

FACTORS INFLUENCING IMPLEMENTATION OF COMPUTER AIDED
ELECTRONIC LEARNING IN PUBLIC SECONDARY SCHOOLS IN NANDI
SOUTH DISTRICT, KENYA

BY

OLOO JOHN EDWIN

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION IN
EDUCATIONAL PSYCHOLOGY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

MASENO UNIVERSITY

© 2014

ABSTRACT

Introduction of Free Primary Education in Kenya contributed to increased enrolment in secondary schools. Reports from the District Education Office, Nandi South indicated that the district had 8016 pupils against 251 secondary school teachers between 2002 and 2007. This created an over stretch in teaching and learning resources due to low teacher: pupil ratio. Due to this, the District Education Board, (DEB) adopted electronic learning using computers as an alternative instructional tool in support of the traditional face to face method. This study therefore sought to establish factors influencing the implementation of computer aided electronic learning in Public Secondary schools of Nandi South district. Objectives of the study were to; establish availability of computers; identify factors influencing implementation of computer aided electronic learning; determine the relationship between the head teachers' computer qualifications and the number of computers acquired and find out the level of computer awareness among teachers. The study was based on Collis & Moonen model that proposes a triad relationship between the teacher, school environment, and application of computer technology. Descriptive and correlational research designs were adopted. Study population comprised of 70 head teachers, 30 computer teachers and 189 non- computer teachers. Saturated sampling was used to select 63 head teachers whereas Simple random sampling technique to select 27 computer teachers and 170 non- computer teachers. Questionnaires and interview schedules were used to collect data. A pilot study was carried out among 7 head teachers, 3 computer teachers and 19 non- computer teachers using test- retest method of reliability. The reliability index was determined at 0.81. Face Validity of the instruments was ascertained by experts in the area from the Department of Educational Psychology, Maseno University. Quantitative data was analyzed using frequency counts, ratios and percentages. Pearson's r correlation was used to determine the relationships between the head teachers' computer Qualifications and the number of computers acquired. The study revealed that 12% of the schools had acquired computers to implement electronic-learning, however over 15% of the available computers were diverted for other non-intended purposes. Schools found significant barriers and influences in electronic learning implementation which included; low computer student ratio, inadequate internet connectivity and low computer awareness. The study showed that there was a positive correlation between head teachers' computer qualifications and the number of computers acquired. The study further indicated that computer aided electronic learning at the district was still at infancy stage, therefore schools needed to acquire more computers; source for relevant subject content; improve internet connectivity and expose teachers to computer training. Findings of the study may benefit the Government in reducing costs and improving teaching efficiency in schools.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Globally, the role of computers in improving learning conditions, experiences and outcomes is still subject to significant debate (Hinostroza, Rehbein, Preston, 2012). Reports however show that using computers have a positive impact on learning outcomes and they have come to play a crucial role in education. Computers and other related electronic tools are also used provided they are available and accessible. Owning or having access to computers is considered the first step though there are various intervening factors which determine its implementation in electronic learning. Just as teachers need to have computers at their disposal, training in applications, use and awareness is crucial. Studies conducted however indicate that information on actual impact of computerizing schools remains scanty (Wamakote, 2010).

In Finland and Singapore, teachers are aware of information technology and the benefits in teaching and learning. These countries have shifted curricula and classroom practices with overall success. Among other developing countries, Costa Rica has been a leader in electronic learning for a decade. Larger countries such as India and China have recently undertaken reforms intended to spark development of higher-order cognition and creativity through use of computers in the electronic learning field. Many factors have however influenced this shift, though they may effectively be organized around the linkage of education policies to workforces that contribute to a globalized world economy (CISCO, 2010).

In Uganda, World Link Projects pilot institutions in electronic learning and have put in place student collaboration between countries in the North and South (iLearn, 2012). This is in order to implement electronic learning through computers and use it to supplement and provide the much needed support for pedagogies. In the strategic development plans and vision papers of Rwanda (Rwanda, 2020), the country's efforts to address both globalization and the potential of knowledge economy in broader society tends to emphasize e-learning and create communication and other higher-order cognitive skills. Schools have therefore adopted e-learning strategies towards this endeavor.

Whereas results indicate that ICT has penetrated many sectors, the Kenyan educational system seems to lag behind. Further, recent reports by the National Council for Science and Technology (2010) indicates that computer use in Kenyan classrooms is still in its early phases, and concluded that experiences of teachers and administrators do play an important role in the use of computers is a crucial factor. With the introduction of Free Primary Education in the country, significant educational achievements in the field of computer aided electronic learning is being realized. Enrolments in public primary schools has increased significantly from 5.9 million in 2002 to 6.9 million in 2003 (MDG ,2007).Evaluations and monitoring reports with the MDGs and EFA demonstrates deficiencies in allocation of education resources nationally.

In a bid to arrest the challenges brought in by high enrolment, implementation of computer aided electronic learning became a priority at the secondary school level. The national policy on ICT in Education (ICT Policy, 2006) was revisited and implementation plans evaluated and renewed. Partnerships forged and new teaching implementation models designed. In Nandi South district, where the study was

conducted, efforts towards adoption of electronic learning has taken new direction. Under the Economic Stimulus Program (ESP, 2013), distribution of computers was facilitated through equipping of a minimum of two public secondary schools to improve on teaching and learning resources. Deficiency had earlier been realized since the district had 251 secondary school teachers against 8060 students in 2002, rising to 10,142 students in 2007(*Education Statistical Booklet MOE,2007*).It was against this that the factors influencing implementation of computer aided electronic learning was studied in public secondary schools of Nandi South District, Kenya.

1.2 Problem Statement

The introduction of FPE in Kenya led to significant educational achievements. Enrolments in primary schools increased significantly from 5.9 million in 2002 to 6.9 million in 2003; representing a Gross Enrolment Rate (GER) of 99% .The whole scenario was replicated in secondary school education which continued to experience a number of challenges, such as overstretched facilities and overcrowding. In Nandi South district, there were 8016 students enrolled in 2002, which increased to 10,142 pupils in 2007 against 251 secondary school teachers. Application of Computer aided Electronic learning as a tool for teaching was recommended by the District Education Board (DEB, 2007) to be implemented as one of the measures to bridge the gap posed by inadequate teaching and learning resources. This study therefore aimed to determine factors influencing the implementation of computer aided electronic learning in Public Secondary schools in Nandi South district.

1.3 Purpose of the Study

The purpose of this study therefore, was to establish the factors influencing the implementation of computer aided electronic Learning in public secondary schools of Nandi South District, Kenya. Objectives of the Study were to;

- i. Establish the availability of computers for Electronic learning in the public secondary schools of Nandi South District.
- ii. Identify the factors which influence the implementation of electronic learning in public secondary schools of Nandi South District.
- iii. Determine the relationship between the headteachers' qualifications in computers and the number of computers acquired.
- iv. Find out the level of computer awareness among teachers.

1.4 Research Questions

- i. What is the computer student ratio in the public secondary schools in Nandi South District?
- ii. What factors influence the implementation of computer aided electronic learning in the public secondary schools in Nandi South district?
- iii. What is the relationship between the head teachers' computer qualification and number of computers acquired?
- iv. What is the level computer awareness among teachers?

1.5 Assumptions of the Study

- i. Ministry of Education's policy on the implementation of ICT in secondary schools is adhered to.
- ii. Various factors influence the implementation of computer aided electronic learning in secondary schools
- iii. There is a relationship between the head teacher qualification and the number of computers acquired.
- iv. Teachers' level of computer awareness varies.

1.6 Scope of the Study

The study focused on the factors influencing the implementation of computer aided electronic learning in the public secondary schools of Nandi South District. The district was a target for the study due to its high student population.

1.7 Limitations of the Study

- i. The study was carried out in the public secondary schools in Nandi South District. For this reason, findings may not be generalized to other places.
- ii. The coding methods used to process the qualitative data are subject to the researchers' interpretation and the inherent biases. This could have affected the reliability of the study.

1.8 Significance of the Study:

The study research may contribute to the following in the knowledge field:

- i. Governments and organizations may end up in cutting costs in education through implementation of computer aided electronic learning
- ii. Teachers and students will be able to access a wide range of information resources. This enables the teacher to manage large classes effectively and make the task of teaching and learning much easier and simplified
- iii. Schools may increasingly use computers to improve efficiency of education.

1.9 Conceptual Framework

The study adopted a model proposed by Collis & Moonen (2001), which is an institutional model for an electronic learning platform (see fig 2). A model for implementation is a blueprint based on experience and theory which is used to guide the teacher. E-learning models are basically attempts to develop frameworks to address the concerns of the learner and the challenges presented by technology so that

online learning can take place effectively. They provide valuable frameworks for understanding the integration of technology and pedagogy and help identify key disparities between current and desired situations. The effectiveness of computer applications is dependent on the manner in which they are implemented. While it is important to have designed software, appropriate hardware and skilled users, all of these are in vain if the applications are poorly implemented in the classroom. A model of implementation is therefore a necessity.

Collis & Moonen, (2001) suggests a 4 E model that guides anyone who wants to integrate use of computers in teaching and learning into four key components. The four components are nested into each other, which means that each depends and feeds or leads onto the other.(see fig1).The approach for the implementation of computer aided electronic learning is seen in a top-down model, that is from the larger school environment to technological aspect, or in a bottom-up, that is from the technological aspects. The 4 E- model is summarized in fig 1.

For ease of use of computers, the hardware itself needs to be available to the users especially for teachers and students. The computer: student ratio is determined to find out how accessible the computers will be. The appropriate and supporting educational software is also a key factor. This is so because it is necessary that the software to be accommodated by the hardware is readily within ease of acquisition by the school administration. The environment as used in the model is a broad area that comprises the school set up and everything that holistically affects the adoption and effective application of subject content and processes of implementation. Policy makers and other stakeholders including the head teachers and Boards of Governors in position of decision making, directly impacts on the implementation of computer aided electronic learning.

A competent and well trained technical and computer literate staff provides the necessary linkage that ensures availability of both hardware and software within the school environment. These are maintained for effective implementation of computer aided electronic learning. Personal engagement in relation to the teachers' personal training and personal contact in use of computers is paramount in the implementation process. Essentially it involves the teachers' commitment to integration of computers as a teaching and learning tool in the classroom. In addition, the teacher must ensure that pupils have access to subject content. Where this is lacking, the teacher, must by all means acquire the necessary training in order to develop her own content suitable to the environment and level of learners.

If a teacher decides to use computers in the classroom, there will be need for educational effectiveness. This entails creation of awareness towards appropriate application of the hardware that aims at understanding pedagogical implications. Use of computers is a dynamic process. Due to this, training of teachers on new methods of classroom instruction that involves use and adaptation to changing trends in technology is important. The internet, being a major source of information to both the learner and instructor is put to use. In view of this, increased awareness on the part of teachers is paramount.

Effective awareness for teaching specific content or subject matter requires understanding and negotiating the relationships between Technology, Pedagogy, and Content. As shown in the conceptual model (fig 1), a teacher capable of negotiating these relationships depicts a great a form of expertise and awareness. Within the context of technology application, it appears that most often we refer to digital technologies such as computers, the internet, and software use. Technology in the

conceptual model refers to an understanding of the way that computers are used in a specific content domain. The school will need to ensure that the computers are made available to both teachers and learners. Content knowledge refers to knowledge about how the computer technology may be used to provide new ways of teaching that specific content. These are factors which may influence implementation of electronic learning in the schools where the study is being conducted.

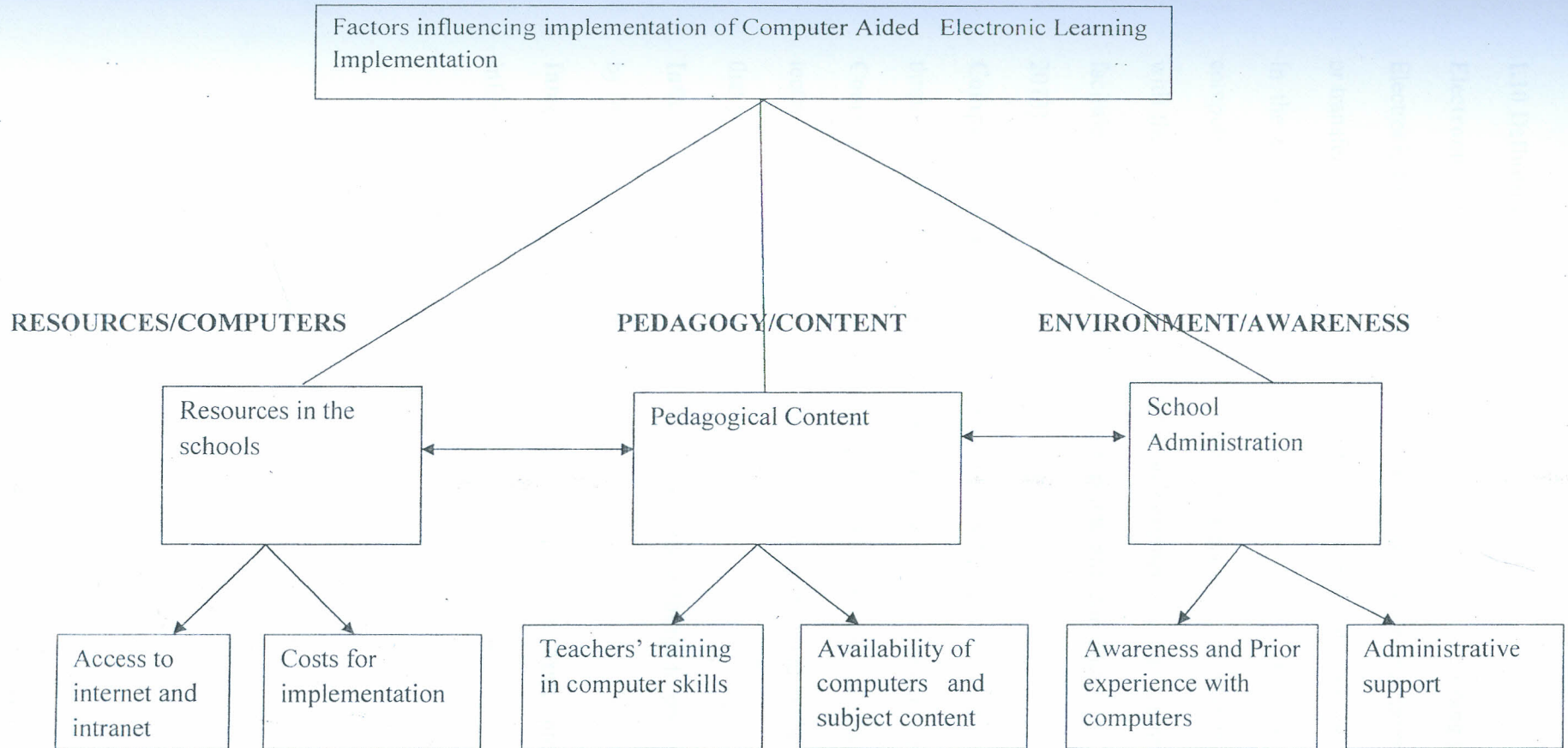


Fig 1: Conceptual model :(Collis & Moonen, 2001) showing implementation of E- Learning

1.10 Definition of terms

Electronic learning: Various definitions of electronic learning are provided below:

Electronic Learning can be defined as a learning experience involving the acquisition or transfer of knowledge delivered or transacted through electronic means.

