLs have the capacity to improve the quality of the content in various subject areas since there is a wide and rich source of information available from the World Wide Web. Students do not need to rely solely on information in textbooks and from the teacher since the internet is providing alternative sources of information.

Another group of benefits that was mentioned was increasing students’ motivation and interest in learning. The specific responses included: captivating presentations, interaction among students and interesting lessons. Figure 4.14 shows the results.

![Figure 4.14 MCLs increasing student motivation and interest](image-url)
Figure 4.14 indicates that in the group of responses on increasing student motivation and interest, majority of the tutors 5(85.7%) indicated that lessons done in the MCLs were interesting. Other responses in the group included MCLs enabling captivating presentations and enhancing interaction among students. In the interviews, one of the deans of curriculum said, “Students acquire basic skills in computer use and learning is interesting with high levels of understanding and retention.”

The finding that computers increase students’ motivation has been reported in other studies. Zamfir (2008) in his study on the impact of computer applications in Romania reported that computer based learning (CBL) increased the students’ motivation and interest for learning. Similarly, Sime et al (2005), while assessing a mathematics lesson observed that the children were very keen and seemed to enjoy. The importance of increased student motivation and interest is enhancing students’ attentiveness and engagement therefore improving effectiveness in learning.

Another group of benefits of using the MCLs that tutors highlighted was making work easier. The specific responses were: drawing accurate diagrams, promoting high retention, enabling retrieving and storing data, promoting sharing of information and making changes easily. Figure 4.15 shows the percentage frequency of the responses.
Figure 4.15 Tutors’ responses on the MCLs making work easier

Figure 4.15 indicates that in the group of responses about MCLs making work easier, there was a variety of responses. Among the responses, the most frequently mentioned 5 (71.4%) was retrieving data followed by sharing of information 4 (57.1%). Other benefits in this category that were less frequently mentioned were storing data, drawing accurate diagrams, and making changes easily. With regard to benefits, one dean of curriculum during the interview said, “…processes like generation of electricity can be seen without having to make costly, tiring and sometimes dangerous trips. When students see the graphics and discuss among themselves as they watch, concepts become clear.”
Literature reveals advantages of using graphic presentations over the traditional methods that deal with real life situations. Van Joolingen and DeJong, (2008) in a literature review highlighted practical reasons to use graphic presentations: safety cost and time. Other researchers have found that computers are a tool that makes work easier for the teacher (Hennessy et al 2010, Tella et al 2007 and Sime et al 2005). The implication of the MCLs making work easier is that using the MCLS facilitates efficient use of time and material resource which in turn improves effectiveness in syllabus coverage.

The final group of benefits was about CT enhancing learning. The specific responses were promoting better understanding and high retention of what is learnt. Figure 4.16 shows the results.

Figure 4.16 Tutors' responses on how use of MCLs’ enhances learning
Figure 4.16 indicates that one of the benefits of using the MCLS is enhancing learning. The most frequently mentioned response in that category 5(71.4%) was high retention of material that is learnt while a few 2(28.6%) mentioned that MCLs promoted better understanding. The benefit of MCLs enhancing learning is in agreement with other studies. Hennessy et al (2010) found that application of CT in teaching and learning demonstrated evidence of positive outcomes in terms of improved literacy, numeracy and science learning by students. Similarly, Hollow et al (2009) in a survey of 147 e learning practitioners from 34 countries in Africa reported that introducing CT improved student attainment, and increased value of education amongst the community. Further, having been trained using CT it is assumed that the graduating student teachers would use it in their own classes. This could assist the current Jubilee Government that is implementing Digital Learning Program (DLP) in primary schools across the country. During the 5th international conference on TVET at the Rift Valley Technical Training Institute, the then Cabinet Secretary, Dr. Fred Matiang’i said,

The rolling out of DLP will bring about a change from the traditional classroom chalk and talk approaches to the state of the art Smart classroom. This initiative will change the shape, function and structure of education …. (Kaluoch, May 2016).
4.7 Challenges in the use of the MCLs

The fifth and final objective of the study was to identify challenges in the use of the MCLs in PTTCs and to suggest recommendations for improvement. The question was an open ended one that was directed to the tutors who used the MCLs and so multiple responses were given. The responses according to the percentage frequencies are shown in Figure 4.17.

Figure 4.17 Tutors’ responses on challenges in the use of MCLs

Figure 4.17 shows tutors’ responses on challenges encountered in the use of MCLs. The following is a list of those challenges.
a) Inadequate computer skills among tutors

b) Poor internet

c) MCLs are inaccessible

d) Negative attitude by tutors

e) Limited time

f) Inadequate moral and technical support

g) Lack of power back up

h) Lack of quality educational materials

Following is a presentation, discussion and interpretation of challenges encountered by tutors while using the MCLs.

**Inadequate computers/ accessories**

Figure 4.17 shows that all the seven tutors who used the MCLs identified inadequate computers and accessories such as software and projectors among others as a challenge in the use of MCLs. This was also mentioned by the deans of curriculum in the interviews. One of them said, “Computer facilities are not enough. Half of the computers are grounded…Desktops are only 40 and the students are close to 1000.”

