# ASSESSMENT OF FACTORS INFLUENCING USE OF COMPUTER TECHNOLOGY IN TEACHING OF MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN NAKURU TOWN SUB-COUNTY, KENYA

**BY**

**WINNIE MILKA KIPRONO**

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**DEPARTMENT OF EDUCATIONAL COMMUNICATION, TECHNOLOGY AND CURRICULUM STUDIES**

**MASENO UNIVERSITY**

## DECLARATION

This thesis is my original work and has not been presented for the award of a degree in this or any other institution**.**

WINNIE MILKA KIPRONO
PG/MED/0005/2012

SIGN…….. DATE……

This thesis is submitted with our approval as university supervisors.

1. PROF. F.C.INDOSHI

Department of Educational
Communication, Technology
and Curriculum Studies,
Maseno University.

SIGN…….. DATE……

2. DR.M. A.AYERE

Department of Educational
Communication, Technology
and Curriculum Studies,
Maseno University.

SIGN…….. DATE……

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## DEDICATION

I dedicate this work to my parents: Thomas Kiprono Ngetuny and Grace Tala Kiprono , all my brothers and sisters for their love and support.

## ABSTRACT

The study assessed factors influencing use of Computer Technology in teaching of Mathematics in secondary schools in Nakuru Town sub-counties, Kenya. Research done in developed countries had found that Computer Technology use in teaching was very little in teaching Mathematics. Its use help students learn by supporting computation and by giving abstract ideas a more perceptible form and therefore significant for Mathematics subject which is poorly performed. Existing literature shows that Computer technology can enhance instruction if basic conditions of teacher experience, provision of computer resources and positive attitude of teachers are met. The purpose of the study was to establish factors influencing use of computer technology in teaching Mathematics. Objectives of the study were to assess: Teacher's teaching experience, Computer Technology resources and teachers' attitude on use of computer technology in teaching of Mathematics. A descriptive research design was used. The study population was, 60 Mathematics teachers, 25 principals and 1 County Quality Assurance and Standard Officer (CQASO).A sample size for the study comprised of 10 Mathematics teachers, 10 Principals and one CQASO. Questionnaires, Computer Technology Lesson Observational Tool (CTLOT) and interview schedule were the main research instruments. Reliability of the questionnaire was established through test retest method and then accepted at Pearson value of 0.7 and above at alpha of 0.05 and were determined by piloting them in 2 schools forming part of population. Reliability coefficient for (CTLOT) 0.83. Validity of instruments was determined by the supervisors who confirmed adherence of items to research objectives**.** Data was analyzed by the use of the Statistical Package for Social Sciences (SPSS) to assess factors influencing use of Computer technology in teaching Mathematics. They data were presented in, frequencies, means, and percentages and tables. Qualitative data was analyzed thematically, transcribed, organized and reported in verbatim form. This finding showed that the use of Computer Technology in Teaching of Mathematics is more done by less experienced teachers and teachers' acquaintance with computer based resources, technical applications, technological errors associated with computer technology use in teaching, the nature of curriculum and students' characteristics are contributing factors to this. However, there were inadequate Computer technology resources and that majority of the teachers had negative attitude towards use of computer technology in teaching. The study recommends that Mathematics teachers should be trained on use of Computer Technology in teaching to enable them have hands on experience. Secondly, teachers should maintain a positive attitude towards integration of computer technology in teaching of Mathematics to accelerate its implementation. Finally, management of Secondary schools should provide adequate computer resources so as to facilitate realization of integration of teaching Mathematics.

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## LIST OF ABBREVIATIONS AND ACRONYMS

**AUC** - Actual Usage of Computer

**ASEI** - Activity, Student, Experiment and Improvisation

**CAS** - Computer Algebra System

**CFSK** - Computers for Schools Kenya

**CQASO** - County Quality Assurance and Standard Offer

**CVI** - Content Validity Index

**D.E.O** - District Education Officer

**GIS** - Geographic Information Systems

**I.C.T** - Information Communication Technology

**INSET** - In –service Education and Training

**M.O.E** - Ministry Of Education

**NEPAD** - New Partnership for Africa's Development

**PDSI** - Planning, Doing, Seeing and Improvisation

**PEPG** - Program on Education Policy and Governance

**SACMEQ** - Southern Africa Consortium for Monitoring Education Quality

**SMASE** - Strengthening of Mathematics and Science Education

**STEM** - Science, Technology, Engineering and Mathematics

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# CHAPTER ONE

# INTRODUCTION

## 1.1 Background to the Study

High rates of achievement in education are critical for transfer of technology and implementation of relevant changes in our society. Education achievement is one of the opportunity factors that will promote economic growth and reinforce equal pattern of globalization (United Nations Education, Scientific, and Cultural Organization (UNESCO, 2011) in Kuvuuka (2013).