In the context of this research, e- learning is defined as the use of networked computers and ICT to deliver learning materials and content in the form of web based with the aim of enhancing academic achievements of the learners by exploiting the facilities and services provided by e learning and computers (e- learning conference, 2013)

Computer aided Electronic learning: can be referred to as learning or teaching through computers with subject wise learning packages or materials.

Computer Awareness: refers to the understanding of the role of computer technology in society and the social implications involved in the use of computers in that given society.

Influence: Is the capacity or power of persons or things to produce effects on others by intangible or direct means.

Internet: refers to an international computer network providing e-mail and information from computer and is accessible to the public.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction:

Based on the objectives of the study, the researcher reviewed the previous studies conducted as follows:

2.1.1 Availability of Computers for Computer Aided Electronic Learning

Availability of computers in schools depends on the policies adopted by each Government. While ICT continues to advance in western and Asian countries, African countries still experience a lag in its implementation, and that continues to widen the digital and knowledge divides. A recent study by (Kiptalam and Kiptanui, 2010), observed that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1 for 15 students in the developed countries. In most countries it is the aim of each Government to create classrooms where ideally the computer to student ratio is 1:1. This ratio definitely improves accessibility of the learners to the teaching tool. Its impact, it has been argued needs to be assessed in the long term. UNCTAD (UNCTAD, 2007) in its policy guidelines, proposed that three major stages i.e. e-Readiness/ (infancy stage), e-intensity and impact awareness to necessitate integration of computers as learning tools in the classroom (fig 2). All the stages can be attained in environments where computers are made available and accessible to the learners. On this basis assessment of availability of computers in Kenyan schools should be done on equal footing with that proposed by UNCTAD and other international requirements.

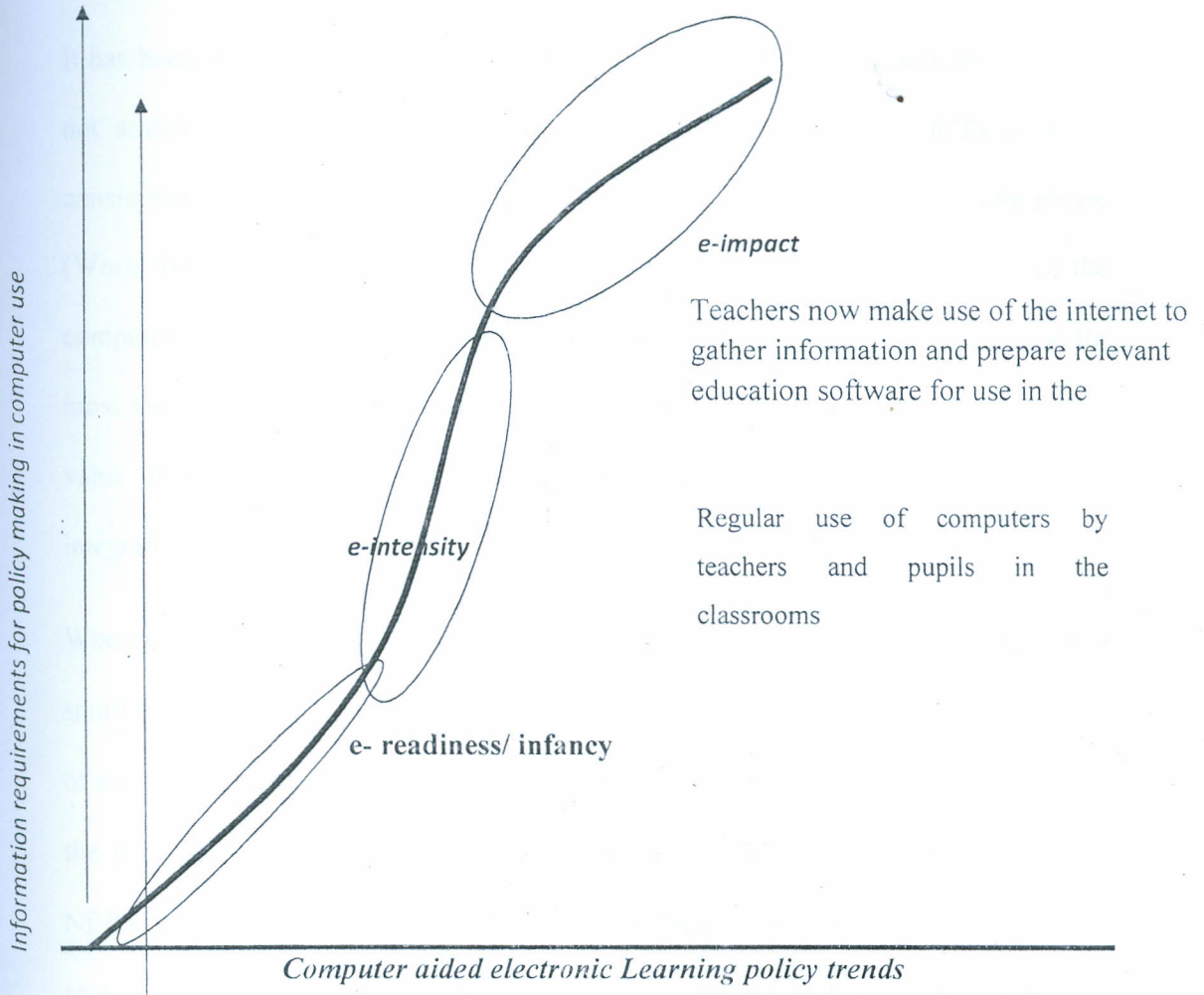


Fig 2.: levels of computer use among Learners

source: UNCTAD (2007)

Attention has been paid to the so-called "\$100 laptop" initiative and other programs to provide "1-to-1 educational computing" to students in developing countries. This is in an effort to make more computers affordable and accessible to schools. Even at \$100 dollars per device, however, such solutions are still much too expensive for most communities around the world. The typical scenario for computer use in schools in developing countries such as Kenya especially in rural areas is for many students to

crowd around one computer while one child controls the mouse, leaving the others as onlookers.

It has been noted that the approach of providing children with a computer is simply not scalable in developing countries, and that, where the use of ICTs is being considered, we should be looking instead at different 'gadget', like the mobile phone (World Bank, 2013). Studies have shown that efforts to improve availability of the computers in the classrooms so as to provide one-to-one (1:1) computer pupil ratio for most institutions remain a mirage. In a 1:1 environment, students get the maximum value from access to personal computers, internet connectivity, and eventual integration of computers into classroom instruction.

Whereas most secondary schools in Kenya have some computer equipment, only a small fraction is equipped with basic computer infrastructure. In most cases equipping of schools with computers and infrastructure has been through initiatives supported by the parents, government, development agencies and the private sector, such as the NEPAD E-Schools programme (Ogutu, 2008). Due to this, computer: student ratio remains low and accessibility restricted to a few teachers and students. Recent study on the pedagogical integration of ICTs in education in Kenya (PanAf, 2009) reported a computer: student ratio of 1:24. This figure cannot be taken to be representative of the situation in the entire country because the study included just a few selected schools.

A survey reported by (Oloo, 2009) found that an average of 21 computers per school were available in the 56 purposefully sampled schools, giving an average of 1 pc to 21 students. This study was similar to the current research though the sample population was comparatively smaller. The current research is more improved in that saturated

sampling technique adopted is more representative as compared to the purposive sampling technique used in the former research. The outcome of both studies confirm that the ideal computer: student ratio of 1:1 was way difficult to achieve.

An alternative method which has been used to make computers available to learners and improve accessibility is the increasingly popular concept of public private partnerships (PPP). This occurs when both public and private sector organizations come together to fund, develop and operate services, thereby facilitating implementation of electronic learning (Curley,2009).To strengthen the availability of computers, MOE has engaged a number of PPP that target a diversity of areas in the broader sector. An example of such initiatives is by the Multimedia project which equipped 240 public secondary schools in Kenya with computers to enhance availability and trained over 800 teachers on basic computer skills (Televic, 2009).

Another initiative by the Government to improve availability of computers in schools has been through the Economic stimulus Program, ESP.It was intended to expand ICT access to Kenyans; initially targeting provision of computers through secondary schools and subsequently expanding to primary schools. The project was to maximize on the benefits gained through the undersea cable that connects the economy to the global digital grid. This was to be achieved by the purchase of 1 mobile computer laboratory for each constituency at a total cost of Kshs. 6 million per constituency. (ESP, 2009). In the project, five selected secondary schools in each district were provided with computers to enhance electronic learning. This effectively improved the number of computers available, though the computer: student ratio of 1:1 was difficult to reach. The British Council under Badiliko Project in 2013, also distributed computers to various schools to go along with the MOE initiative in Economic stimulus to enhance availability of computers in secondary schools. Despite these

initiatives, the general impact of availing computers to institutions is yet to be assessed.

Other independent initiatives such as the e-Schools program of the New Partnerships for Africa's Development, (NEPAD), have emerged, though with short term programs. According to (Isaacs, 2009) their cumulative effect of processes and formations suggest a growing Government and civil society involvement towards providing more computers to schools. Though effort has been made, there remains a gap on the quality of reach since most schools still have very few computers to ensure implementation of electronic learning.

Government's effort to provide more computers to the schools has faced a lot of criticisms from various sectors. The Government has been put to task for having its priorities wrong. Other opinions have it that finances which are allocated to the purchase and acquisition of computers could be channeled towards construction of physical facilities such as classrooms and science laboratories which are lacking in most learning institutions all over the country (Standard Newspaper, Aug 17, 2013). Sceptics of the computer projects also argue that providing computers to schools is a massive undertaking financially which may entail massive e-waste as most of the hardware become obsolete within a short duration of time. Markle Foundation's report on National Strategy of "ICT for Development"(2003) states that affordability is certainly a limiting factor in access to computers, making it difficult to attain the ratio of computer student ratio of 1:1.

The provision of computers to schools so as to attain this ratio has again widely been criticized in many education fora. An example of such a forum was at the E- learning conference in Lusaka, Zambia (E-Learning conference Africa, May 2010) in which Education specialists were reluctant towards recommending for provision of computers to schools in Africa under the One Laptop per Child (OLPC) initiative, arguing that most schools did not have the minimum infrastructure to accommodate the computers. Equally, most schools did not even have teachers with the technical knowhow to use the same computers. Collins (2002), also found out that learners dropped out of schools because of not being knowledgeable enough in use of computers. All these suggest that preparatory training is indeed required for new learners and teachers. Apart from lack of physical interaction, application of computers in e- learning has generally been criticized for not availing facilities in the case of traditional schools, internship opportunities, access to physical library and book stores, career and development counseling (McCracken, 2004).

2.2 Factors Influencing the Implementation of Computer Aided Electronic Learning

Several factors do influence implementation of computer aided electronic learning in secondary schools in Kenya. Among others, training of teachers, internet connectivity to schools, power sources to run the computers, technical support staff are key issues. One of the most important factors in electronic learning implementation is the availability of enthusiastic and knowledgeable people devoted to the enhancement of teaching and learning, (ICT and MDGs, December, 2003). This involves development and organization of an electronic learning course that requires a set of extensive skills and understanding of the Global web and internet environment. It is on this context that connectivity of computers to the internet is considered important.



In any educational institution, introduction of electronic learning in any educational institution requires vast changes in teaching style, content and assessment. Technical skills required by teachers are also paramount. It is pointless to talk about introducing electronic learning if the teacher does not have the required basic computer skills or experience to impart to the learners. It is considered that if properly integrated in the curriculum, computers can positively influence children's learning and will depend on the context in which the teacher uses it to create a conducive e- learning environment (McNabb, 2005). If it helps to drive the curriculum and create an effective learning environment, chances are it will have a positive impact for implementation.

In countries where teachers are less technically skillful, training activities are given more emphasis. Besides receiving the skills during the training sessions and pedagogical techniques, the teachers need to understand how computers can substitute the routine work and speed up the preparation of lesson notes and assessments, (Collis and Moonen, 2001). According to (Ahmed, 2004), several factors, such as imperfect infrastructure, lack of prepared educators, a new culture in a number of forms and techniques are some of the factors which will influence the implementation of electronic learning in the developing countries. Other researchers view the problems and barriers with respect to computer use by teachers as coming from several sources such as insufficient motivation, absence of technical support, a school administration that does not embrace computer use, lack of administrative support etc. (Cuban, 2001; Dede, 2010a; Means, Penuel & Padilla, 2001).

The mere availability of the technology tools can create problems. Teachers may be tempted to apply computers to a learning activity that can very adequately be handled without the intervention or support of these machines. In the process students and

teachers learn how to use the "user-friendly" technology and may never get to the act of collaboration and adequate transfer of knowledge. According to (Dillard, 2002) , computers then become an obstacle to collaboration rather than its supporter.

Electronic learning is increasing in popularity especially where lack of resources is a major challenge (Chadwick, 2013). There is a school of thought which argues that e-learning can take place with or without the aid of a teacher or trainer and does not necessarily rely on the internet. It has similarly been argued that a simple CDROM or DVD may hold a number of textbooks that can be viewed on a standard desk top computer. The proponents of this reasoning has created the misconception that use of computers as a tool for teaching and learning may finally take the place of the teacher. Despite this, the use of the internet is a key factor in implementation of electronic learning.

Funding of electronic learning activities creates great challenges in the implementation process as most funds are targeted at teaching and not acquiring computers as a tool for teaching. Most institutions in their budgets do not clearly define what e- learning entails and what aspects of e- learning can be funded, Sibanda, (2013). Too many learning initiatives have focused on the technological aspects as the solution rather than the medium. Budgets have been exhausted building computer labs that are underutilized. According to (Sibanda, 2013), budget allocations should tend towards learning intensives rather than technological- intensive approach and should take into account the whole school budget.

Implementation of electronic learning in schools will rely on electricity and other sources of power enable to provide energy to computers and laptops. Electricity, however remains Africa's largest economic challenge with the level of penetration

lower than 25% in most rural areas, (Park, 2013). This lack of power isolates, communicates and limits their access to education and information both of which are key to fast tracking a nation's development. Samsung, (2013). The need to provide alternative sources of power has generated new developments in education. For example, Solar powered internet is set to benefit children in rural Africa (Smith, 2013); Nandi South district being included. According to the manufacturers, the solar powered internet school" can easily be carried by truck to remote areas, survive harsh weather conditions and crucially operate where there is no electricity supply (Samsung, 2013).