Literature review shows that across Africa and most developing countries, inadequate facilities are a challenge in the use of CT in the education process. A synthesis of literature review of factors influencing classroom use of CT in Sub-
Saharan Africa identified limited technology infrastructure as a leading cause (Hennessy et al, 2010). Maruti (2010) in a survey of e-learning readiness in PTTCs in Kenya reported poor and inadequate ICT infrastructure in colleges as one of the factors that hindered E-learning in colleges. Maruti reported a student – computer ratio of 13 students per computer. The challenge has persisted as reported by Mwaniki (2013) in an exploratory study of responsiveness of Primary Teacher Education in Kenya to challenges of the 21\textsuperscript{ST} century. By the time of this study, infrastructural inadequacy was a major challenge despite CT being identified as an investment area by NESSP 2013-2018 (Republic of Kenya, 2013) and the Jubilee Government Manifesto (2013).

**Limited time**

Limited time was identified by nearly all of the respondents 6 (85.71\%) as a challenge to effective use of MCLs. On being asked by the researcher if tutors in specific subject areas used the MCLs, one dean of curriculum asked,

Where is the time to go to the lab? The labs are few and almost exclusively used for ICT subject lessons. Time is a big challenge…an hour after school hours when the technician opens the lab is hardly enough for all the other subjects!?

Research studies agree that lack of adequate time hinders effective implementation of CT. Kozma, et al, and (2004) point out that too often the curriculum in developing countries is rigid and overloaded, leaving little time for
innovative classroom practices. Similar reports have been done by researchers in various parts of the world (Bingimlas 2009, Maruti 2010 and Mwaniki 2013). The implication of inadequate time is that the objective of addressing quality of education through new innovative practices becomes elusive as educators require time and effort to implement them.

**Inadequate computer skills among tutors**

Inadequacy of computer skills among tutors was mentioned by all the tutors who used the MCLs. The challenge was also mentioned by the deans of studies in the interviews. One of them had this to say;

> Training of tutors is a big setback to implementation of CT in the college. I can only remember one afternoon training hardly enough to internalize and there has been no practice because access to the lab is another issue coupled by time.

This challenge was found by Khan (2012) who reported that lack of knowledge regarding the use of ICT and lack of skill on ICT tools and software had limited the use of ICT tools in the teaching learning situation in Bangladesh. The current study found that inadequate CT skills undermined effective application of modern CT in the MCLS.

**Poor internet connection**

All the seven respondents who used MCLs cited poor internet connection as a challenge to implementation of CT in PTTCs. Wi-Fi was reported by the deans of
curriculum as being too expensive and so in one college it had even been disconnected. One dean on internet connectivity said;

> Wi-Fi is available but very slow and so searching information online is very frustrating. In fact students use their mobile phones to search for information. Besides, due to financial constraints, the computer lab technician has been advised by the administration to control internet and this of course limits usage.

This finding is confirmed by literature review which shows that poor internet connection is a challenge in many Sub-Saharan African countries (Hennessy et al, 2010) and Bangladesh (Khan, 2012). Maruti (2010) reported 53% of the tutor population mentioned lack of connectivity to the internet as one of the hindrances to E-learning in PTTCs in Kenya. Even bigger economies than Kenya like Saudi (Al-Alwani 2005) and European schools (Korte et al 2007) have an issue with internet connectivity. The preamble of the MCL training manual (2010), highlights the fact that countries world over are working very hard to escape the eminent ‘Global Digital Divide’ (GDD). If PTTCs in Kenya do not access the World Wide Web (WWW), then the society will be unable to escape the GDD which implies that it will be on the receiving end in various areas of global competitiveness.

**Inaccessible labs**

All the seven tutors who used MCLs cited lack of accessibility to the MCLs as a challenge. The interviews with the deans of curriculum were consistent with that
finding. One of the deans, on the issue of accessibility to the MCLs said, ‘One poorly equipped lab for 1000 students is like a drop in the sea. In any case computer labs are only used for ICT….it is booked throughout the week.’ Studies of access to CT in even the developing countries show inadequate access as overriding in inhibiting its adequate application in education and training (Kessy et al, 2006; Becta 2004 & Ford 2007).

Hennessy et al (2010) concluded in their study that if technology could not be accessed by the teacher, as in so many educational settings in Sub Saharan Africa, then it would not be used. Agreeing with this view is (Maruti, 2010) who reported that computers in PTTCs in Kenya were not enough to meet the tutor and student population and most were of low speed. Sadly, five years later, the situation had not changed.

**Lack of power back-up**

Half of the seven tutors who used the MCLs cited lack of power back up as a problem in the use of labs. That finding was consistent with literature particularly studies from the developing world. Khan (2012) reported that most of the rural areas in Bangladesh do not have electricity and therefore one cannot even run a computer in the first place. Khan added that most of the cities of Bangladesh do not get electricity more than eight hours in a day due to inadequate electricity supply. Hennesssey at al (2010) argues that some countries in Sub Saharan Africa are developing digital content for use across the curriculum but electricity supply
remains rather sporadic and therefore a hindrance. The interviews with the deans of curriculum revealed that it was frustrating to tutors when power went off in the middle of the lesson and there was no back up and so data would be lost, besides the lesson not proceeding. The implication of unreliable power supply is that tutors lack confidence of conducting lessons in the MCLs.