According to Tomei (2005) the rapid growth in use of computer Technologies have brought outstanding changes in the twenty-first century, as well as affected the demands of modern societies. Use of computer technology is increasingly becoming very important in our educational system. Therefore, there is a growing demand on educational institutions to use computer technology to teach the skills and knowledge students need for the 21st century. Realizing the remarkable importance of computer technology, educational institutions try to restructure their educational curricula and teaching facilities, in order to close the existing computer technology gap in teaching. This restructuring process requires effective adoption of technologies into existing environment in order to provide learners with knowledge of specific subject areas, to promote meaningful learning and to enhance professional productivity.

In China for the last two decades in higher education process, Computer Technology in education has made significant progress, changed the quality of education and it is clear that students are changing by using computer technology tools (Finger, *et al* 2007) cited in Kuvuuka (2013). Developments in computer technology have affected all sectors of the society and education sector is not left out where it can improve students' learning by

changing the way teachers teach and the structure of their pedagogies (It empowers secondary school students to develop new ways of thinking, being and acting in the world and begin learning (Khine & Fisher, 2003,Shear & Knobrel, 2003) in Kuvuuka( 2013).

Computer Technological education is used to support teaching, delivery, development, and effective use of computer technology as an aid to problem solving. (Watson *et-al*, 2003) in Kuvuuka (2013). Hence, Computer technology in teaching can influence changes in what and how the learners learn. According to Castro (2003) and Cawthera (2000) computer technology has the means to aid in the preparation of learners by developing cognitive skills, critical thinking skills, information access, evaluation and synthesizing skills. Similarly Hardman (2005) argues that "placing this new technology in schools could help alleviate the deepening crisis, enabling shifts in pedagogical practices and thus potentially benefiting students' learning".

Many authors have documented huge benefits that computer technology resources bring to teaching. For instance, according to Porzio (1995) , Hung and Khine (2006) in Monyoro (2013) calculus students who used mathematica (a Mathematics software) were better able to make connections between numerical, graphical and symbolic representations than students learning via traditional methods such as lecture method, historical method, book and pencil exercises and teacher-centred teaching. The assertion is supported by Roddick( 1999) Hung and Khine (2006) and in Monyoro (2013) found out that engineering mechanic students who used mathematica solved problems requiring calculus more conceptually when compared to students learning via traditional methods such as lecture method, historical method, book and pencil exercises and teacher-centred teaching focusing only on the procedures

There is need to increase literacy among students through the use of Computer Technology as it can increase students' understanding of mathematical concepts as there are various uses of

Computer Technologies in Mathematics education. Computer Technology can provide multiple representations of concepts. For example, the concept of a "rate" can appear as the speed of a moving character, the slope in a graph, and a coefficient in an equation. With technology, these can be linked, so that a student who makes the slope "steeper" in a graph can see that this implies a bigger number in the equation and a faster motion an animation. For example, in a variable m in $f(x) = mx + c$ represents a rate of change when the function is graphed and students could explore the connection between m and the gradient (slope) of the line (Roschelle *et al*., 2007).

Computer Technology can be used to handle arithmetic detail, the detail of graphing, transforming algebraic expressions, computing geometric properties, and more. Technology could reduce the effort devoted to tedious computations and increase students' focus on more important Mathematics. Snir (1996) in Hung and Khine (2006) argues that computers can make a sole contribution to the clarification and correction of commonly held misconceptions of phenomenon by visualizing those ideas. For instance, he suggests that the Computer Technology can be used to form a representation for the phenomenon in which all the relational and Mathematical wave equations (trigonometry III) are embedded within the program code and reflected on the screen by the use of graphics and visuals. Such use, according to Anderson, Boyle and Yost, (1986) in Hung and Khine (2006) makes the computer an efficient tool to clarify scientific understanding of waves and other Mathematical topics.