2.3 Relationship between Head teachers Computer Qualifications and the number of Computers Acquired

Several studies have addressed the unrealized promise of ICTs and computers to transform the fundamental nature of schooling. (Visseret *al.*, 2003; Mentz and Mentz, 2003 and Tearle, 2004) When technology is simply layered onto a traditional framework, its potential has been observed to be severely constrained, educational leaders are therefore challenged to examine the larger educational structure before considering the particulars of improvement of learning by use of computers .It should be noted that technology itself cannot be "disruptive" in a transformational sense if the curriculum driving it is not disrupted.

Although teachers play a big role in the implementation of e- Learning, they cannot create cohesion in the E- Learning process all by themselves. A support from the school managers is quite important. It is up to the managers to provide leadership in this process and create conditions for support and collaboration with other stakeholders and professionals. To integrate computers in teaching and learning in a

harmonized and coordinated manner, it is important to have a clear, shared vision and informed leadership (Majumdar, 2005). Both are essential to ensure that all the components of the implementation plan are present and that they support each other.

It can be said that Kenya is at the emerging stage of electronic learning and use of computers in the schools. The country as a whole is at the stage of increasing awareness of the existence and added value of use of ICTs in the schools.

Furthermore, it is a reality that some schools with computers are not putting them to use because head teachers or Principals do not know what to do with them. Those computers remain idle in the boxes or gather dust just locked in a room. These people are not to blame. Often it is a matter of awareness and skills that are lacking. (E-Readiness, 2007). Since schools perform the double duty of curriculum and social supervision, the contribution of the school principal to constructive innovation is repeatedly stressed; as is the necessity of continuing of communication among all levels. Educational Leadership is urged to assure the provision of resources so that the teachers may pursue innovations in sensible and safe setting (Stuart, 2010). This suggests that vision driven with professional development, good communication, material resources, and research are critical to the success of computer transformation. This calls for teacher education which needs to be stressed not only for equipping prospective teachers with technological skills but also instilling confidence and habits for transfer of knowledge. It takes the right leadership at both the national and institutional levels to recognize and treat computers as one of the top priorities in developing a successful electronic learning environment (Awidi, 2008).

Brundrett and Terrell (2003), says that the type of head teachers and principals recruited in our schools will determine how well we can fare in the introduction of

integration of ICTs and computers in teaching and learning. (Dede, 2010a) pointed out that most of society's attempts to shrink the widened equality gap that new educational technologies could create focus on access and literacy of the population. The head teacher takes a key position in the school in provision of infrastructure for access to computers as a teaching tool. This study will therefore establish the relationship between the availability of computers for e- Learning and support given by head teachers in acquisition of Public secondary schools in Nandi South district.

2.4 Level of Computer Awareness among Teachers

Computer awareness begins with recognizing the common concerns and possible fears individuals may experience upon their initial encounters with this rapidly expanding technology (Tangia,2008). Awareness is also dependent upon an individual's specific knowledge of computer hardware peripheral devices and applications such as information processing and information sharing. Increasing ones knowledge and skills in these areas can be accomplished through various training resources. With training and experience, overall acceptance and appreciation of computerization will continue to rise. Individual skills will also increase, so starts ones experience for the benefits of rapid communication and information processing.

Awareness relates what can be done with computers. People must also be open to using ICTs and ready to change attitudes. The case for computer education and awareness is largely based on the need for children taught by teachers to be prepared for a living in a " *society that is fast becoming dependent on the first application of computer technology*" (McDougal, 1980:3). In Kenyan schools, however, ICT awareness in educational institutions has been dominated by stakeholder meetings, although after some time, it was necessary to involve targeted institutional based

awareness to capture more schools. This involved creating awareness through organized seminars and workshops.

In the Kenya ICT document (ICT policy, 2006), there is a stated commitment to invest in ICT infrastructure with deliberate plans to ensure that the digital divide between the rural and urban schools does not escalate. The policy paper advocates for close working relationship with Public Private Partnerships (PPP). The PPP initiatives have at the same time focused more on creating awareness in the schools, an initiative which has gone a long way in increased use of computers in some public secondary schools.

In order to be successful in e-learning one has to learn new skills, Willging & Johnson, (2004) found out that students dropped out of school because they are lacking in technological skills. According to Professor Joshua Angrist, of the Massachusetts Institute of Technology and Victor Lavy, of the Hebrew University of Jerusalem, says “ *there is no evidence that computer-aided instruction improved pupil performance and also that increased educational use of computers actually raised pupil test scores. In fact, the best estimates showed that the mathematics scores of pupils in schools that received new computers actually went down.* (ANGRIST,2012) .This study suggests that computer aided instruction is no better or less effective than other teaching methods. Alternately it is argued that, computers may consume school resources or displace educational activities which, if maintained, will have a prevention of a decline in achievement” (Lavy, 2011).

Studies of Evan & Hasse (2001), O'Regan (2003) and Rovai & Jordan (2004) found out that learners equally faced limited physical interactions among themselves in an e-learning environment, especially when using computers. E-learners should be

Information & Communication Technology (ICT) savvy. Hamid (2002) stated that technical skills could cause frustration to e-learning students due to the limited knowledge when using computers. Equally there is the argument that e-learning students have a higher dropout rate than their conventional counterparts (Abouchedid & Eid, 2004). When computers are used in teaching, there are tendencies that the effective teaching will disappear between the teacher and the learner. This is due to the intervention of the attention that is given by the student to the computer machines. In other words, computers could become a barrier in communication between the teacher and the learner. Despite these hiccups, studies show that the concept of e-learning would lead to increased, student motivation, class participation and improved behavior (Silvernail, 2010), when appropriately used. Resnick (2002), points out that using computers favors and facilitates strategies of construction to generate knowledge in contrast to strategies of instruction. He describes computers as "construction machines". Application of computers however, should not be seen as a panacea and the solution to all education's problems.

Awareness seminars, wherever mounted by education experts, will go a long way to be a beneficial initiative to instil in our teachers the understanding the use of computers as one ingredient in the education process and not a replacement to all other traditional resources. In many cases, it is important to make it clear that the adoption of computers is not the education reforms per se, but one significant component of such a reform. It is only at the secondary school stage level where students can become truly conscious of varied learning methods in the use of computers and other ICTs. so awareness sessions for the teachers is recommended.

The natural resistance of teachers to change is very evident with the use of computers because of the widespread nature of the changes associated with their applications. Not only do teachers need to spend time learning about the technology and how to use it, they also need to adjust to changes which may be required to their role in the teaching/learning process and to the strategies they use. This can bring down and eliminate technophobia. According to (*School Net Africa, 2004*), development of basic skills, is necessary .One major weakness to varied trainings offered to teachers for skill development is that they are just a means to an end rather being beneficial to teachers. A number of civil society network organizations have tended to run digital literacy awareness programmes for targeted organizations to complement training efforts. Kenya has the Mkuru Promotion Centre, which develops ICT skills, particularly for the underprivileged (Farrell, Glen & Shafika, 2007). The program has created computer training to teachers instead of becoming an additional task to them. E-learners needed additional encouragement and support, to compensate for the perceived isolation from use of computers in the classroom. The purpose of this study, therefore will aim at finding out the degree of awareness amongst the teachers on use of computers as a teaching tool within the school set up.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The study adopts descriptive survey and correlational designs. A survey design involves asking a large group of respondent's questions about an issue (Fraenkel & Wallen, 2000).According to Creswell (2003), a survey design provides a quantitative or numeric description of trends, attitudes or opinions of a particular population by studying the sample of that population. From the sample results the researcher generalizes about the population and may infer with accuracy how the population would respond (Fieldman, 2002). A survey approach also allows the researcher to use a wide range of data collection methods (Dascombe, 2000; De Vaus, 2002). Descriptive survey allows the researcher to gather data so as to present a complete picture of a given subject. In this study, the researcher used the design to establish factors influencing computer aided electronic learning in Nandi South district.

A correlational design helps to study the relationship between two variables or more measurements for which researchers have no control of. It also helps predict how two or more variables are related however, it does not explain any cause and effect relationships. It is suitable for this study because it provides for easy administration of research instruments, data collection from a cross section of respondents over a wide area, in a short time and at comparatively cheap cost (Mugenda, 2008). It also allows the researcher to explore relationship between different variables obtained from the same individuals at approximately the same time (Gall, Gall & Borg, 2007). In the current study, the researcher uses it to determine the relationship between Head teachers' qualifications and the number of computers acquired.

3.2 Study Area

Nandi South district, which has been chosen for study, has a population of 752,965 people and literacy rate of 67.5% (Kenya Bureau of Statistics, 2011). Almost one third of the populations were immigrant workers at the expansive tea plantations while the rest are indigenous. It is composed of four divisions of O'Lessos, Nandi Hills and Kemeloi and Tinderet. Though it was a potential agricultural region, it has a low poverty index of 45.9 compared to the national index of 49.1 (World Bank, 2009). The major human activities are Maize and tea growing. Farmers also practice Dairy farming to supplement earnings from tea farming. Part of the District however, is located on a rugged terrain, which makes it difficult to undertake any meaningful crop farming. Schools in this area are difficult to reach due to the rugged terrain. The district is located to the north east of Kisumu district, bordering Kericho, Hamisi and Nandi North district lying between 0.18 latitude and 35.12 longitude, (Nandi South district Statistics, 2008) . Its high population has created an over stretch on teaching and learning resources leading to the District Education board to adopt computer aided electronic learning. This study therefore aims to identify factors which influence implementation of computer aided electronic learning in the district.

3.3 Study Population

The target population for this study consists of 70 Head teacher, 30 computer teachers and 210 non- computer Studies and 2 other teachers in all the 70 public secondary schools in Nandi South district. In some schools, there is no computer teacher available, so the sample population covers all those schools where a teacher for computer studies is available.

3.4 Sample Size and Sampling Techniques

Sampling was conducted to get information about large populations with less costs, less field time and more accuracy. Saturated sampling technique was used in selecting 63 head teachers from the 70 secondary schools. 7 head teachers, 3 computer teachers and 19 non computer teachers were drawn for piloting purposes thus constituting 10% of the sample population. Random sampling was used to select the 189 non computer teachers for the study. Random sampling is considered to be the best as they ensure representativeness and precision

The study population and sample size are presented in table 3.1

Table 3.1

Study population and Sample Size

Respondents	Population	Sample size	Percentage
Head teachers	70	63	90%
Computer teachers	30	27	90%
Non Computer teachers	210	189	90%

3.5 Instrumentation

Data was collected using Interview schedules and Questionnaires.

3.5.1 Interval Schedule for Head Teachers

According to Horton, (2001b), a variety of different techniques can be used to evaluate e- learning. In the study, structured interviews are undertaken and questionnaires distributed to the teachers. The researcher used an interview schedule to get information from the head teachers. Initially rapport was created with the head teacher in order to have a relaxed atmosphere for the interview. Objectives of the interview were clearly spelt out by the researcher and topics to be addressed well outlined. As a motivation, results of benefits of the interview to the respondents were provided and exact time to be taken by both parties was agreed upon. Responses were recorded as the interview continued. The head teachers' interview schedule is attached as Appendix A

3.5.2 Questionnaires for Teachers

The main purpose of using questionnaires is to explore the current use of computers in secondary schools and understand more fully the factors influencing computer aided electronic learning in the public secondary schools of Nandi South district. Both closed and open ended Questionnaires are used to get information from the computer teachers and non- computer teachers. Questionnaires were adopted again to ascertain the level of computer awareness and application in the implementation of electronic learning. Open ended Questionnaires allow flexibility in the respondents' answers. They were mainly applicable for qualitative data, whereas closed ended Questionnaire responses were provided to get responses for Quantitative data. Participants' confidentiality and anonymity were ensured and no data were stored with names

attached. Interview and questionnaires were stored by number and the list connecting the number to a school. Questionnaires are listed in APPENDICES C and D.

3.6 Reliability and Validity of the Instrument

3.6.1 Reliability of the Instruments

Mugenda and Mugenda (2003) indicate that validity is the degree to which empirical measure of several measures of concepts accurately determines the concept. A pilot study was conducted among 3 head teachers, 27 computer teachers and 21 non computer teachers who formed 10% of the study population. Reliability coefficient was determined by the use of Cronbach's alpha formula which yielded 0.81, which was above the recommended threshold of 0.75 (Durheim & Painter, 2006).

3.6.2 Validity of the Instruments

Face validity was ascertained by experts from the Department of Educational Psychology, Maseno University. The panel conducted validation in terms of clarity, relevance and appropriateness. Their suggestions were used to correct the final instruments since professional standards needed to be met in the Study.

3.7 Data Collection Procedures

The researcher sought permission from the Ministry of Education and the National Council of Science and Technology through the School Of Graduate Studies, Maseno University. Notification letters were sent to the DEO Nandi South District and heads of sampled schools, briefed them about the research. After which he distributed the Questionnaires to them which they filled. Further, the researcher had an interview schedule with the head teacher. On the data collection day, the researcher met the respondents. The respondents were provided with ample time to go through the questionnaire. For accuracy of results the researcher emphasized for non- sharing of information.

3.8 Data Analysis

Data collected was sorted, edited and coded. They were classified and tabulated in readiness for analysis. Descriptive statistics such as frequency counts and means were used to calculate Quantitative data. Pearson's r was used to determine the relationship between the head teachers' qualifications and number of computers acquired for each school. Qualitative data was transcribed and reported in an ongoing process as themes and sub themes.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This section was used to analyse data from interviews conducted on the head teachers and Questionnaires provided to both the computer and non- computer teachers.

4.1.1 Availability of Computers for Computer Aided Electronic Learning

In this objective, the researcher interviewed head teachers and enquired on the number of computers available in their schools. The researcher asked details such as storage and their accessibility to both teachers and pupils. The number of computers available in sampled schools is recorded in Table 4.1. Issues related to accessibility of the hardware to members of the school community were recorded Latest student population for each school was also recorded and computer: student ratio obtained. Sampled schools were categorized as per division. The study noted that whereas 27.1 % of the schools had 5-10 computers, 37.1% had 11-15 computers, and 24.2% had 16-19 computers; 12.0% of the schools had 20 or more computers each. Slightly over 15% of available computers in sampled schools were put to use for other purposes other than for electronic learning.

Table 4.1

Number of Computers per Institution

Category of Computers	Percentage
5-10	27.1
11-15	37.1
16-19	24.2
20 or more	12.0

The results from Table 4.1 was presented on a pie chart.