**Inadequate administrative support**

Three quarters of the tutors who used the MCLs 6 (85.61%) felt that inadequate administrative support was a hindrance to effective use of the MCLs. Concerning the issue, one dean of curriculum had the following to say,

> I think tutors are positive about using computers in teaching and learning because I see some using their personal laptops to do staff related to their work here in college. It means that if administration provided the necessary computer hardware and software to be used in classrooms besides the lab, tutors can easily use CT for instruction.

Although more and more teachers and student teachers are becoming personal users of computers, and the availability of technology is increasing, this knowledge does not simply transfer to teaching practices (PlayerKoro, 2007). PlayerKoro suggests that school administration should give direction and support to the teachers for effective use of CT. Similarly, although the MCLs have been put in place and tutors are becoming more and more computer compliant, there is the feeling among tutors that college leadership is not doing enough. This finding was revealed by the deans of curriculum during the interviews. One of them said;
The support that tutors get is mere verbal encouragement because the facilities and the resource materials are inadequate. The excuse given is that there are financial constraints. Some tutors use their personal computers for college work but the lab technician is slippery when the tutors seek his technical help…but he maintains the lab equipment.

There is evidence in reviewed literature that administrative support is a key to successful use of CT in teaching and learning. Hennessy et al (2010) point out that the negative attitude among school leaders towards computers is a challenge to application of CT to teaching and learning. Similar findings were made by Yuen et al (2003) and Anderson et al, (2005). Ang’ondi (2013) reported how school administrators would keep the computer room under lock and key and sometimes even accuse teachers of vandalism! The implication is that tutors become apprehensive about using the computers and so the college administration needs to create an enabling environment for tutors to use MCLs for instruction. The administration should for example guide the ICT department on how to collaborate with other subjects.

Negative attitude by tutors

Nearly all the respondents who used the MCLs saw negative attitude among tutors as a challenge to effective use of the MCLs. One dean of curriculum in the interview pointed out that barrier in the excerpt below:

The danger area is that generally our education system is too much examination oriented. A lot of emphasis is on syllabus coverage and not the learning process itself. Therefore some tutors see going to the lab as a waste of time...
This finding of tutors with negative attitude has been reported under the first objective of this study earlier (Table 4.2) where 27 (26.21%) of the sampled tutors had negative perceptions of MCLs. Some research studies have attributed negative attitude among tutors to cultural mindset especially among the older ones. Becta, (2004) survey reports that teachers are often suspicious of new ideas and they only tend to adopt after seeing proof that it can help them do what they are currently doing better. Similarly, Grossman (2008) reported resistance, (often unconscious) of many educators to the intrusion of the still obscure technological newcomers that threaten to alter drastically long established and time honoured practices and customs. The implication is that tutor preparedness should go beyond acquisition of CT skills to a change of mind set.

**Inaccessible quality educational materials**

A few tutors mentioned lack of access to quality educational material and the interviews revealed the same. One dean of curriculum upon being asked about challenges encountered in use of CT said,

> Computers have opened avenues to lots and lots of information but most of the credible information is not for free…it has to be subscribed and the PTTCs have not come to that level. The digitized content from KICD is not available in all subjects and for those that have been digitized, the facilities and hardware is too inadequate to allow effective use.

Literature review shows that adequate and good quality resources in developing countries are elusive. Effective implementation of technology into education
systems involves substantial funding, that is very hard to manage in developing countries (Hennessy et al 2010). Khan (2012) in a study of ICT barriers in Bangladesh, found acquisition of computer resources in a country where many people are living below the international poverty line a big challenge. In the same light, Afshari, Bakar and Su-Luan (2009) state that efficient and effective use of technology depends among other things, access to online educational resources by teachers and students. This study found that more and updated content from the internet that would boost the quality of learning matter was not accessible. The researcher found such boost to have been long overdue as Bunyi, Wangia, Magoma, Limboro and Akyeampong (2011) observe:

Although the history of primary education and teacher education is imbued with discourse on teacher quality, the rhetoric on improving the quality of teachers has not been matched with action with the result that primary teacher education programs have remained virtually unchanged since attainment of independence in 1963.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The general purpose of this study was to investigate tutors’ perceptions and use of Multimedia Computer Laboratories (MCLs) in Primary Teacher Training Colleges in Kenya (PTTCs). The objectives of the study were:

1. To examine tutors’ perceptions of Multimedia Computer Laboratories in public primary teacher training colleges;

2. To investigate tutors’ use of the Multimedia Computer Laboratories in training of primary school teachers;

3. To assess factors related to tutors’ perceptions and use of the Multimedia Computer Laboratories in training of primary school teachers;

4. To examine tutors’ views about benefits about use of the Multimedia Computer Laboratories in primary teacher training; and

5. To identify challenges tutors encounter when using the Multimedia Computer Laboratories in public primary teacher training colleges.