Mathematics has been recognized worldwide over the ages of civilization as a vital tool for survival particularly in areas of science and technology. Mathematics education therefore has increasingly become science and technological oriented. Besides this, the subject is rated as poorly performed and teaching it with technology is already in place, thus this study sought to

establish the influence of factors affecting use of computer technology in teaching Mathematics in pubic secondary schools in Nakuru Town Sub-Counties

According to Cuban, Kirkpatrick and Peck (2001); Hoyles, Legrange, Son, and Sinclair (2006); Ruthven and Hennessey( 2002), Wallace (2004) use of Computer Technology in teaching was very little in Mathematics classrooms and that inadequacy of Computer Technology resources, negative attitude of teachers and teachers' level of experience are the main factors that influence use of Computer Technology into teaching process . Although there are numerous research on the positive impacts of computer-Assisted Learning (CAL) in foreign countries and higher institutions of learning including institutes of technology, polytechnics and universities in Kenya, the high school Mathematics teachers have done very little to use this technology in teaching. This created a need for more research on those factors and several others which have not been identified that affect the performances in Mathematics. According to Schiller (2003) factors such as educational level, age, gender, educational competence in the computer for educational purpose and attitude towards computers technology can influence the use of computer technology. In this research, we discussed three factors that influence use of Computer Technology in teaching Mathematics focusing on improving performance in Mathematics by making abstract concepts easier for students. According to Odera (2011)many science and mathematics teachers shy away from using computer technology into their teaching despite the availability of computers in the schools.Also Clark (2000) remarked that few teachers used computer technology for instructional purposes and observed that generally computers are not are not being used most instructional curricula. Heinich et al (2002) noted that advancements in computer technology have now made it possible to use computers into the teaching of science. They stressed that the emphasis in teaching and learning should now be on providing learners with the opportunities for problem solving. This he believed should include cooperative learning

methods which may not necessarily require additional special training in the part of the users. He further stated that computers are now more of a natural tool to use in teaching and learning because a wide variety of software is available. This provides students with experiences to work together to solve complex problems. Heinich *et.al* (2002) believes also that when the computer technology is used in teaching, students will be able to incorporate several different types of computer applications to explore a problem in a particular field. So the traditional method of teacher centered instruction used by most teachers will change. The students will learn by doing which is the corner stone of all science learning. The students will also learn to explore topics in science and create meaningful learning experiences for themselves Heinich et al (2002). Using computer technology in teaching teachers' role changes from that of the information provider to that of a facilitator of teaching (Clark, 2000).

Currently, the Kenyan government has made remarkable progress putting in place an ICT policy framework and implementation strategy complete with measurable outcomes and time frames. One key steps towards attainment of vision 2030 is the launching of National ICT policy in the year 2006 and main objective was making Kenya an ICT hub and a premier location for Business Process Outsourcing (BPO) in Africa of Millennium Development Goals (MDGs). The process got a support from Government officials, stakeholder and Ministry of Information and Communication. However, general implementation is challenging as there was lack of technological resources.

In Kenya, due to the Government initiative through the Ministry of Education and other stakeholders, there has been massive rollout of computer hardware and software to learning institutions (MOEST, 2003-2004). This rollout was hoped would enable the learners in using the computers during their learning sessions be at par with the rest of the world. Education sector professionals were particularly keen to adopting the technology of using computers in

teaching and learning particularly of Mathematics and Sciences due to insight on its benefits in educational media instructions.

Empirical data from researchers such as, Nievergelt (1986) in Hung and Khine (2006) and Bollinger (1986) have documented many potential benefits of using computers in Mathematics education, an area that has presented a lot of challenges to learners particularly at the secondary school level. However, information obtained from most learners and their teachers in secondary schools particularly in Nakuru Town sub-counties indicate that most schools are yet to use of computers in teaching and learning of Mathematics. This study therefore sought to investigate the factors affecting use of computers in teaching of Mathematics in secondary schools in Nakuru Town Sub-Counties, Kenya to document the challenges that might still be prevailing in our learning institutions. Several researchers have studied these factors and classified them as either individual, school, system factors, extrinsic or intrinsic. Becta (2004) classifies the factors as either teacher level or school level factors. Teacher level factors include lack of time, lack of confidence and resistance to change while school level factors consists of lack of effective training in solving technical problems and lack of access to resources These studies therefore focused on other factors that affect use of computer technology in teaching at secondary schools in Nakuru Town Sub-Counties.. It therefore focused on influence of teacher teaching experience, Computer Technology Resources and teachers' attitude on the use of Computer Technology in teaching.