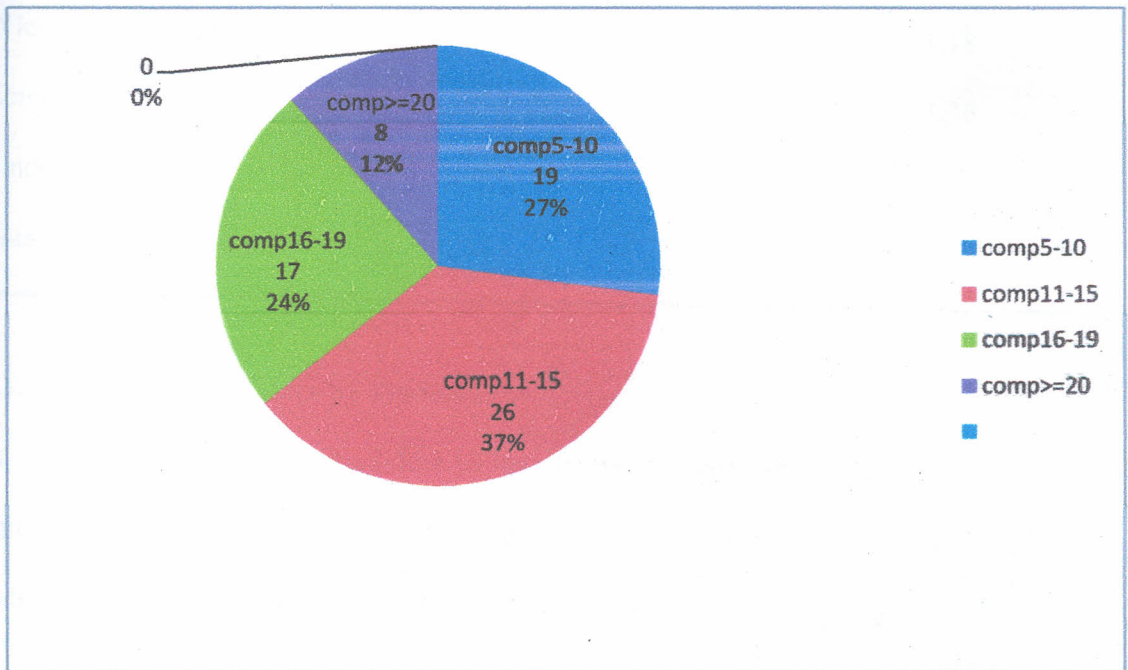


Fig3: *Distribution of computers in public secondary schools of Nandi South District.*

The first stage on the implementation of electronic learning in any public institution typically concentrates on the acquisition of computers and accessories (Bork, 2003).

This study was therefore similar to other previous studies in that it made a count of all

the computers in all the sampled schools. This enables the study to establish the availability and the corresponding easiness with which the computers were acquired and made accessible to students and students.

Table 4.2

Ratio of computers: students

Division	schools	computers	students	Computer: student ratio
Nandi Hills	19	150	2490	1:17
O'lessos	9	87	1518	1:18
Kemeloi	24	173	6181	1:36
Tinderet	8	111	3481	1:32
Total	70	521	13660	1:26

4.1.2 Access of Computers by Students

In the study, other than normal face to face interaction with students, teachers use computers as the primary means of knowledge exposition. It is the Government policy to have a computer: student ratio of 1:1 for effective learning to take place.

From the table, it is noted that as student numbers continues to grow, computer: student ratio becomes low since many learners cannot easily access the equipment. Looking at the data, public secondary schools in Tinderet division have the lowest computer: pupil ratio that is one computer for 32 students. This low ratio is attributed to schools being located generally in poor terrain that do not allow acquisition of necessary infrastructure to sustain availability and use. It is noted that the division

with the best computer: pupil ratio is Nandi Hills. This is an urbanized area where schools have better improved infrastructure such as computer laboratories and classrooms. While the average computer: student ratios are relatively low for schools in the four divisions at (1:26), individual schools comparatively, have encouraging computer student ratios. The results show that though schools have acquired computers, their numbers varied from one school to the other.

The findings of the study are in line with that of (Onyeahu, 2009) which found out that computers and accessories are expensive to purchase and not all schools can afford to buy many of them. Despite this, computers are considered important learning and teaching tools, therefore have to be made available and accessible to both teachers and learners. (Okoroh, 2006) observed that ICT and use of computer facilities do not only help students but also assists teachers in preparation of teaching materials, demonstration of equipment and concepts. (Ajayi, 2002) observed that most of our educational outlets are not yet computerised and so professionals do not have access to different information and communication technologies, so the urgent need to equip educational institutions with more computers. For accessibility of computers to the learners, computer: student ratio ideally should be 1:1.

In order to boost availability, the study notes that the Government has taken an initiative to spearhead distribution of computers to selected schools under the Economic Stimulus Program (ESP). This program involves bringing in higher specification computers into schools that have better infrastructure to accommodate them. Further, the study notes that, schools located in urban areas use using mobile trolleys. Desk top computers are put on trolleys where a teacher books them from the computer store and wheels them to normal classrooms. This method, though boosting

availability of computers to the learners, has been observed to be rather cumbersome and time consuming. The risk of the machines malfunctioning through continuous transportation from the computer store to the classroom is common.

In comparison, studies made at Edgecumbe College, Minnesota, United States (2005), employed the use of Computers on Wheels (COWs) to improve availability of the facilities. This method creates student and teacher confidence and adeptness towards use of computers. With better access to computers, a wider range of students are exposed to computer aided enhanced learning, and makes learning enjoyable, engaging and beneficial (Beiter, 2003).

In another bid to enhance availability of computers, two schools, in Olessos and Nandi divisions have created intranet connections. This enables more workstations to be provided both in classrooms and in the laboratories. Research studies made in Hong Kong by the (Working Group on Implementation of e-learning and Textbooks, April, 2009) proposed different views on computer: student ratios. One opinion in the study hold a similar idea of 1:1 ratio, though others suggest that computers would be best provided to working groups rather than for individual students. One computer to one working group was an ideal method of implementation of electronic learning in the schools. The suggestion of working groups aims at minimising costs.

The current study notes that use of computers in implementation of electronic learning in public schools in the district is still at the infancy stage when compared to previous studies made by UNCTAD member countries (UNCTAD, 2007). The World Bank's World Links for Development (WorLD) project, (2000), proposed an estimated a computer: student ratio of 1: 139 for students across Africa as the normal

trend. This study concludes that sampled public secondary schools currently are currently within the required range of computer: student ratio worldwide recommendations. Computers are available in the sampled schools, though there is need to purchase more since student numbers are on the increase.

4.1.2 Access of Computers by Teachers.

The results of the study also note that several computers available in the schools were donations from well-wishers and organizations. These computers however have serious defects. For example, some of them cannot run the latest software such as Windows 7, therefore limiting the number of electronic learning tasks to be applied by the users. At a school in Kemeloi division, four computers donated to the school by the church are Pentium II machines. They are not able to accommodate the latest available software in the market.

Slightly over 10 % of the computers available are obsolete. They are normally packed in a section of the classroom or computer laboratory and constitute to a high proportion of e- waste. Availability of obsolete computers lowered the morale of users due to non-compatibility of the software and inability to perform certain key tasks. Implementation of electronic learning in these schools is therefore hampered by availability of obsolete computers. Speaking from an institutional context, a head teacher at a school in the district mentioned that *"a number of staff donot have personal computers that they could use in accessing the internet and programmes that could enhance teaching and learning"*. To maximize the use of available resources, the teachers have one or more computers allocated permanently in the Head of Department's office so that a selected fewer number of students can be organized to visit that office to undertake learning under the guidance of the subject teacher.

In one school in the division, available computers are placed on a centrally located laboratory. This facility is, however, is not bookable by the learners, though the facilities are made accessible to the students on a first come basis. Though convenient, it has become extremely difficult to supervise the learners due to the limited number of teachers with basic computer skills at the institution. This kind of arrangement is similar to the COWs project since its major aim is to improve accessibility and availability of computers as a learning resource. This study is in consistence with the findings of Odera (2011) who found out that there was inadequate provision of computers in Kenyan secondary schools.

The study notes that the fact that computers are still very expensive in Kenya makes them a target for thieves who have ready markets for them to other third parties at much more money. This makes many schools in the district to incur extra expenses trying to burglar proof their computer rooms. This extra expense essentially has made some schools to shy away from purchasing new and extra computers as a replacement to stolen ones. The situation, though insignificant, has lowers access of the machines to the learners. Implementation of electronic learning is therefore hampered.

The study expresses differing opinions regarding the reliability on access and availability of computers for teaching practices. The research findings points that accessibility of computers can create an impact on a teacher's purpose for using the technology in varying ways. For example one teacher did not have permanent access to computers in her classroom and appeared to utilize the available single computer for predominantly administrative purposes as seen in this extract: *"Because I don't have access to it in my classroom at all times. I actually use it more as a resource*

area for my students" .Another teacher from the same school accessed computers in her classroom on a regular basis but considered that not all teachers were as fortunate: *"For me it's quite good, because I have a classroom that has a computer network attached to it. So I tend to have access not only to the computer but I can go and pick up a few laptops and bring them in if need be. "So it's all right for me". The other times though you need to book into the library or to the computing rooms and oh that's so hard to get them". "find spaces and that's the difficulty, finding time to access our computers"* . These findings indicated that there are a few computers available for use of the teachers to effectively implement computer aided electronic learning in the schools.

4.2 Factors Influencing Implementation of Computer Aided Electronic Learning

Various factors that are influencing implementation of computer aided electronic learning are readily noted. For most schools that have acquired computers, the school administration distributes the hardware depending on priority needs other than for implementation of electronic learning.

4.2.1 Distribution of Computers

During the interview, head teachers were requested to give a breakdown on allocation of computers available in the school as for each department. Fig 4 below shows a bar graph of the distribution of computers as allocated to different functions in the schools. Analysis was carried for sampled schools in the four administration Divisions.

Table 4.3

Computers for Administration

S/No	Division	Total. pcs	Pcs administration	%age value per division
1	Nandi Hills	96	14	14.6
2	Ol'Lessos	87	15	17.2
3	Tinderet	112	17	15.2
4	Kemeloi	188	20	10.6
	Total	483	66	13.7

Table 4.3 shows that between 13-17% of available computers are used for administration purposes other than for computer aided electronic learning. For example at a girls' school in Kemeloi division, 3 out of 25, i.e. 12% of the computers provided to the school for electronic learning, were allocated to the bursars', examination and the Principal's offices respectively for clerical and processing of examinations. Similarly in one of the boys' schools in Nandi division, Boys, 3 out of 20 computers, i.e. 15% had been placed in the secretarial typing pool. Although this was considered noble, it had created gaps in the provision of electronic learning programs at this level. Besides, others are used by the classroom teachers for course preparation, student resource management and record keeping.

Table 4.4

Selected uses of Distributed Computers

	Nandi Hills	Tinderet	Kemeloi	Ol'Lessos
Computer for learners	82	95	168	72
Computers for administration	14	17	20	15
Total no. of computers	96	112	188	82

Electronic learning activities in Nandi South district have concentrated more on putting into place computer infrastructure that supports e- learning with very limited emphasis on content development and pedagogical aspects for teachers. The skewed allocation of available computers by school administrators and teachers to other areas has basically denied students the much needed resources to implement electronic learning in their respective schools. This is one of the factors which have been identified as contributing to the low computer: student ratio.

Table 4.4 shows that 14.5% and 15.2% of the available computers in public secondary schools in Nandi Hills and Tinderet respectively are allocated by school officials for general administration other than for implementation of Electronic learning. In total, 13.7 % of the computers available in the schools are used for administration purposes rather than for the intended purpose of implementation of computer aided learning. The study notes that whereas 13.8% of the computers available are used for administrative functions, a further 0.02% of the computers had totally broken down. This contributes to e-waste. These are considered to be hazardous electronic items both to the teachers and students.

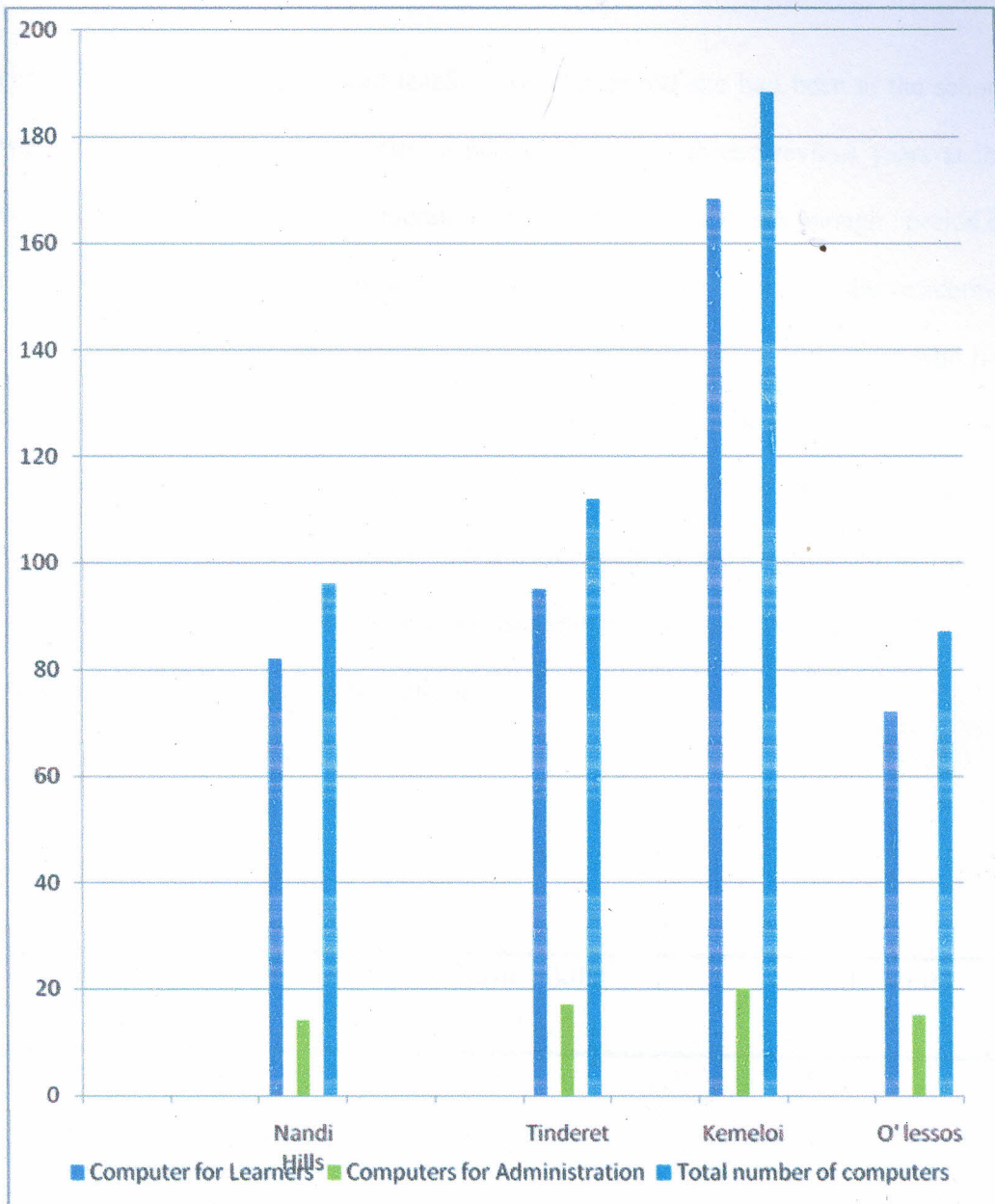


Fig4: *Distribution of computers for secondary schools and application.*

4.2.2 Head Teachers' computer competency

Using both Questionnaires and interview schedules for the head teachers and questionnaires for the teachers, the researcher notes several factors as influencing implementation of computer aided Electronic learning. Head teachers were required to provide their level of computer knowledge and competence. The number of all

computers acquired by the head teacher over the period she had been at the school was also recorded. For conformity, a period of at least three previous years at the current school was put into consideration.. It is assumed that this is enough period of time for the head teacher to have made an administration impact in the residential school. They were also asked to provide statistics on the number of teachers who had been given sponsorship for computer training by the school administration over the previous year. The following data was obtained as shown in Table 4.5. Head teachers with certificate skills in computer use and applications are categorized as having ability to use Microsoft word, whereas Basic skills includes knowledge of Microsoft word, spreadsheets as well as the internet.