The research was done through library research and a field survey. Library research involved review of documents such as educational policy documents, government reports, research findings and relevant publications on education. The
field survey was done through collection of data from a sample of 103 tutors through the use of questionnaires and interviews with the deans of curriculum of the sampled colleges. The study employed a descriptive survey design. Data was analyzed through statistical procedures (measures of central tendency and measures of association) to analyze quantitative data and thematically for qualitative data. The previous chapter has reported, analyzed and discussed the research findings according to the objectives of the study. The present chapter presents the summary, conclusions and recommendations of this study based on the findings discussed in chapter four.

5.2 Summary

The main findings of this study are summarized below on the basis of themes developed from the five objectives of the study.

5.2.1 Tutors’ perceptions of MCLs

The first objective of this study was to examine tutors’ perceptions of the MCLs in the colleges. This study has defined perceptions as ‘the individual tutor’s beliefs about the MCLs as an instructional resource.’ Tutors were given some Likert scale attitude statements with strongly agreed, agree, disagree and strongly disagree as the choices. Those who either strongly agreed or agreed were interpreted to have positive perceptions of the MCLs while those who either strongly disagreed or disagreed were interpreted to have negative perceptions.
The study found majority of the tutors to perceive the MCLs as a useful instructional resource for all subjects in the school curriculum. For them using the MCLs is not wastage of time. A further analysis of tutors’ perceptions based on the demographic characteristics revealed that gender, age and years of experience did not influence their perceptions.

However, an analysis of the characteristic of professional qualifications showed that although all tutors were professionally trained, higher qualifications corresponded with positive perceptions more than lower qualifications. More tutors with higher professional qualifications (PhD, PGDE and M.Ed.) were found to have positive perceptions of the MCLs than those with negative perceptions. On the other hand, more tutors with lower qualifications (B.Ed. and diploma) were found to have negative perceptions of the MCLs than those with positive perceptions.

5.2.2 Tutors’ use of MCLs

The second objective of the study was to investigate tutors’ use of MCLs. ‘Use’ in this study referred to conducting of lessons in the MCL and the various ways tutors used MCLs for instructional purposes. The study revealed that very few tutors conducted lessons in the MCLs and which was rarely done even by those few. This was in spite of a very large number indicating that MCLs were a useful instructional resource for tutors in all subject areas.
The study showed that the few tutors who reported using the MCLs used them minimally to carry out functions stipulated in the MCL installation manual (2006) and which the researcher listed as: internet search for content, lesson preparation, presentation using Avidanet software, using digital materials and using edumatic exercises.

The main use was found to be search for internet content. However, it also emerged that it was not optimally used as internet connectivity and access to the MCLs were impediments as revealed by interviews with the deans of curriculum and answers to the open ended question on challenges encountered in the use of MCLs.

Utilization of the CT resources (Avidanet software, digital content and edumatic exercises) in the MCLs for lesson preparation and presentation was found to be infrequent.

5.2.3 Factors related to tutors’ perceptions and use of MCLs.

The third objective of this study was to assess factors related to tutors’ perceptions and use of the MCLs in teacher training. A review of literature revealed factors related to perceptions and use of MCLs which included; training in CT, access to computers and support of tutors in computer use. The researcher studied those factors in relation to perceptions and use of MCLs in PTTCs. Below is a summary of findings for each of the factors.
Training in use of MCLs

Results show that three quarters of the respondents had undergone training in the use of the MCLs while a quarter had not had any training. It also emerged that MOE officials only trained the HODs who in turn were expected to train their members. The training done by MOE which was done in one week was inadequate as majority said that it did not help them to use the MCLs effectively. No follow up by MOE officials was done and so reportedly, internalization of essential knowledge and skills for utilization of MCLs was not realized. The training by the HODs was not well coordinated and even some HODs never trained their members as revealed by the interviews with the deans of curriculum and answers to the open ended question on challenges facing the use of MCLs.

Access to MCLs

In this study, access referred to availability and adequacy of MCL facilities and resources for use by subject tutors and their classes. The study found that most colleges had one or two and some three MCLs but not all of them were in use because some were just stores for broken down computers. Nevertheless, the number of MCLs was found to be inadequate because majority of the tutors did not access the MCL with their classes whenever they needed to. Moreover, the deans of curriculum in the interviews stated that the MCLs were booked throughout for ICT subject and other subject tutors barely had access. In addition, more than three quarters of the tutors in the study did not have access to the
necesary equipment and software for integration of CT in their subjects. It emerged from the interviews that the equipment and Avidanet software that had been installed for use of MCLs were not in place and therefore was not being used. As a result, the objective for which the MCLs were installed, of improving learning by making it more interactive through the use of different media was not being achieved.

**Support in integration of CT**

The study investigated technical, moral and material support given to tutors in integration of CT by computer technicians, computer literate colleagues, the college principal, PTE syllabus, education policy and the college timetable.

Firstly, the results showed that nearly all colleges had a computer technician to maintain the MCL equipment and who could be consulted about computer related questions and problems. However, it was also reported that a lot of computer equipment was in a state of disrepair and therefore not used. Beside, one dean in the interview stated that the computer technician in their college was ‘slippery’ when tutors tried to get technical help from him. Apparently, the MCL technicians were not adequately supporting effective use of the MCLs.