According to Anita and Smriti (2013) Education been a key sector in the Kenyan economy and has not been spared either. Computer Technology use provides a collection of great tools that can help in changing the teacher-centered and text-bound teaching into technology enriched, student-centred and interactive knowledge environments. Educational institutions are under increasing pressure to use the new Computer Technology to teach students the knowledge and skills they need in the 21$^{st}$ century (Wan, 2011). Computer Technology use

have the potential to transform the nature of education, where and how teaching and learning take place and teachers role in the teaching.

The 21st century has witnessed an advanced development in information communication and technology (ICT) through the introduction of undersea fibre optic cables which link the whole world through the computer technology (internet), making the world a global village (Deepark & Turner, 2006). Furthermore, there has been an increase in access to computers due to tremendous advancement witnessed in Computer Technology hardware and software engineering which has resulted in the lowering of the prices of desktop and laptop computers (Garrison and Anderson, 2003).

Governments of the world over have invested heavily on the provision of Computer Technological resources in public schools. The United Kingdom in the 2008/09 financial year budgeted 2.5 billion pounds while the USA used $ 6 billion in the same period for the provision of ICTs in education Nut (2010) in Manyoro (2013). According to Manyoro (2013) Kenya intended to use $ 600 million (Ksh. 53 billion) in three consecutive years to provide laptops to all pupils joining class one starting from January 2014. This was in addition to annual budgetary provision aimed at providing Computer Technology facilities to educational institutions. The huge investment aimed at creating knowledge based economy that will steer the country towards achieving Vision 2030. Apart from the provision of laptops to pupils, the government has also put in place measures that will equip teachers with the necessary skills for the successful implementation of the project.

Today, there is a growing awareness among global policy makers and educators that the education system needs to be reformed if it is to effectively equip students with the knowledge, attitudes and skills that they will need to succeed and thrive in the society. Currently a move towards the use of pedagogy which for the purpose of this study means the

use of computer technology in teachings and computer technology related technologies for educational purposes is being observed. Computer technology Programs have been developed to assist the teacher in presentation of lessons in an interactive and user friendly manner. This has encouraged the use of Computer Technology in teaching.

In Kenya Certificate of Secondary Education, Mathematics performance has consistently been low among students at the secondary school level as compared to other subjects (Table 1.3).In Kenya National Examination Council (KNEC) indicates that, students were failing, especially in Mathematics because their teachers were drilling them to pass exams by memory instead of learning (Otieno, 2010**).** Abstract concept in the subject like loci, linear programming proving trigonometric ratios can be easily taught using spreadsheet (Benathy & Jenlik, 2004, Noss & Kent, 20004) and can make these concepts easier for learners. In Nakuru town Sub-Counties, besides poor use of computer technology, Mathematics performance has remained low for a long time.

Table 1.1 showed Mathematics performance in National Examination Mean Score for Nakuru sub-counties secondary schools for the period 2008-2016.

**Table 1.1: Nakuru Town Sub-County Mathematics Mean Score for the period 2008-2016**

| **Year** | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| **Entry** | 5294 | 3847 | 4104 | 3944 | 4110 | 3914 | 3826 | 4750 |
| **M. score** | 3.8982 | 2.9708 | 3.0363 | 3.040 | 3.220 | 4.1582 | 3.81 | 3.00 |
| **Mean Grade** | D | D- | D | D | D | D+ | D | D |