Table 4. 5

Head Teachers' Computer Qualifications

Division	Certificate	Basic Skills	Skills(None)
Nandi Hills	5	4	3
Kemeloi	12	3	9
Tinderet	5	3	9
Ol'lessos	2	2	5
Total	24	12	26

The study shows that out of the schools sampled, 41.9% of the head teachers have certificate and Basic skills whereas 58.1% teachers have no skills in computer use and applications. These are the skills which can enable them impart the much needed pedagogical knowledge to the learners. Schools in Tinderet division lead all the others for having the largest number of head teachers with no skills in computer knowledge.

This corroborates earlier findings that indicates poor infrastructure in schools in the area. The division is located far from major towns such as Nandi Hills which is metropolitan.

Of great significance to the study is that 21.5% of the head teachers interviewed have acquired basic computer skills which enable them put in place an electronic learning program that involves Spreadsheets such as Excel, Access, and knows how to use Power Point knowledge in classroom instruction. Those who have acquired certificate knowledge are considered to have perfected computer knowledge applications in Basic skills with the added advantage of accessing, internet and analysis of data. Effectively, they are able to implement electronic learning programs within their respective schools.

Studies conducted by (Becker, 2013) suggests that those teachers with an orientation to collaborate with each other and toward taking a leadership role in their profession are also the strongest users of computers. In nearly every subject, a teacher who is "professionally engaged", interacts with peers on instructional and subject-matter issues, mentoring and teaching workshops and is more likely to have their students use computers regularly during class time. The above observation corroborates the study that indicates that head teachers' who take a leading role in acquiring computer skills knowledge are in the forefront in creating a good learning environment in their respective schools. They are able to provide leadership and in most cases are in a better position to provide sponsorship training for teachers under their care to undergo training in computers

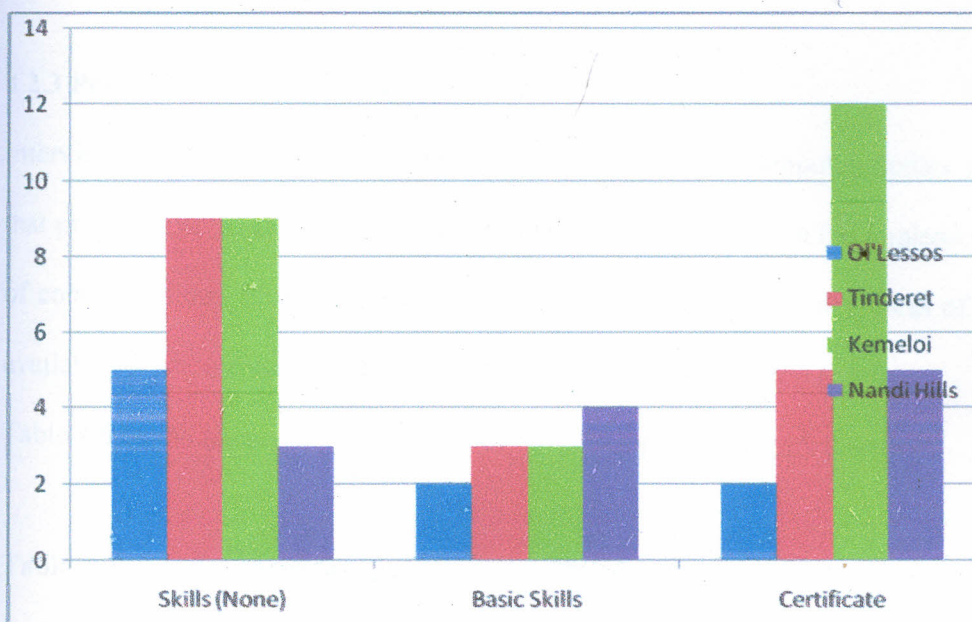


Fig5: *Computer skills of Head Teachers in Nandi South District*

Dinham (2005), asserts that leadership is important in developing effective, innovative schools and in facilitating quality teaching and learning through use of computers. The role of the head teacher is crucial in providing guidance, encouragement and conditions necessary to enhance the use of computers in the teaching profession. Bates (2000), argues that e- learning can provide opportunities for shifts in the culture of training and education .The cultural change largely focuses on the need for appropriate training needs of the teachers in the use of computers and related software. Evan & Hasse (2001), found out that learners normally lack computer proficiency and, since e-learning is centered on computer technologies, it is a barrier to those learners without good computer skills. Kember et al.(2001) mentions that preparation is indeed needed for newcomers in e- learning as they may think that nontraditional learning is the same as a traditional learning environment which involves face to face interaction. The current study therefore points out that computer knowledge and training of the head teacher is a boost to the implementation of computer aided electronic learning in the school where he provides leadership.

4.2.3 Power Source to Schools

Interview conducted among head teachers and teachers for computer studies showed that provision of power in schools contributed to a great extent in the implementation of computer aided Electronic learning in the institutions. Different sources of power available to schools were mains electricity, solar and power generators

Table 4.6 below shows the distribution of power supplies to sampled schools.

Table 4. 6

Power Source to Schools

Source of Power	Number of schools	Total number of computers
Mains Electricity	48 (68.5%)	395
Power Generator	05(7.1%)	104
Solar Power	03 (4.3%)	25
None	14(20.0%)	37

From Table 4.6, it is observed that some schools used a combination of main electricity and power generators; this category of schools is categorized as consumers of main power electricity.

Table 4.6 also shows that 68.5% of the public secondary schools in the district are connected to the mains electricity power supply. The schools with mains electricity connections have the highest number of computers because they have regular and reliable source of energy. The widespread availability of electricity would suggest that

other factors may actually be more important in deterring schools from implementing electronic learning than just the supply of electricity. On the other side of the scale, schools with no power supply have fewer numbers of computers.

In some areas of the district, limited availability of electricity was a significant constraint. For this group of schools, power was described as unreliable rather than entirely absent. Significant challenges are created when there exist regular power cuts due to national utility shortages and erratic outages as a result to failing transmission infrastructure. This constraint is simply articulated by a teacher: *'You may acquire technology but if you do not have power you cannot operate any equipment given'*.

Due to limited or lack of power infrastructure and connection to some institutions, three of the schools under the study have resorted to using diesel generators to provide energy to power their computers. This manner of sourcing power is highly inconveniencing because it is mostly used at night when most of the schools have already closed for the day, so they may no longer put to use this type of energy effectively. Any available computers are therefore underutilized; in which case negatively influencing the implementation of computer aided electronic learning programs. Collis and Moonen (2001), in the theoretical model mentions the school environment as being a major influence in the implementation of electronic learning. Environmental factors such as use of energy and other sources of power, positively influences implementation of computer aided electronic learning in the schools' wherever they are available.

In the implementation of electronic learning in remotely located schools in India, Ravichandran (2010), advocates for the use of VSAT (Very Small Aperture Technology), which are preferred due to their low power consumptions. Expansion of

education network to newer areas is made easy by simply plugging in new antennas at the sites. The current study notes that some schools in Tinderet division which are located in remote areas are not connected to the internet; thus, it is by using VSAT technology that they can be reached and students made to benefit from implementation of electronic learning.

As a tool for raising the number of marginalized groups students to have access to higher education, Electronic learning is a cheaper and more flexible alternative. (Dhanarajan, 2001; Patton, 2000; Potashnik and Capper, 2002) mentions the various challenges that are met when implementing electronic learning particularly in developing countries. These countries lack vital e-learning components such as computers, electricity and skills (Dhanarajan, 2001; Heeks, 2002; Rajesh, 2003). The studies shares the general view that lack of main electricity and other sources of energy to power computers are not unique to Kenya and Nandi South District.

4.2.4 Training and Sponsorship

Teachers in sampled schools were asked to provide information on whether they have attended any training on computer use and management during the previous year and whether any financial sponsorship had been provided to them by their respective school administration, more so by the head teacher. Responses of the teachers are shown in table 4.7.

From the table, it is noted that only 8% of the teachers have been sponsored more than twice for training in Basic computer skills, 22% sponsored twice, 33% once and 31% none at all. An interview with the head teachers reveals that despite their willingness to sponsor the teachers for training in use and application of computers, a large proportion are reluctant to take the challenge for various reasons. Some head

teachers cite technophobia; the fears of technology among members of their teaching staff, while others have shown no interest at all in the trainings.

Table 4.7

Frequency of training of teachers as per sponsorship by the head teachers

Response	Percentage value
None at all	37
Once	33
Twice	22
More than Twice	08

In conformity with the observation made in the study, head teachers who have acquired knowledge in computer application, created and provided sponsorship for training of their members of staff. Lack of appropriate training or re-training of staff is one of the biggest factors that negatively influence e- learning implementation in the public secondary schools in the district.

Inadequate sponsorship of teachers for training in the use of computers was also attributed to limited funding of electronic learning programs in schools. In many occasions, head teachers diverted money allocated under different vote heads to sponsor teachers for training in the use of computers. The findings of the study noted that there was good effort made towards implementation of electronic learning activities in the schools where the teachers had undergone training in use of computers.

Dawson and Rakes (2003), assert that in-service training is crucial and that it can improve teachers' efforts to implementation of electronic learning. It is on this basis that the more times a head teacher sponsors teachers for in service courses, the more likely they are to effectively implement computer aided electronic learning in their respective schools. Govindasamy (2002), notes that successful implementation of e-learning environments requires an understanding of the pedagogy and technological integration for learning to take place effectively. This implies that there is need to identify and evaluate pedagogical aspects that enable learning to occur and then appropriately apply technologies to them.

The frequency of training of the teachers is shown in figure 6.

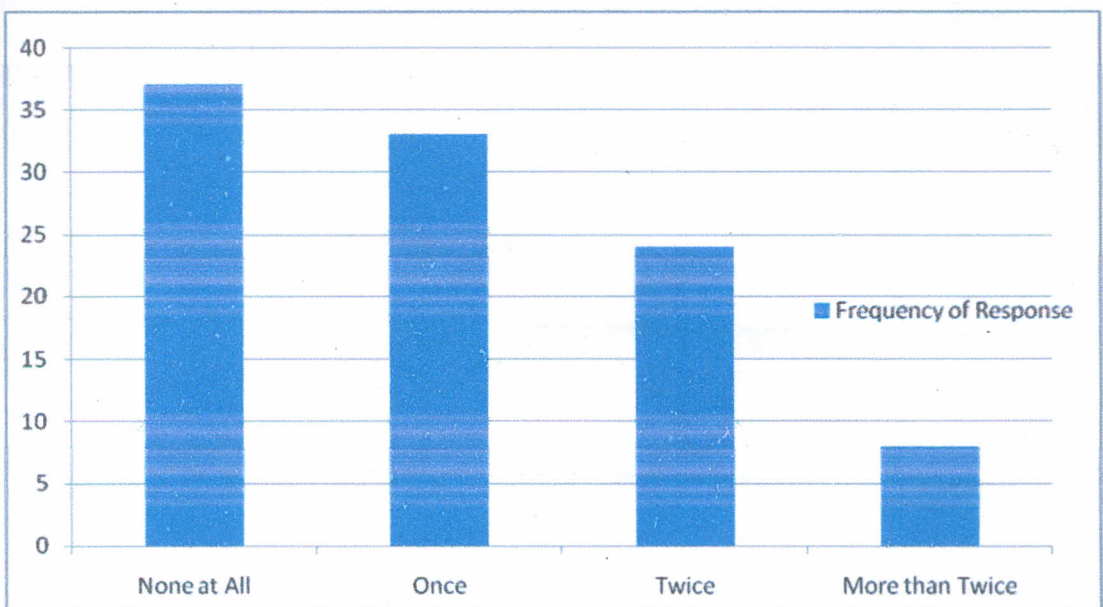


Fig 6: *Frequency of training of teachers as per sponsorship by the head teacher*

As argued by (Walker, 2002; Duguet, 2002; Lally, 2002), teacher education and training is considered to be the single most important factor in ensuring successful use of computers in education. Its importance has been overlooked or underestimated in

the development of initiatives when introducing technologies into schools with the result that electronic learning initiative fails outright or are never developed to full potential. Teacher education is considered vital for equipping teachers with the much needed skills in application of computers.

A study by Carr, (2004), also mentions that lack of ICT skills is one of the barriers in e-learning training. As e-learning is the product of advanced technology, e-learners will have to learn new skills and responsibilities related to the technology (Angelina, 2002a, p.12).

4.2.5 Distribution of Computer Laboratories

The numbers of computer laboratories put up for each of the sampled schools were counted. The table below shows the number for each division.

Table 4.8

Distribution of Computer Laboratories

Division	No computer labs	Percentage computer labs
Nandi Hills	4	28.13
Kemeloi	13	40.63
Tinderet	8	21.88
O'lessos	7	21.70

Table 4.8: shows that computer laboratories are available in less than 30% of the public secondary schools in each of the Divisions. It cannot however be verified whether most of the schools are putting more priority in the construction of computer

laboratories as compared to other physical facilities. The study notes however that some schools have converted classrooms to be used as computer laboratories; in which case, the facilities have been designated as computer laboratories.

Fig 7 shows the percentage number of computer laboratories for sampled schools for each division in the District.