Concerning availability of a helpful colleague with expertise in CT, the study found that although the ICT tutors had the necessary expertise to support other tutors in using the MCLs, there was no clear policy on how collaboration between
ICT and other subjects should be. The PTE syllabus (KIE, 2004) suggests that there should be collaboration but does not guide on how to do it.

The study further found that the college principals gave moral and material support for use of MCLs as affirmed by nearly two thirds of the respondents. However a significantly large group said that college principals did not give such support. Interviews revealed that support from college principals was mere rhetoric during staff meetings because in reality the instruments of integration were inadequate and tutors were not supported to acquire technical knowhow.

The study found that there was no clear cut education policy on how to integrate CT in specific teaching subjects. The interviews with the deans of curriculum revealed that calls by political leaders, principals and education officials for teachers to use CT in teaching were mere rhetoric with little consequences on the ground. Minae (2014) found that although the government of Kenya has invested heavily on the development of ICT national and strategic integration policies, this has not properly and proportionately been cascaded to institutions of learning.

The problem was compounded by the college timetable which was found not make provision for use of MCL by other subjects besides ICT. Responses in the interviews and open ended questions showed that other subject tutors used the laboratory outside the official working hours or made special arrangement with the ICT tutor.
5.2.4 Benefits of using the MCLs.

The fourth objective of the study was to find out the tutors’ views about the benefits of using the MCLs in teacher training. Following is a summary of the benefits:

a) Access to online literature was one of the benefits frequently mentioned. According to tutors in this study, MCLs were beneficial as they had internet connectivity which enabled them to access more and current information for enriching the content of their subjects.

b) Increasing students’ motivation and interest for learning was another benefit that majority of the tutors who conducted lessons in the MCLs tutors identified. Tutors in this study found CT beneficial in enhancing understanding and retention because learners are motivated by the graphic presentations.

c) The benefit of making work easier was expressed in a number of ways. Among the responses, the most frequently mentioned was retrieving data followed by sharing of information. Other benefits in this category that were less frequently mentioned were storing data, drawing accurate diagrams and making changes easily. In concurrence, one dean of curriculum said, “….processes like generation of electricity can be seen without having to make costly, tiring and sometimes dangerous trips.
When students see the graphics and discuss among themselves as they watch, concepts become clear.”

d) Another benefit that tutors mentioned was that MCLs enhanced learning. Among the specific responses in this category, the most frequently mentioned did high retention and promotion of better understand.

5.2.5 Challenges in the use of the MCLs

The fifth and final objective of the study was to identify challenges in the use of the MCLs in PTTCs. The following is a summary of the challenges that the tutors who used the MCLs said they faced;

a) Inadequate computers/ accessories. Half of the respondents identified inadequate computers and accessories such as software, digitized learning materials and projectors among others as a hindrance to the use of the MCLs.

b) Limited time. The issue of limited time was identified by nearly half of the respondents as a challenge to effective use of the MCLs. Some tutors claimed to focus on completing the wide syllabi on time and so making trips to the MCL was seen as a waste of time.

c) Inadequate skills among tutors. A high percentage of respondents indicated that inadequacy of skills essential for the use of MCLs by tutors was a hindrance to effective use of the laboratories in PTTCS.
d) Poor internet connection. A quarter of the respondents cited poor internet connection as a challenge to implementation of CT in PTTCs. Wi-Fi was reported by the deans of curriculum as being too expensive and so in one college it was even disconnected.

e) Lack of accessibility to the MCLs. Almost a quarter of the respondents in the study cited lack of accessibility to the MCLs as a challenge. They claimed that the laboratories were occupied throughout by Computer Studies.

f) Lack of power back-up. A small percentage of the respondents cited lack of power back up as a problem. Tutors and students were demoralized when lessons were interrupted where besides losing their work due to power failure, lessons could not proceed.

g) Poor student entry behavior. Results indicate that a few of the respondents said that poor student entry behavior in terms of inadequate computer knowledge and skills hindered effective use of CT.

h) Inadequate support. Results indicate that inadequate moral and technical support by various stakeholders and curriculum support documents was an impediment to effective use of the MCLs.

i) Negative attitude among tutors and students. Results show that negative attitude among students and some tutors mainly due to ignorance of the importance of the MCLs, led to lack of a desire to utilize them.
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j) Inaccessible quality educational materials. A few tutors mentioned lack of access to quality educational materials.

5.3 Conclusions

The study concluded that tutors’ perceptions towards MCLs were largely positive. However, majority of the tutors did not use the labs despite having positive perception. The study therefore revealed that there was inconsistency between teachers’ beliefs and their actual use of MCLs. The researcher found the inconsistency between teachers’ perceptions and actual use of MCLs to be due to underlying factors such as inadequate and inconsistent training on use of MCLs, lack of access to the lab and its accessories, insufficient administrative and technical support and lack of appropriate action to support educational policies.

From the responses on factors related to tutors’ perceptions and use of MCLs, the researcher concluded that most of the factors that other researchers studied ten years ago were still prevailing and so had not been adequately addressed. Results further showed that whereas the demographic characteristics of the tutor based on gender, age and teaching experience were not seen to significantly influence tutors’ perceptions and use of MCLs, professional qualifications and other factors such as access and support were found to have significant influence.