***Source: Nakuru Town Sub-County Kenya Education Statistics 2008 to 2016***

The mean grade attained is lower as seen in the table 1.1 above

**Table 1.2: Nakuru County Mathematics Mean Score for the period 2011-2016**

| Sub County | Rank | 2011 | 2012 | 2013 | 2015 | 2016 | Overall Mean |
|---|---|---|---|---|---|---|---|
| GILGIL | 1 | 3.030 | 4.520 | 4.298 | 4.720 | 2.88 | 3.8896 |
| NAKURU-NORTH | 2 | 3.960 | 4.320 | 3.870 | 5.300 | 3.87 | 4.27 |
| NJORO | 3 | 3.590 | 4.310 | 4.333 | 5.400 | 8.78 | 5.282 |
| SUBUKIA | 4 | 2.400 | 4.000 | 3.490 | 4.767 | 2.71 | 3.4714 |
| MOLO | 5 | 3.160 | 3.890 | 4.521 | 5.147 | 3.42 | 4.0276 |
| RONGAI | 6 | 3.280 | 3.760 | 3.602 | 4.902 | 3.08 | 3.7248 |
| NAIVASHA | 7 | 3.360 | 3.520 | 3.083 | 4.679 | 2.49 | 3.6264 |
| KURESOI | 8 | 3.450 | 3.480 | 3.584 | 4.361 | 2.42 | 3.459 |
| N.TOWN.SUB-COUNTIES | 9 | 3.040 | 3.220 | 3.602 | 2.582 | 3.00 | 3.0890 |
| COUNTYMEANS | | 3.252 | 3.891 | 3.881 | 4.939 | 3.09 | 3.8106 |

***Source: Nakuru County Education Office, 2018***

The mean grade attained is lower as compared to the mean grade obtained in other subjects and Nakuru town Sub- Counties were ranked the last in the county as seen in table 1.2. In the year 2011, Nakuru Town Sub-Counties had been defeated by Gilgil and Subukia but it had a low entry number as compared to them, also the mean grade had slightly deviated positively though there was low entry in the years 2012 and 2013.In 2014 there was no ranking of schools. The County mean-score dropped by an index 0.095 from 5.374 to 5.274.The slight improvement could be attributed to the teachers SMASE training on Computer Technology integration. This assumption had to be proved through research. This study therefore, sought to establish the influence of factors affecting the use of Computer Technology in the teaching of Mathematics and to establish the strategies that can be adopted to improve performance in Mathematics by students in secondary schools in Nakuru Town Sub- County, Kenya

**Table 1. 3: Nakuru Town Sub-County Subject Rank List**

| Subject | 2011 | 2012 | 2013 | 2015 | 2016 | Overall | Rank |
|---|---|---|---|---|---|---|---|
| C.R.E | 6.284 | 5.661 | 6.496 | 6.706 | 5.89 | 6.287 | 1 |
| HOMESCIENCE | 4.800 | 6.276 | 6.744 | 6.708 | 6.26 | 6.132 | 2 |
| ENGLISH | 5.274 | 5.108 | 5.695 | 5.633 | 3.925. | 4280 | 3 |
| HISTORY | 5.394 | 4.829 | 6.010 | 5.463 | 5.295. | 4240 | 4 |
| KISWAHILI | 4.950 | 4.299 | 5.517 | 5.154 | 4.66 | 4.980 | 5 |
| GEOGRAPHY | 4.611 | 4.771 | 4.803 | 5.425 | 5.56 | 4.903 | 6 |
| PHYSICS | 4.211 | 4.100 | 6.086 | 5.893 | 5.02 | 5.073 | 7 |
| BIOLOGY | 4.130 | 3.894 | 5.033 | 4.920 | 3.60 | 4.494 | 8 |
| CHEMISTRY | 3.319 | 3.548 | 4.157 | 4.464 | 2.98 | 3.872 | 9 |
| **MATHEMATICS** | **3.040** | **3.222** | **4.158** | **3.808** | **3.00** | **3.557** | 10 |

***Source: Nakuru County Education Office, 2017***

In table 1.3, Sciences were poorly performed as compared to other subjects but Mathematics was the worst of all even though it is not an optional subject this was in comparison with other subjects which had their own challenges.

In table 1.3, from 2012 to 2015, there was slight improvement and this could be attributed to Computer integration and the fact that revision materials could be obtained at a lower cost. This is according to an interview carried out during SMASE Science and Mathematics head of department meeting. This report however has not been verified as true report. The improved mean of 4.1582 was as a result of merging as explained by the D.E.O during 2016 Education day.