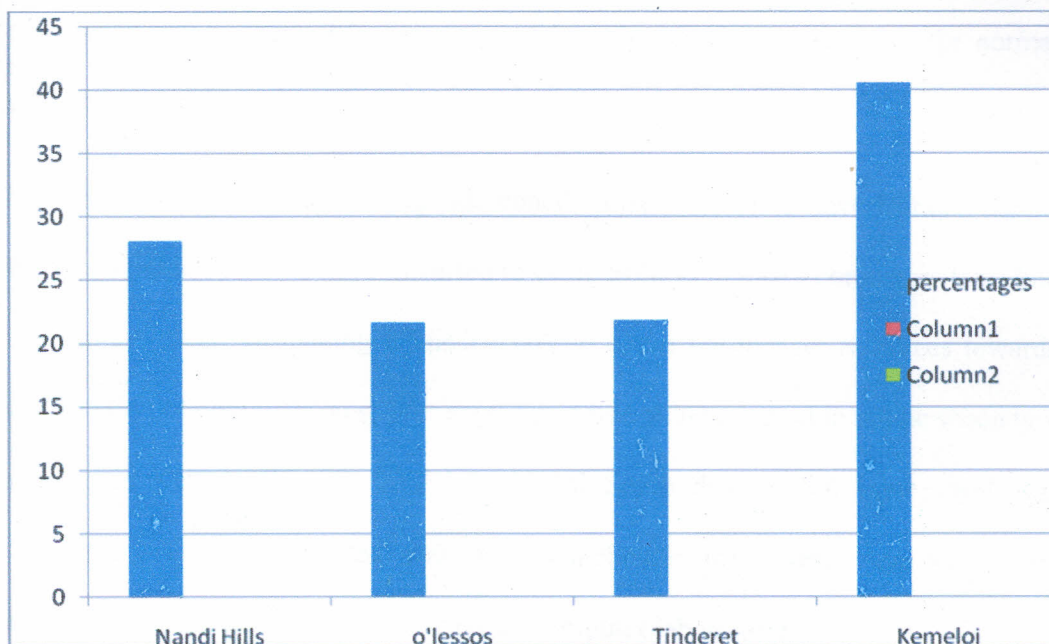


Fig 7: Distribution of computer laboratories

From interviews conducted with the head teachers, information obtained shows that computer laboratories are constructed with the assistance of Boards of Governors and through funding from well wishers. The headteacher initiates the construction activities and makes proposals for action to be taken. In order to accommodate as many workstations as possible, some head teachers have converted other unoccupied buildings to be used as computer laboratories. Kemeloi division which has the highest number of computers available coincidentally recorded highest number of computer laboratories put up. Similarly, Nandi Hills with fewer computers comparatively put up

fewer computer labs. Though computer laboratories are constructed by school administrations and stakeholders, studies show that they were not a major requirement when adopting electronic learning. It is observed that 10% of schools sampled use trolleys to move computers from a central location to the classrooms where students had regular instructions conducted. This means that the computers are kept in a centralized place where they are wheeled into the classrooms reserved for normal every day instructions.

Studies made in Bulgaria and Uganda concur that in order to have learners access more computers, schools have reverted to using trolleys to move computers from one class to the other; so making it unnecessary to divert the meager resources towards construction of computer labs. This same trend was being adopted in public secondary schools in Kenya (KESSP, 2005). In Nandi South district, the same trend was observed. The study noted that with stakeholder initiatives, more and more classrooms are being renovated to serve as computer laboratories.

4.2.6 Internet Connectivity

Respondents were requested to provide information on the number of computers available in their institutions which are connected to the internet, ISP providers and sources of funding for implementation of electronic learning in their schools. A count was also made on the number of computers which are connected to the internet for school sampled. A cumulative statistic for divisions was conducted.

Table 4.9 shows that less than 10% of numbers of computers available in each division are connected to the internet. In the study, it is also observed that no school has engaged an ISP to provide internet connectivity; but wholly depends on the use of modems to make connections. Schools in remote locations of Tinderet and Kemeloi

experience various barriers to connectivity. In schools located in these areas, low data transfer speed that slows down the working with the internet is noted to interrupt lessons. This is due to the fact that the schools in these areas are located in mountainous terrain, so to get data connections using modems is difficult.

Table 4.9

Computers connected to the Internet

Division	Total No. pcs	Total No. pcs connected to internet	%age pcs connected to internet
Nandi Hills	150	11	7.33%
Kemeloi	173	10	5.80%
Tinderet	111	11	9.90%
Ol'Lessos	87	05	5.74%

These were presented on the table and presented on table and pie chart

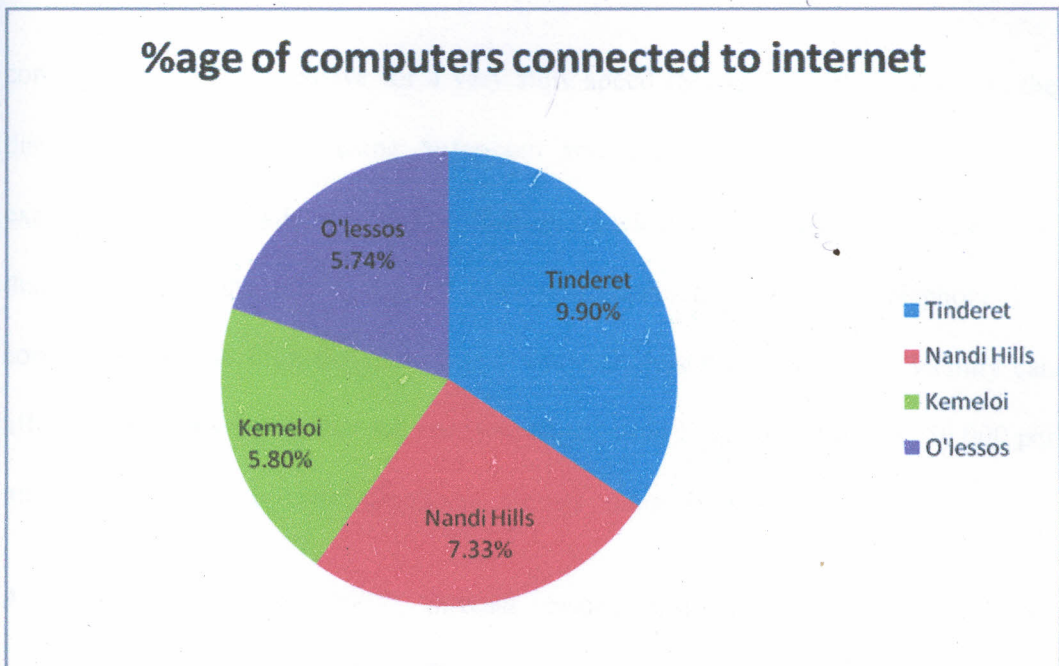


Fig 8: *Pie chart showing internet connectivity Distribution in schools*

Practical issues such as hardware (accessibility to computers), connectivity and networking (access to the Internet) often influences a teacher’s decision to use computer resources in teaching and learning sessions. Inter-school networks that can enhance electronic learning among neighboring schools are lacking since they are yet to be established. This in effect has negatively influenced electronic learning programs in the schools.

Respondents have a general view that limited bandwidth created big challenge to internet access at their respective schools. Most respondents feel there is need for the internet access to be faster, cheaper, more widespread and more reliable. Where the internet is available, lack of bandwidth makes it impossible to have meaningful interaction with the computers. On the other hand, where bandwidth is reliable, schools cannot afford to pay for it. . On average, it costs approximately Ksh 80000 per month to connect to about 15 computers on a bandwidth of 128/64kbps. This is

considered as very expensive for a very slow speed (Mungai, 2010). Schools in the district have resorted to using Safaricom and airtel modems which are equally expensive. Two schools in O'lessos division which have adopted modem telephone dial up connections to the internet have complaints that recurrent telephone line connections are so high that only a few well privileged schools in the vicinity can afford them. They report that the charges ranged from Shs. 30,000 to Shs. 50,000 per month on telephone bills accruing from internet connectivity alone.

According to (Wheeler, 2003), internet creates, fosters, delivers, and facilitates learning, anytime and anywhere. It provides connections to outside computers and also makes possible delivery of individualized, comprehensive, dynamic learning content in real time, aiding in the development of knowledge and links learners and practitioners with experts At the same time it enables teachers and students and keep pace with the rapid changes that define education trends .It is a force that gives a competitive edge, permitting teachers to participate in the rapidly changing global economy (e-learning.com, 2002). Clearly, the penetration of internet in secondary sector is significant. This study therefore identifies connectivity of computers available in the schools as a positive influence in the implementation of computer aided electronic learning in the public secondary schools.

Studies conducted in Tanzania by (Simba &Jeremy,2009) notes that most secondary schools in the country lacked internet connectivity therefore content for delivery to schools are hampered. This study is similar situation to that observed for the public secondary schools in Nandi South. However, in Tanzania, the study focused on 40 secondary schools based in 12 districts. The target study population was similar to the current study. The results of the studies are the same since they all concur that the

funds involved in having internet connectivity to the computers are high in both countries. Due to impediments in acquiring connectivity, the study observes that schools look for measures that will ensure that content available over the internet are stored and retrieved when needed. Alternative solution is to physically deliver the education learning contents using removable storage devices like CD-ROMs/DVDs, memory sticks/flash disks or mobile hard disks to the school's local Servers (LAN servers). A suggestion made by Simba et al (2009) proposes that schools be placed in clusters for cost sharing and cost reduction in connectivity. This is aimed at making the costs of internet connectivity affordable to schools which are located within the same geographical area. The expenses so incurred can be spread out to all the users.

4.2.7 Storage of Subject Content

The manner in which subject content is kept and disseminated to the learners is a major factor in implementation of computer aided electronic learning. Due to frequent interruptions and at times non availability of internet connections, it is necessary that subject content downloaded from the internet be stored by the teacher for use in subsequent lessons. It was therefore important to find out if there is any relationship between availability of computers connected to the internet and storage units. Computer teachers were asked to give storage options they had for storage of content subject matter obtained from the internet. The content storage facilities included CD-ROMS, memory cards, flash disks and Central processing unit of the computer.

The respondents concurred that all instructional content downloaded from the internet were stored in CD-ROMS. The researcher verified this information by finding out if there was any relationship between the number of CD-ROMS available in the schools

and the pcs. The table below shows results for sampled schools in O'lessos, Tinderet and Nandi Hills Divisions.

Table 5.0

CD- ROMS and Pcs for Public secondary schools of Olessos Division

Division	Pcs to internet	Printers/CDROMS acquired
O' lessos	11	87
Tinderet	19	111
Nandi Hills	16	150

The table shows that Nandi Hills division schools have the highest number of CDROMS to store subject content compared to other divisions.

Table 5.1

Correlation – pcs connected to internet and CD-ROMS for public secondary schools -O'lessos division

Correlations

		Pcs	Printers/CDROMS
Personal computers	Pearson Correlation	1	0.9057
printers/CDROMS	Sig. (1-tailed)	.	0.00012
	N	11	11
	Pearson Correlation	0.9057	1
	Sig. (1tailed)	0.00012	.
$r = 0.9057$	$r^2 = 0.81$	$\ell = 0.05$.

A single-1 tailed Pearson's *r* correlation was used .The table indicates that there is a positive correlation between the number of pcs connected to internet to CDROMS at $p > 0.05$ (95% confidence limits).It verifies that learning material obtained from the internet has a high chance of being stored in the CDROMS since they are the most available storage facilities in the institutions. The same studies was undertaken for sampled schools in Tinderet and Nandi Hills which are located in rural and Urban areas respectively

Table 5.2

Correlation between CD-ROMS and Personal computers - Tinderet Division

			Pcs
	Pearson Correlation	1	0.7710873
Printers/CDROMS			
	Sig. (1-tailed)	.	0.0001112
	N	19	19
Pcs	Pearson Correlation	0.7710873	1
	Sig. (1-tailed)	0.0001112	.
	N	19	19
R= 0.7710	R ² = 0.5929	ℓ=0.05	

The study also shows that as in the case of Olessos Division schools, there is positive correlation between the number of pcs connected to the internet in the schools and the number of CD-ROMS available. The correlation table below shows that R= 0.771, therefore R²= 0.5929. This was significantly greater than zero. It was concluded that the number of pcs available in the schools had high correlation with the number of CD-ROMS. On interview of the computer teachers, there was general agreement that they prefer to use CD- ROMS other than DVDs to keep information which has been downloaded from the internet. The sampled schools in the division; similarly stored education content in CD-ROMS.

The two tables shows that the number of computers connected to the internet varied from school to school. Equally the number of CDROMs as a storage medium varied for each school. Most schools in the district preferred to make use of CDROMs as the

medium for storing content downloaded from the internet. Not all schools are able to store education materials obtained through the internet in CD- ROMS. About 25% of the schools from the division do not have computers and CD-ROMS to help implement electronic learning.

The table indicates that for those schools that do not have a pc, there is equally no CDROM available. It means that the school has no way of implementing electronic learning using computers. The institutions wholly depend on the face to face traditional method of pedagogy. It can be concluded that the availability of CDROMS in schools positively influences implementation of electronic learning. It is observed that in the case where the school has more pcs than CD-ROMS, the computer teacher organizes for the subject materials to be shared from the available CD-ROMS.

Correlation does not necessarily mean causation. It does not mean that the availability of the CDROMs necessarily make the teachers decide to use them as storage devices. In most schools, CDROMS are put more to use because of their affordability compared to other devices such as flash disks. It is up to each teacher to determine how to use these resources to generate the greatest benefit. This is because content from the internet provides the student with the option and opportunity for study or clarification of particular concepts on given topics .Despite certain hurdles noticed, storage of subject content is a key factor which positively influences implementation of e- learning.

Table 5.4

Correlation – pcs and CD-ROMS for public secondary schools-Nandi Hills division

Correlations

		Pcs to internet	Printers/CDROMS
Personal computers	Pearson Correlation	1	0.8042
	Sig. (1-tailed)	.	0.00011
printers/CDROMS	N	16	16
	Pearson Correlation	0.8042	1
	Sig. (1tailed)	0.00011	.
$r = 0.8042$	$r^2 = 0.6402$	$\ell = 0.05$.

The data is used to calculate correlation between the pcs and CD-ROMS. The correlation value of $r = 0.8042$ is noted to be significant in that $r^2 = 0.6402$ which is significantly greater than zero at 0.05 confidence limits. This is observed, like in other schools in Tinderet and Nandi Hills divisions that there is a positive correlation on the number of available CDROMS and pcs.

It is an adaptation of the CD that is designed to store computer data in the form of text and graphics. Teachers can use the CD-ROM in conjunction with text in a number of different ways. The CD-ROM provides an enrichment of resources. According to (Tchinda, 2007), lack of textbooks and pamphlets to assist teachers and students to work with causes a lot of problems since almost everything taught is got from the internet. This may mislead one because not all material can be valuable and correct.

The findings of the study, therefore puts the teacher to be in the forefront as a facilitator of knowledge.