Further, the study concluded that though the MCLs were minimally used by specific subject tutors, computers and other accessories in the MCLs were
perceived to be beneficial in teaching and learning in various ways. The implication is that if the MCLs were used appropriately, the quality of instruction in PTTCs would be improved.

Finally, the study found integration of CT to be marred with a multiplicity of challenges. Findings from literature review revealed that the challenges facing use of CT for teaching and learning in PTTCs were not new. The challenges were well documented in critical documents such as Kenya Vision 2030 and Sessional Paper no.14. The researcher concluded that stakeholders needed to be more proactive in addressing those challenges.

5.4.1 Policy Recommendations

The study made the following policy recommendations;

i. Since this study has shown that tutors have positive perception of MCLs, it recommends that the Ministry of Education, Science and Technology (MOEST) should focus on creating an enabling environment. One such way is decentralizing computers and their accessories from the MCLs. This study recommends every classroom to have at least one computer with internet access and an LCD projector.

ii. The MoEST in conjunction with KICD should adequately train subject tutors on how to use the MCLs and generally how to integrate CT in their subjects. Besides, Computer Studies’ tutor should be guided on how to
assist other tutors to integrate CT in their specific subject areas. Mechanisms of inducting new tutors should be put in place.

iii. Teachers Service Commission should recognize higher professional qualifications in promotions and remuneration so as to encourage tutors with lower professional qualifications to pursue higher professional credentials. The study shows that the process of acquiring higher professional qualifications increases the tutor’s exposure and confidence in the use of CT which in turn influences perceptions of CT innovations such as MCLs.

iv. The study found one of the benefits of using MCLs as ability to use online literature but has not been effectively done. The study thus recommends that PTTCs be more proactive in improving the quality of subject matter by tapping from the global arena. Students can benefit more if they were given topics to research on or projects to do and share with the others via blogs or even social media. Colleges should have web pages where tutors can post and share important academic information. Colleges should also subscribe good quality online scholarly books and journal articles instead of just relying on course books that they have used over the years as reported.
v. The study recommends that all the stakeholders involved in PTE in Kenya should closely monitor and evaluate progress made towards addressing challenges affecting effective use of MCLs in the colleges including: ensuring power backup, providing high speed internet and improving access and computer skills among other constraints.

vi. Finally, this study found inadequate moral and technical support by various stakeholders and curriculum support documents as a challenge to effective use of the MCLs. It thus recommends that MoEST together with KICD should support and encourage learning institutions to develop suitable policies that are relevant to their institutions. Such policies should provide suitable guidelines for action. The PTE syllabus for example, should be reviewed in a way that incorporates CT in all subject areas.

5.4.2 Recommendations for further research

Following are recommendations for further research that this study makes.

i. One of the key objectives of CT innovations in classroom practice particularly the use of MCL was to improve the teaching and learning processes aiming at uplifting the quality of education. A study of the extent to which use of CT has contributed to better quality of education recommended.
ii. The initiative by the current Jubilee government to implement the digital learning program is aimed at changing the shape, function and structure of primary school education. A study of pre service teacher preparation including use of MCLs on integration of CT in all subject areas would be significant to policy makers.

iii. The study recommends a survey of tutors’ perceptions and use of MCLs in other subject areas in PTTCs that have not been included in this study.

iv. One of the findings of this study is that professional qualifications influence the use of MCLs. The researcher therefore recommends a comparative study of professional progression of tutors against teachers’ perceptions and use of CT.
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APPENDIX 1: TUTORS’ QUESTIONNAIRE ON THEIR PERCEPTIONS AND USE OF MULTIMEDIA COMPUTER LABORATORIES

Dear respondent,
Thanks for accepting to fill this questionnaire. I am a PhD student investigating tutors’ perception and use of multimedia computer laboratories. This is in partial fulfillment of the requirements of the degree program. Read each question carefully before filling in your response. Answer all questions honestly and freely by writing down your answers in the space provided or ticking in the brackets provided. Note that there are no correct or wrong answers. The information you give will be used strictly for research purposes.

Part One: Demographic information (Responses in this part will help me to interpret the results).
Please tick where appropriate.

1. What is your gender? Male [ ] Female [ ]
2. What is your age bracket?
   a. 50 years and above [ ]
   b. 40s [ ]
   c. 30s [ ]
   d. 20s [ ]
3. How many years have you taught in primary teacher training college?
   __________________________
4. What is your highest professional qualification? (tick where appropriate)
   a. PhD [ ]
   b. M.Ed. [ ]
   c. PGDE [ ]
   d. B.Ed. [ ]
   e. Diploma [ ]
Part Two: Tutors’ perceptions towards Multimedia Computer Laboratories

Please use the following key to answer the questions that follow;

- SA  Strongly agree
- A  Agree
- D  Disagree
- SD  Strongly disagree

(Please rate your responses by placing a tick against your choice.)