## 1.2 Statement of the Problem

The use of Computer Technology in teaching is a Government policy intending to facilitate learning through digitalization of content. However, this policy cannot take effect unless there is provision of adequate computer resources, training of teachers and change of attitude towards use of computers by the teachers responsible. In developed countries, Use of

Computer Technology in teaching is greatly advanced while there is a lag in African countries. Findings from research show that the extent of Computer Technology use in teaching activities is very low. This poses a question on the factors that influence the use of Computer Technology in teaching.

Computer technology use plays very important role in all aspects of life. Its usefulness, effectiveness and accuracy is very crucial. In Kenyan secondary schools, use of Computer Technology in teaching within the school curriculum is wanting. Computer Technology use has been lowered with teachers sticking to the old-fashioned "chalk and talk method'' of teaching. To realize the potential essential in computer technology, there is a need for innovative Computer technology tutoring in secondary school education. This requires relevant research on the use of Computer Technology in the teaching in secondary schools. Many researches have documented many potential benefits of using computers in teaching.

It has been known that Mathematics and Sciences subjects (Biology, Chemistry and Physics) are a thorn in the 'flesh' of most high school students in Kenya. Mathematics is considered as one of the most challenging and problematic subjects in the educational aspect besides it being one of the most important areas of science, given that mathematical skills and knowledge are important in everyday life, and there are also many mathematical applications in other subjects and sciences. Therefore, Mathematics is a basic tool in analyzing concepts in every area of human life. This is a reason why Mathematics is a subject which should be taken seriously. Teachers should focus on promoting the students' understanding of mathematical concepts which many students find difficult to engage in mathematical concepts bearing in mind that, for learning to take place, students need to be actively engaged with the explored concepts or objects – whether abstract or concrete .

Mathematics is a subject that has presented a lot of challenges to learners particularly at the secondary school level. However, information obtained from teachers in secondary schools particularly in Nakuru Town Sub –Counties show that most schools are yet to embrace and use computer technology in teaching of Mathematics. This study therefore sought to assess influence of factors affecting use of computer Technology in teaching of Mathematics in secondary schools in Nakuru, Town Sub-County, Kenya.

### 1.3 Purpose of the Study

The purpose of the study was to assess factors influencing use of computer technology in teaching Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.

### 1.4 Objectives of the Study

Objectives of the study were to:

1. Assess teachers' teaching experience on use of computers in teaching of Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.
2. Assess adequacy of computer technology resources in using Computer technology in teaching of Mathematics in Nakuru Town Sub-County, Kenya.
3. Assess the attitude of teachers towards use of computer technology in teaching of Mathematics Nakuru Town Sub-County, Kenya.

## 1.5 Research Questions

The study was guided by the following questions:

1. What is teachers' teaching experience in teaching of Mathematics and use of Computer Technology in teaching of Mathematics in secondary schools in Nakuru Town sub-county?
2. What is the adequacy of computer technology resources in teaching of Mathematics in Secondary schools in Nakuru Town Sub-County?
3. What is the teachers' attitude towards the use of computer technology in teaching of Mathematics in secondary schools in Nakuru Town sub-county?

## 1.6 Assumptions of the Study

The study was guided by the following assumptions:

1. That all school administrators were aware of the need to use computer technology in teaching.
2. That all Mathematics teachers in secondary schools in Nakuru Town Sub-county were trained in use of Computer Technology in teaching.

## 1.7 Significance of the Study

The findings might enable policy makers in the Ministry of Education and all other stake holders to formulate ways of making computer Technology use in teaching effectively in schools and ensuring that the teachers were experienced in using computer technology and have knowledge in the use of computer Technology in teaching of Mathematics.

The study will help understand factors that greatly influence the use of computer technology in teaching of Mathematics. The findings will also create opportunities for more research on many other factors which might have some influence on the use of computer technology in teaching. Also, the findings of this research may be used by scholars in the study of other

subjects and findings on teachers' attitude .It will also enable the school management to understand the teachers and formulate ways of helping them if need be.