4.2.8 Telephone Lines

During the interview, head teachers were asked to provide information on whether their schools have functional telephone connections. It is noted that 65% of the sampled schools are linked by telephone. The study also observes that there is limited penetration of the national physical telecommunication infrastructure within the district. This leads to little access to dedicated phone lines and high-speed connectivity for e-mail and the internet. No school has created a DSL (Digital Subscriber Line) connection with each other for internet connectivity. However, where such arrangements are made, the network can allow teachers and students to communicate between schools to share resources and data. A major hindrance to shared connectivity is the lack of funds to support it. This is supported by 60% of the head teachers who are interviewed. The study reveals that the Government has not allocated any funds to schools to cater for internet services; this in effect has slowed down the uptake of computer aided electronic learning within the public secondary schools. The DSL connections may equally be hampered by weak signals and unreliable internet connections. Schools may need to create intranet connectivity in order to improve on e- learning.

4.2.9 Technical Staff

Head teachers were requested to respond and give information on maintenance and upkeep of computers in their schools. It is observed that half of the schools in the district do not have trained technical staff to keep their computers in good functioning conditions so technical staff is outsourced from nearby town centers.

Delayed implementation of learning programs is experienced every now and then. In the study, 15% of sampled schools stated that there is always significant backlog of technical problems awaiting resolution. The study noted that in house technical support may be provided by the computer teacher but this tends to concentrate on area of end user computing and support through trouble shooting only. Whether provided by the school or externally, the facilities are essential to the continued viability of computer use in the given school. While the technical support requirements depends on what and how the computers are deployed and used, without on-site technical support staff, much time and money may be lost due to technical breakdowns. According to (Bull, 2010), it is essential to gain the support of all the staff who are involved in designing, implementing and maintaining the system. This observation is therefore in tandem with the results of the study which aims to find out the technical support required for a successful implementation of computer aided electronic learning.

4.2.10 Timetable

Respondents were requested to provide information on the number of teacher pupil contact hours on the timetable allocations to use of computers in any given week. It is noted that teachers tended to allocate approximately 3 hours per week on the timetable to study and upgrade their computer skills. This is considered adequate and appropriate. (Eadie, 2000) found out that a number of schools all over the world were rethinking creative ways of preparing their timetables to use for ICTs and computers with the needs of the learners being a key factor. They intend to provide larger chunks of time, more flexible access and more cross curricular and open ended tasks. This is line with the findings from this study which found out that schools in the

district are allowing more time for the students to practice with the computers, although the numbers of computers available for the purpose were few.

It was observed from this study that head teachers who are computer savvy were more supportive in allocating more tuition time to students access to computers, in effect creating more contact hours in implementation of Electronic learning. (Okereke, 2009) states that there is a compelling need for training and retraining of both teachers and students in the effective use of information and communication technology. This is quite in agreement with the results of this study which found out that the head teacher is key to support of training of teachers and supports imparting of computer skills to the learners.

4.2.11 Analysis of Factors

Within the survey, head teachers were asked to express what they thought were major factors influencing the implementation of computer aided electronic learning in the district and rank them.

Using Spearman's rank correlation, where n is the total number of selected factors where d was deviation from the mean $n=8$, which are the number of items. The head teachers who were selected for the survey had been provided with computers by the Ministry of Education and were in the process of implementing computer aided electronic learning in their respective institutions. Each factor was ranked by head teachers sampled from the public secondary schools in all the divisions. Spearman's rank correlations were determined against the number of computers. The Spearman rank correlation r signifies the magnitude and direction between two variables that are on interval or ratio scale:

Table 5.5

Head teachers ranking of factors

Factors	Tind eret	Ra nk	Kem eloi	Ra nk	Nandi Hills	Ra nk	O'les sos	Ra nk	Spearm an's <i>r</i>
Connectivity to internet	6	7	9	8	7	9	5	8	0.785
Knowledge of content	1	3	3	7	4	8	1	3	0.375
H/teacher support	2	5	2	3	3	7	2	6	0.625
Classroom provision	0	1.5	2	3	1	3	1	3	0.762
Laboratory availability	1	3	2	3	0	1	0	1.5	-0.2875
Training of teachers	2	5	2	3	1	3	4	7	0.525
software for computers	2	5	1	1.5	1	3	1	3	0.925
Location of schools	0	1.5	1	1.5	2	6	0	1.5	0.675

Lack of financial resources is the most significant influence reported by the respondents. This is linked to the expressed frustration by head teachers regarding the lack of resources available to purchase computers, pay for software and internet services, ($r = 0.785$), train personnel, ($r = 0.525$) implement programmes and maintain infrastructure within the schools ($r = 0.925$). The majority of head teachers work in small public schools and many of these directed their frustrations at the lack of available government funding.

The need for improvement in teacher training and the practice of teaching is the emphasis given by slightly over half of the respondents. The answers focus on how computers enables better quality and more diverse training to take place, and the way in which this has been done leads, in turn, to an improvement in teaching. They also

an emphasis on the positive manner in which the internet has opened up possibilities for the acquisition of materials for effective learning to take place; the majority of respondents identifies the financial cost of adequate network connections as a primary influence. Others highlight the significant bandwidth disparities within the district which has restricted implementation of computer aided electronic learning.

Respondents are unanimous that availability of computer laboratories was not a key factor in implementation of computer aided electronic learning ($r = -0.2875$). This factor may be due to the fact that most schools having converted available classrooms into computer rooms were least concerned with putting up computer laboratories.

4.2.12 Reference materials

In order for computer aided learning to be effectively implemented in the schools, Reference materials ought to be made available to the schools. The researcher requested for a list of reference materials from the head teachers.

The study shows that for schools that have initiated electronic learning, lack of educational content to be used on classroom instruction is observable. Apart from one girls' school in Kemeloi division which offers computer studies to her students, nearly all the schools under study do not have adequate and relevant reference materials such as books, journals and magazines. Students therefore, have to depend wholly on materials provided either as handouts or as resource materials kept in the CD- ROMS. Even computer manuals and pamphlets are lacking in the schools. The same case is noticeable for most school libraries in the district.

Practically all the teachers from the sampled schools do not have any knowledge on how to develop subject software for use in teaching. This, it is noticed is a possible

drawback for teachers and e-learning providers (E-learning guru, Newman, 2008). It is evident that for an effective implementation of electronic learning program in the district, teachers need to have knowledge of content preparation and not depend on content which may be foreign to the learners. To bridge the gap, Open Educational Resources (OER) are being used as a substitute. (OERs), are educational materials and resources offered freely and openly for anyone to use and under some licenses or to be re-mixed, improved and redistributed (Atkins, 2007).

E- Learning content also got a boost from firms which are working closely with the Ministry of Education. Others like the Belgium-based Televic Education were looking at providing the requisite technical support. The firm aims at delivering e- content to at least 240 secondary schools and teacher training colleges (Televic, 2009). Local based organizations have also taken a similar initiative by providing free content for students and teachers from where they can upgrade them to pursue higher education qualifications using online learning materials.

In their effort to support computer aided electronic learning implementation in the public secondary schools, Microsoft, through its corporate responsibility, has provided education software to the institutions in the district at subsidized fee. The free software reflects the current curriculum developed by the Kenya Institute of Curriculum Development (KICD). The development of the software focuses more on the science subjects whose teaching is relatively consistent internationally. It is noted that buying computers alone in schools is not enough but equipping the computers with the content is also very important. Digital content ought to be validated by KICD as is the case with the print curriculum support materials. This is to effectively ensure implementation of electronic learning in the schools.

4.3 Relationship between Head Teachers' Computer Qualifications and the number of computers acquired

The need to acquire computers for implementation of electronic learning in institutions of learning was a key factor in all over the district. Schools were sampled at random to determine Head teachers' computer skills in relationship to number of computers acquired by respective.

Table 5.6

Relationship between Head teachers' Computer Qualifications to the number of Computers acquired for whole District

Qualification	head teachers	computers acquired	Correlation
Certificate	32	24	0.9767
Basic Skills	12	26	0.6846
No Skills	19	12	0.0786

Statistics were provided also for the public secondary schools in all the Divisions. The table shows that there is positive correlation between the head teachers' qualifications in computer skills and the number of computers acquired by that particular head teacher. It is observed that the higher the qualification of the head teacher, the higher the correlation index comparatively. Other factors remaining constant, the head teacher who has basic skills qualification in the use of computers had acquired more computers than the ones with either certificate or no skills. It can be argued that the more computer savvy a head teacher is, the more computers he acquires either

through school purchases, donations from well wishers or through any other initiatives.

It is also observed that the higher the qualification of the head teacher, the higher the correlation index comparatively. Other factors remaining constant, the head teacher who has basic skills qualification in the use of computers had acquired more computers than the ones with either certificate or no skills.

Whereas availability of computers in the schools is important, training of teachers and head teachers in computer use and maintenance is equally critical. The study reveals that a school which has no electricity power connection, with the head teacher having no skills in computer use, did not acquire many computers nor printers. The same applies to other schools which have unreliable power connections. In the same institutions where the head teacher does not possess any knowledge on use of computers, it is noted that very few or no computers have been purchased or acquired. The study is in line with Githua, Mbugua & Muthomi (2011), who found positive attitude towards computer use as a teaching and learning tool amongst Kenyan secondary school Principals. The results also agree with findings of Empirica (2006) that Cyprus educators teachers and Principals held very positive attitude towards computer integration in the curriculum and use.

4.4.0 Level of Computer Awareness among Teachers on Electronic learning

Questionnaires were provided to the respondents and asked to give their responses on levels of awareness on a scale of 1-4. The rating was conducted by getting the means on a nominal scale. $\text{Mean} = (4+3+2+1)/4 = 10/4 = 2.5$. A mean of more than 3 was taken as agreed, whereas a mean of less than 3, was not aware. Respondents were provided with the Likert 4 scale on teacher computer awareness.

Table 5.7

Different levels of implementation Awareness

Level of awareness on computers amongst teachers in the public secondary schools

Item	Number of Respondents				mean
	A lot of awareness (4)	Some awareness (3)	Little awareness (2)	No awareness (1)	
1) Application of search engines in internet	52	27	55	126	2.5000
2) Use of computers for student assessment	119	65	14	12	3.3857
3) Application of hypermedia and features in classroom teaching	22	12	10	166	1.4761
4) Understanding concept of electronic mail ,administrative and education use	75	23	65	17	2.4571

Table 5.6 indicates that 44% of teachers sampled in the study show a lot of awareness on the use of computers as a tool for student assessment and 39.2% knows about applying the internet as a search engine. They are least aware about application of hypermedia and features in classroom teaching. While humans organize and catalog subject directories, search engines rely on computer programs. To use search engines effectively, it is essential to apply techniques that narrow results. The study notes that teachers who were in the sample population (mean, 2.500)had little awareness about the application of the internet.

Table 5.8

Responses on Computer Awareness

Item	Number of Respondents					Mean score
	S A (5)	A (4)	N (3)	D (2)	SD (1)	
Equipping schools with computers is very expensive	56	42	11	97	10	3.171 Agreed
Many teachers fear using computers for teaching and learning (Technophobia)	63	81	09	38	5	3.542 Agreed
Teachers need to be trained in content development before implementation of electronic learning	78	50	26	44	18	3.583 Agreed
Using computers in electronic learning implementation in schools will lead to lose of jobs by teachers.	55	21	17	44	79	2.671 Disagreed
A computer literate head teacher will fully support implementation of electronic learning in school	110	45	31		13	3.870 Agreed

4.4.1 Awareness Levels

The Table shows that there was a general **agreement** amongst the respondents on the following areas:

That equipping schools with computers was expensive (mean, 3.171). Respondents were quite in agreement with studies made by. ICT works, 2010) that “Computers are

still very expensive and despite spirited efforts by the government agencies, NGO, corporate organizations and individuals to donate computers to as many schools as possible, there still remains a big percentage of the schools unable to purchase computers for use by their pupils”.

Many teachers fear using computers in teaching and Learning (mean, 3.542). The study supports that made by (Brosnan, 2000a, 2000b; Rosen & Weil, 2000) which suggests that factors such as the context in which a teacher was first introduced to the computer, past failures and successes with hardware or software, and the current tasks being attempted, including the use of a new computer applications (Saadé & Otrakji, 2007), were all determinants of the state and type of anxiety the teachers were experiencing thus creating a state of technophobia.

Most teachers were unable to apply multimedia in teaching thus the low mean (mean, 1.4761).The introduction of multimedia into the learning environment and collaboration with learners from the school environment provides a much higher level of interactivity and makes experience more dynamic (Lucienne, 2013).

4.4.2 Computer Literacy among Teachers

A computer literate head teacher will fully support implementation of Electronic learning implementation in school; however the respondents **disagreed** that using computers in electronic learning implementation in schools will lead to lose of jobs by teachers (mean,2.671).Expressions of disagreement made by the respondents in the study may be valid in respect to studies made for public secondary schools in Nandi South district, (Mungai, 2010) also concurs that the teacher may fear being rendered irrelevant by the introduction of computers in his/her class. The ‘feel’ that the teacher still remains an authority and a ‘know it all’ in class is something that most teachers

cherish, and anything that makes them otherwise is deemed an enemy of the classroom” . Paivi and Siu (2006) in their study revealed that teachers had moderate knowledge of ICT and skills in using Computers. These findings are similar though based in different settings.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS & RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

5.2 Availability of computers in the public secondary schools

Even though 12% of the schools have more than 20 computers each to support e-learning, over 15% of the available hardware is used for other purposes other than for e-learning. The numbers of computers available for computer aided electronic learning are few. This goes to show that schools should acquire more computers.

Availability of computers is considered to be important because the computer is a basic resource to facilitate the electronic learning process. The use of computers provides innovative ways to complement the traditional student-teacher interaction in the district to optimize resource usage, sharing and collaboration.

5.3 Factors Influencing Implementation of Computer Aided Electronic Learning.

Minimal or lack of electricity in institutions is however not a deterrent factor in implementation of computer aided electronic learning. While 60% of the schools in the district have electricity from the main power lines 5% of them do not wholly depend on it to power the computers. This finding may reflect the level of exposure of the respondents have to other sources of energy; 16% of the respondents have not undergone any formal training in use of computers. A small number of the respondents may have missed training due to technophobia.

Poor internet connectivity to the schools is a key factor which negatively affects implementation of Computer Aided electronic learning in the schools.

Positive correlation between number of CDROMs and computers in the learning institutions pointed to the prevalent use of the equipment in storing subject content.

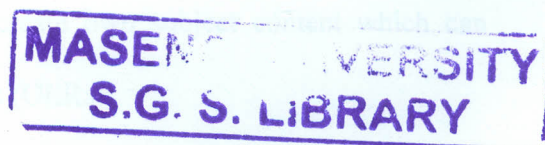
Schools are not necessarily concerned about construction of computer laboratories as key to the implementation of computer aided electronic learning, since available classrooms are easily converted to be used as computer rooms.