5. In general, I think Multimedia Computer Laboratories are useful instructional resources in PTTCs?
   SA [ ]  A [ ]  D [ ]  SD [ ]

6. I think Multimedia Computer Laboratories should only be used by tutors of computer studies.
   SA [ ]  A [ ]  D [ ]  SD [ ]

7. I think using Multimedia Computer Laboratories for instruction is a waste of time.
   SA [ ]  A [ ]  D [ ]  SD [ ]

Part Three: Factors influencing perception and use of the multimedia computer laboratories

The factors are numbered i) to iv).

i) Training of tutors

(Training is the preparation of tutors to use the Multimedia Computer Laboratories). Please tick where appropriate.

8. Have you participated in in-service course on use of Multimedia Computer Laboratories?
   Yes [ ]  No [ ]
9. What was the duration of those courses?
   i. Two weeks and over [ ]
   ii. One week [ ]
   iii. One day and less [ ]
   iv. Untrained [ ]

10. Have those courses been helpful to you in? Please rate the helpfulness of those courses.
    SA [ ] A [ ] D [ ] SD [ ]

ii) **Access to computers.**
    (Access is defined as the availability of computers and software in the Multimedia Computer Laboratories and being able to use them).

11. How many Multimedia Computer Laboratories are in your college? ______________________

12. Do you conduct lessons of your subject in the Multimedia Computer Laboratories in your college?
    Yes [ ] No [ ]
    (Please tick where appropriate in the questions below if your answer above is yes).

13. Are all the students in your class able to access the computers in the Multimedia Computer Laboratories at any given lesson time?
    a. Yes [ ]
    b. No [ ]

14. I have access to the Multimedia Computer Laboratory for use with my classes whenever I need to.
    a. Yes [ ]
    b. No [ ]

15. I have both the necessary equipment and software available in the Multimedia Computer Laboratories for integration of CT in my teaching subject.
    a. Yes [ ]
    b. No [ ]
16. I have personal access to the Multimedia Computer Laboratories for preparation of lessons.
   a. Yes [ ] b. No [ ]

iv) Support in the use of computers.

(Support in this study refers to technical, moral and professional assistance given to tutors in accepting to use and actual use of MCLs in the teaching and learning process. The support may be given by a computer lab technician, colleague with expertise, institution administrators and educational policies and documents.).

Please tick where appropriate.

17. The college has a computer technician I can call with computer related questions and problems.
   a. Yes [ ] b. No [ ]

18. There is a colleague with enough computer expertise and is willing to answer my computer-related questions?
   a) Yes[ ] b) No[ ]

19. My principal is supportive of the use of Multimedia Computer Laboratories.
   a) Yes[ ] b) No [ ]

20. The syllabus guides me on how to integrate CT in my lessons.
   a) Yes [ ] b) No [ ]

21. I use the Multimedia Computer Laboratories only because it is a policy requirement.
   a) Yes [ ] b) No [ ]

22. My teaching load does not allow me to prepare to use the Multimedia Computer Laboratories for my lessons.
23. The college timetable specifies when the Multimedia Computer Laboratories can be used and by what subject.
   a) Yes [ ]    b) No [ ]

Part Four: Use of Multimedia Computer Laboratories

(Use in this study refers to conducting lessons in the Multimedia Computer Laboratories (MCL) and the various ways tutors use MCLs for instructional purposes.).

Please use the following key to answer questions number 24:

- VF Very frequently
- F Frequently
- NF Not frequently
- N Never

24. How frequently do you apply the following CT uses in the teaching process? (tick where appropriate)

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<th>VF</th>
<th>F</th>
<th>NF</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet search</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lesson preparation</td>
<td></td>
<td></td>
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<tr>
<td>Using Avidanet</td>
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<tr>
<td>Using Digital content</td>
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<tr>
<td>Using Edumatic exercises</td>
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</table>

25. Please use the space provided below to state five ways in which the Multimedia Computer Laboratories has helped you to improve your lessons.

i. ________________________________
Please use the space provided below to state five barriers you encounter in using the Multimedia Computer Laboratories.

26. Please use the space provided below to state five barriers you encounter in using the Multimedia Computer Laboratories.

    i. __________________________________________

    ii. __________________________________________

    iii. __________________________________________

    iv. __________________________________________

    v. __________________________________________

Thank you for your time and cooperation. The responses to this survey will be analysed and the overall results made available to the colleges in the study.
APPENDIX 2: INTERVIEW SCHEDULE FOR DEANS OF CURRICULUM

The schedule is based on the following research questions:

1. What are tutors’ perceptions towards the Multimedia Computer Laboratories in Primary Teacher Training Colleges? (RQ1)
2. In what ways do tutors use the Multimedia Computer Laboratories to integrate CT in teacher training? (RQ3)
3. What factors influence tutors’ perceptions and use of the Multimedia Computer Laboratories in the training process? (RQ2)
4. What are the benefits of using Multimedia Computer Laboratories in primary teacher training curriculum? (RQ4)
5. What challenges are there in the use of the Multimedia Computer Laboratories? (RQ5)

Part one: Introduction

This sub-section will provide bio data of the respondents:

1. What is your position at the college?
2. How long have you been a tutor?
3. What are your subject combinations?
4. Have you been trained on the use of multimedia laboratories?