5.4 Relationship between head teachers' qualification and number of Computers acquired.

The study observes that where institutions have computer savvy head teachers, more hardware are acquired by the head teacher to enhance e- learning at the respective school. Where a head teacher has certificate and higher knowledge on use of computers, there is a comparative high number of computers acquired by him through stakeholders of the school or well-wishers.

5.5 Level of computer Awareness among teachers.

Less than 10% of the respondents are able to access and store information from the internet and use it in teaching. It is also observed that teachers show a lot of awareness in the use of computers for student assessment (mean, 3.3857), exhibits some awareness in application of internet search engines (mean 2.5000), but have little awareness on application of hypermedia and features in classroom teaching and learning (mean, 1.4761). However a majority of the teachers are in agreement that they need training in content development before implementation of electronic learning (mean, 3.5830) can effectively take place.



5.6 CONCLUSIONS

In conclusion the study was able to identify several factors that influence implementation of computer aided electronic learning in the district:

- i. Though computers were available in the schools, they were few in numbers as shown by the low computer: student ratios.
- ii. Results of the study have shown that limited internet connectivity to computers, inadequate teacher sponsorship to training, lack of relevant subject content and unreliable main electricity connections to schools as some factors which influence implementation of computer aided electronic learning in the public secondary schools
- iii. The type and qualification of head teacher is key to implementation of computer aided electronic learning. Where a headteacher has at least Basic knowledge in computers, there is high likelihood for her to support e-learning operations in the school.
- iv. The findings show that a majority of teachers lack awareness in the continuously changing trends in use of computers.

5.7 RECOMMENDATIONS

- i. The Ministry of Education needs to create a standard practice for the use, maintenance and enhanced availability of computers.
- ii. In order to effectively implement computer aided electronic learning in schools, stakeholders need to provide basic infrastructure such as electricity, connect available computers to the internet and create clear policies on training and computer awareness amongst the teachers. In the long run, teachers will need to be trained to create own subject content which can supplement Open Education Resources (OERs).

- iii. It would be more appropriate to employ head teachers who have the basic computer skills. The study has shown that these cadres of head teachers are more inclined towards promoting computer aided electronic learning in their respective schools as compared to the less skilled ones.
- iv. Every day changes in the field of computing require that teachers be exposed to new pedagogical skills through regular and sustained training thus creating the much needed awareness. This is important for effective implementation of electronic learning.

5.8 AREAS FOR FURTHER STUDY

Whereas the study is conducted in Nandi South district where most of the secondary schools are rural based, further research ought to be conducted on factors influencing implementation of computer aided electronic learning in urban secondary schools.

In addition, further research ought to be conducted to ascertain whether implementation of computer aided electronic learning may successfully be undertaken without the use of the internet.

REFERENCES

- Agak J. Ayere P., (2007), NEPAD E-Schools Study in Kenya.
- Ahmed, I, 2013 *A South African perspective*, *Journal of Educational*.
- Ajayi, G. O. (2005). Information and Communication Technology. Building capacity
- Akar, E., Ozturk, E., Tuncer, B. & Wiethoff, M., (2004), 'Evaluation of a
- Angelina, P., (2002a), 'Local initiatives in e-learning', The Star Tech Plus, 29 Aug., p.11
- Angelina, P., (2002b), 'E-learning: The alternative learning processes, The Star Tech Plus, 29 Aug., pp.9-12:
- Bates, A. T. (2003) *Restructuring the University for Technological Change*. London: The Carnegie Foundation for the Advancement of Teaching. Available at <http://www/bates.cstudies.ubc.ca/carnegie/carnegie.html>
- Blignaut, S., Trollip, S. R. (2003), *Developing Taxonomy of Faculty Participation in Asynchronous Learning Environments - An Exploratory Investigation*. London: pp. 107-204.
- Boyett, J. & Boyett, J (1998), *The Guru Guide: The Best Ideas of the Top Management Thinkers*. New York: John Wiley & Sons.
- Bridges.org, E-readiness Assessment Tools Comparison. 28th February 2005 (Updated)
- Brundrett, M & I Terrell, (2003), *Learning to lead in the secondary*. New York: John Wiley & sons
- Cantoni et. al. (2004), *Electronic Learning*. London:
- Chadwick C. *Training Room online News 24*
- CISCO (2002), Available <http://www.cisco.com/warp/public/10/www.training/e-learning>.
- Clarke, T (2001), effective head of Department, London Routledge Falmer. industry in Kenya collaborative virtual learning environment', *Education + Training*, vol. 46, no. 6/7, pp. 343-352. .
- Colle, R .D. (2005). *Building ICT4D Capacities in and by African Universities*, *International Journal of Education and Development Using Information and*

- Communication Technology*, Vol. 1, Issue 1, pp 101-107. Available at:
https://www.comrninit.c_qrn/en/no_de/221272/36 [Accessed 8 May 2009]
- Collis & Moonen (2002). *Flexible Learning in a Digital World*. Routledge
- Collis, B., (2001), *New Didactics for University Instruction: Why and How?*
 International Journal in Computers and Education, Vol. 31, pp373-393.
- Communications Commission of Kenya (June 2001). Status of the
 telecommunications.
- Country Profiles: Africa 2006.DIFD.
<http://www.dfid.gov.uk/countries/africa/kenya.asp>
- Créswell, J.W. (2003). *Research Design: Qualitative and Mixed Methods Approaches*
 (2nd ed.). London: Sage Publication.
- Curley M.(2009) Innovation to improve access to ICT in Education.ICT and
 MDGs:World Bank Group perspective, December 2003-2009
Education statistical booklet MOE, 2003-2007.
http://www.cck.go.ke/telecomu/status_tele_.html. in African Universities,
 conference proceedings. Nairobi Kenya - February 2005
- David, S. and Walonick, PhD,(2007), *Elements of a Research Proposal and
 Report*.London: McGraw-Hill.
- De Vaus, D. (2002). *Surveys in Social Research* (5th ed.). London:
 Routledge <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/KENYAEXTN/0,,menuPK:356536~pagePK:141132~piPK:141109~theSitePK:356509,00.html>
- Dede, L. 2010a, *Ict journal, vol 6, Jan. 2010*
- E-Learning conference, (2007), What is e-Learning? Nairobi, Kenya.
 Ethiopia; African Region Public Sector Group, World Bank.
- Fieldman, R. (1996), *Understanding Psychology* (4 Ed). Massachusetts: McGraw-Hill.
- Fraenkel, J. and Wallen, E.N. (2000). *How to design and evaluate education research*,
 (4th ed.) inc.
- Gall, D., et al (2007). *Educational Research: An Introduction* (8th ed.). New York:
- George, G. (2008). *Social Science Research. Theory and Principles*. Nairobi: Applied
 Githua ,M. Mbugua, N.Muthomi , W (2013). *International Journal of Information*
- Glen I.Shafika I. (2007), *Survey of ICT and Education in Africa; A Summary Report*,
 Based on 53 Country Surveys. Washington, DC: infoDev Available at
<http://www.infodev.org/en/Publication.353.html>. World Summit on the
 Information Society Declaration of Principles: Building the Information
 Society. A Global Challenge on the New Millennium, 2003
- Govindasamy, H.(2002),. *What the research says about ICT and classroom*
- Hinostroza E., Rehbein, L.E, Preston C., (2012) *elearning Africa*. <http://www.dfid.gov.uk/countries/africa/kenya.asp>

- Horton, W.K. (2001b) *Evaluating elearning Englewood cliffs NJ American Society for Training & Development (ASTD) press*
- Isaacs S. (2005) "Reaching MDG2.SchoolNet Africa" in 14D
- Jaganathannathan S. & Michelle D. Kalinski, (2001), E-Learning in the Commonwealth, Aga Khan University, Tanzania KENYA Vision 2030 document. "Kenya Internet Usage and Marketing Report." 2006. Internet World Stats. Kenya Commission for Higher Education. 2006.<http://che.or.ke/news.html>.
- K.R (2004).E-Learning compared with face to face: Differences in the academic achievement of postgraduate business students, Jossey-Bass, San Francisco
- Mugenda, A. Kpundeh S. et al (2008), Information and Service Delivery: Case Studies from Kenya and Ethiopia; African Region Public Sector Group, World Bank.
- KENET, (2007), E-Readiness Survey of Higher Education Institutions in Kenya 2006. Kenya Education Network, Nairobi, Kenya. Available at: <http://ntc.egerton.ac.ke/rapid-results-initiative-ict-facilities-improvement/Readiness>
- KESSP, Kenya Education Sector Support Program, (2005), Delivering Quality Education to All Kenyans
- King, K. & Palmer, R. (2007), Skills Development and Poverty Reduction: A State of the Art Review, Torino: European Training Foundation. Available at: <http://www.etf.europa.eu/pubmgmt.nsf/> (Web Publications) Open Document [Accessed 8 May 2009]
- Kothari, C. R. (2004). Research Methodology: Methods and Techniques (2nd rev. ed). New Delhi: New Age International (p) Ltd Publishers.
- Kpundeh S. et al (2008), Information and Service Delivery: Case Studies from Kenya and Ethiopia; African Region Public Sector Group, World Bank.
- Mary L. et al, (2009), Electronic Learning: Impact, New York: North Central Regional Educational Laboratory
- McNabb,N(2010),elearning,Anassessment[http://www.itu.mt/wsis/docs/geneva/official/dop.html](http://www.itu.itu.mt/wsis/docs/geneva/official/dop.html)
- Mentz, E. and Mentz, K. (2003).Managing Technology Integration in schools.
- MOE, Kenya, (2006), <http://www.education.go.ke>, ICT Policy and Strategy.
- Morris G. C. (2002). Psychology, an Introduction, Michigan: University of Michigan.

- Mugenda O.&Mugenda A. G., (2003), *Research Methods; Quantitative and Qualitative Approaches*. Nairobi: African Centre for Technology Studies (ACTS).
- Myra P. S. &Sadker M. D. (2003), *Teachers, Schools and Society*, 2nd Edition. Michigan: McGraw- Hill, Inc
- Nandi South district statistics (2008).
Online. Center for Development &Media Studies, India.
organization in schools. Retrieved November, 14 2005, from http://www.becta.org.uk/page_documents/research/wtrs_classroom.pdf
- Science and Education*. Vol 3 ISSN 2231-1262 Volume 3, Number 1 (2013) pp. 7-14 © Research India *Research and Training Services*
http://www.educ.cam.ac.uk/centres/cce/projects/ict/Lit_review_longer_paper.pdf Publications <http://www.ripublication.com>
- Odera, F. T. (2011), *Secondary schools, e- Learning implementation*, Thesis, unpublished
- Ogutu J.O,(2008) *The Impact of ICT Integration in the Six Nepad e-schools in Kenya*. Thesis
- Okereke L. (2009). *Information and communication technology*. Lagos: Macmillan publishers
- Omwenga, E.I. et al, (2004), *A Model for Introducing and Implementing E- Learning for Delivery of Educational Content within the African Content*,
- Oloo, L (2009) *e Learning in Kenyan schools*. Thesis unpublished *African Journal for Science and Technology (AJST)*, Vol 5, No 1: June 2004
- Paivi, A. Siu, C.(2006) *ICT in Education in Finland and Hongkong. An Overview of the present state of the Educational systems*, *Informatics in Education 2*, 183-194.
- Pelgrum and Plomp (eds), (1993). *The IEA Study of Computers in Education Project*. 2005-2006. E-Africa Commission.
www.eafricacommission.org/nepad_eschool_initiative.html
- Republic of Kenya (2006). *Ministry of Planning and National Development Integrated Household Budget Survey*. Nairobi. Government Printers.
- Samsung, S.(2013) *Journal of ICT vol 6; Aug. 2013*

- Sarah H. University of Cambridge, UK;(2007) E- learning handbook.
secondary schools in South Africa Smith, D.(2013) *Global development Newspaper* July 13, 2013. Prentice Hall Eagles Worth Cliffs.
- Shonerigun, C & Gray S (2003) Is e- LEARNING Really the future or a Risk? *Ubiquity* 4(10), 1.1
- Sibanda, D. Luciene, A, (2013) *Financing e-education Policy Goals in Public South African perspective*, Journal of Educational Administration vol. 41(2), 186-200. *Administration vol. 41(2), 186-200.*
- Stuart. T. (2010). *What the research says about portable ICT devices in teaching and Survey Handbook*, (2005a), *Republic of Kenya, 2001 Republic of Kenya. Data Profile. 2006. World Bank.* <http://www.education.go.ke/ICTFund.htm>
learning. Retrieved November, 14 2010, from http://www.becta.org.uk/page_documents/research/wtrs_porticts.pdf
- Survey Kenyan Higher Education Institutions Report 2007.pdf [Accessed 8 May 2009] <http://www.apcwomen.org> harnessing the Potential of ICT in Education. <http://www.itu.int/wsis/docs/geneva/official/dop.html>
<http://devdata.worldbank.org/external/CPProfile.asp?CCODE=KEN&PTYPE=CP> Kenya Institute for Education. <http://www.kie.20EDUCATION%20AND%20TRAINING%20JUNE%202006.pdf>;
The Australasian Journal of Educational Technology, 20(3), 313-316.
 “National ICT Policy.” 2006. Ministry of Information and Communications. <http://www.information.go.ke/docs/ICT%20Policy.pdf>. Tangia, R. Sustainable
- Tangia, R (2004). Sustainable ICT for emerging economies, Mythology and Reality of the Digital Divide Problem. A Discussion note.
- Televic, 2009, *weekly Magazine, January 2009, vol 10*
- UNESCO (2006) Revitalizing science and technology training institutions in Africa: the Wayforward. Nairobi: UNESCO, Available at <http://www.ansti.org/reports/RevitalizingScience.pdf> [Accessed 8 May 2009]

UNESCO (2002), The Eighth conference of Ministers of Education of African Member States Statement of commitment, Dar es Salaam: MINEDAF VIII
www.unesco.org World Bank Group, (2003), ICTs for Higher Education Background paper from the Commonwealth of Learning UNESCO

Visscheret *al.*, 2003; Mentz and Mentz, 2003 and Tearle, 2004), Handbook on ICTs Michigan Printers, Michigan

Valdez, G., et al (2000), Computer-Based Technology and Learning: Evolving Uses and Expectations. Accessed March, 2005.
<<http://www.ncrel.org/tplan/cbtl/toc.htm>> Ladys wsky,

Wamakote, L. Wambi, J (2003), Benefits of E-Learning, New York: The World Bank Institute.

Wangui P. (2013), Pondering E-Learning, Sunday Standard 27th January 2013,
World conference on Higher Education, Paris, 5th to 8th July 2009 ICT and MDG's
World Fact book 2007. <https://cia.gov/cia//publications/factbook/geos/ke.html>
www.internetworldstats.com/af/ke.html 11.NEPADe-SchoolsDemonstration