   a. **RQ1: Perceptions towards the Multimedia Computer Laboratories**

1. In your view, are Multimedia Computer Laboratories useful or not?
2. Do you use the Multimedia Computer Laboratories to conduct lessons?
3. Do you think Multimedia Computer Laboratories should only be used by ICT tutors?
b. RQ3: Use of Multimedia Computer Laboratories

1. Do you conduct lessons in the Multimedia Computer Laboratories?  
The questions that follow are to be answered by those who answer in the affirmative  
2. Do you prepare lessons in the format provided for in the installation manual?  
3. Do you use the Avidanet software in your lesson presentations?  
4. Do you use digitized content?  
5. Do you give edumatic exercises?  
6. What are the others ways in which you use Multimedia Computer Laboratories for your lessons?

c. RQ2: Factors related to perceptions towards Multimedia Computer Laboratories

1. What factors enable you or prevent you from using the Multimedia Computer Laboratories?  
2. Does the training you received help to effectively use the Multimedia Computer Laboratories?  
3. What technical, moral and professional support do you receive as you use the Multimedia Computer Laboratories for your lessons?

d. RQ4: Benefits of using Multimedia Computer Laboratories

1. Do you think using the Multimedia Computer Laboratories is beneficial in teaching and learning?  
2. Please identify some of the benefits.  
   a.  
   b.
e. **RQ5: Challenges in using the Multimedia Computer Laboratories**

1. Do you encounter problems as you use the multimedia labs for your lessons?

2. Please identify some of the problems.
   a. 
   b. 
   c. 
   d. 
APPENDIX 3: SAMPLE OF A SCIENCE LESSON PLAN USING THE MULTIMEDIA COMPUTER LABORATORIES

Topic: Excretion
Subtopic: structure and functions of mammalian kidney
Duration: 40 minutes
Class: Second Year
Date: 20/01/2014
Time: 10.40-11.20

Objectives: By the end of the lesson, the learner should be able to;
1. Describe the external structure of the mammalian kidney
2. Slice through the kidney longitudinally on the screen the internal structure of the mammalian kidney.
3. Relate the structure of the kidney to its functions
4. Draw a well labeled diagram of the longitudinal section of the kidney

References:
1. PTE science pg. 88-89
2. Comprehensive Biology Book 2 pg. 90-91

Teaching aids
1. Digital pictures of the internal and external structure of the mammalian kidney
2. Animations on the functions of the mammalian kidney

<table>
<thead>
<tr>
<th>Stage/time</th>
<th>Teaching/learning activities</th>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction/3 minutes</td>
<td>•Review of the previous lesson on functions of the skin by use of questions and answers. •Tutor writes the key point on the whiteboard and students note down</td>
<td>•Exertion of waste products •regulates body temperature •protecting other organs •Reception •syntheses of vitamin D •prevents loss of water</td>
</tr>
</tbody>
</table>
| Lesson Development (Step 1) | • Tutor sends the picture of the kidney to all the students’ screens.  
• Tutor divides students into groups of 4  
• Students observe and manipulate the picture in their groups.  
• Students describe the external structure of the kidney on the screens.  
• Tutor guides the learners to discover the adaptation features of the kidney.  
• Tutors guide a discussion on the functions of the fat layer and the thick muscle.  
• Students make notes | • Like the skin, the kidney is an excretory organ that removes waste from the body.  
• Bean shaped with a depression at the Centre called hilum.  
• Located on the lower abdominal cavity.  
• Mammals have two kidneys with the left slightly above the right.  
• Covered by a layer of fat that works as a shock absorber.  
• Has a thin membrane that prevents friction.  
• Muscles provide energy for its function. |
| --- | --- | --- |
| **Step 2**  
15 minutes | • Tutor and the students slice through the kidney vertically to expose the internal structures.  
• Students observe it in their groups and identify the different regions  
• Consolidation of the learning points.  
Students make notes. | • It has three distinct regions  
• Cortex the light coloured region towards the outside  
• Medulla the dark coloured region towards the inside  
• Pelvis the light coloured the innermost region |
| **Step 3** | • Tutor sends an animation of  
• Removes waste materials |
| 6 minutes | kidney functions to all the students’ screens.  
•students observe in their groups and led by tutor discuss the functions,  
•students take down notes | •regulates pH of fluids  
•ionic regulation water balance in the body |
|-----------------|-------------------------------------------------|
| Summary and conclusion 6 minutes | •consolidation of the main points through question and answer.  
•evaluating understanding through an edumatic exercise.  
•students do an assignment and submit. | •external structure of the kidney  
•internal structure of the kidney  
•functions of the kidney  
•draw a well labeled diagram of the longitudinal section of the mammalian kidney |
APPENDIX 4: RESEARCH PERMIT

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

NACOST/P/15/2777/5727

Mary Wambui Nderitu
Kenyatta University
P.O. Box 43844-00100
NAIROBI

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Integration of Computer Technology: Tutors perceptions and use of Multimedia Computer Laboratories in Public Primary Teacher Training Colleges In Kenya” I am pleased to inform you that you have been authorized to undertake research in all Counties for a period ending 31st December, 2015.

You are advised to report to the County Commissioners and the County Directors of Education, all Counties before embarking on the research project.

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

DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:
The County Commissioners
All Counties.
The County Directors of Education
All Counties.