### 1.8 Scope of the Study

The study was limited to public secondary schools in Nakuru Town sub-county .This is because it has a common source of funding as oppose to private where provision of computer resources varies. It involved 10 principals, 10 SMASE trained Mathematics teachers and one County Quality Assurance and Standard Officer (CQASO) as the sample size of the study. The two schools which were picked for piloting did not form part of study. This study employed a descriptive survey and it dealt with influence of factors (teachers' teaching experience, attitude and adequacy of Computer Technology resources) and Use of Computer Technology in teaching mathematics. Research instruments that were used to collect data were questionnaires, lesson observation schedule and interview schedule. The study used computer technology lesson observation schedule to obtain data on level of use of computer technology in secondary schools.

### 1.9 Limitation of the study

Limitation of the study was the use of questionnaire as main data collection tool. This had floor and ceiling effect because the items were close ended. It made it difficult to address issues of how and why in data collection. To address that, the research included open ended items as well as relying on other supplementary tools including observation and interview schedule for triangulation purpose and confirmation of data. Also the study covered three factors namely; teacher experience, adequacy of computer technology resources and attitude of teachers towards use of computer technology in teaching. These may not have been the only factors affecting the use of computer technology in teaching.

## 1.10 Theoretical framework.

On theorizing on the use of technology in Mathematics education, this research adapts the Tutor-Tool-Tutee notions, the White Box–Black Box idea, the idea of Micro worlds and Constructionism, and the Amplifier–Reorganizer duality. It focused on specific concerns related to using computer technology into teaching. The ideas related to specific types of software and not to more general theories on learning. This study focuses on computer technology resources. Adequate provision and consistent use of Computer Technology enable teachers to use Computer Technology in teaching of Mathematics and hence resulting to good performance in Mathematics. The use of Computer Technology in teaching of Mathematics improves when adequate Computer Technology Resources are realized in schools than when there are inadequate resources. It can be observed that all Computer Technology based resources are vital in use of computer technology and its decline may influence its advancement in teaching. However with inadequate provision, teachers withdraw from using computer Technology in teaching Mathematics resulting to poor performance.

Basing on Tutor, Tool, Tutee,with increasing spread of microcomputer, a framework was developed, which classified educational computing activity according to three modes or roles of the computer: tutor, tool, and tutee (Taylor, 1980). To function as a tutor, "the computer presents some subject material, the student responds, the computer evaluates the response and from the evaluation, determines what to present next. To function as a tool, according to Taylor, is to have the possibility to use the computer technology in a variety of ways. The tutee mode is to tutor the computer technology, by using the programming language to talk to it. In computer technology the teacher programme and use it as mode of instruction. In this study tutee is teacher teaching by programming the computer technology and for this to happen teachers' teaching experience and also attitude towards using Computer Technology

is important consideration. More experienced teachers (teachers who have taught mathematics for many years Mathematics) are more likely to use computer Technology than less experienced teachers. Computer technology in school affects the teachers' choice of using or not using a Computer Technology in teaching Mathematics. Computer Technology use in teaching of Mathematics is crucial in Mathematics teaching. This will be realized if teachers develop positive attitude towards it. On the attitude, focus was on whether teachers and students had a positive or negative attitude towards Computer integration in teaching negative attitude will result to minimal or no use of computer technology whereas positive attitude initiate well use of computer technology.

*White Box – Black Box.* A theoretical idea that focused on the interaction between the knowledge of the learner and the characteristics of the technological tool was the White Box/Black Box (WBBB) notion put forward by Buchberger (1990). According to Buchberger, the computer technology is being used as a white box when students are aware of the Mathematics they are asking the computer technology to carry out; otherwise the computer technology is being used as a black box.

*Microworlds and Constructionism*. This frame was based on the theory developed by Papert and Harel (1991) in relation to the notion of constructionism: "learning-by-making" (tutee mode). They provided examples of Microworlds, such as turtle geometry and defined them as worlds where ideas can be developed by exploring their properties.

Pea (1987) re-elaborated the psychological notion of cognitive tools for the case of technology in education. Computers have the potential for both amplifying and reorganizing mathematical thinking. However, Pea argued that the one-way amplification perspective, whereby tools allow the user to be more efficient and to increase the speed of learning, misses the more profound two-way reorganizational possibilities afforded by the technology.

In this research, the researcher constructed a theoretical framework inspired by these frameworks and based on this tutor tutee framework.

### 1.11 Operational terms.

Key terms used in the study are defined below:

1. **Use of Computer Technology**-Using of computer software and hardware in teaching of Mathematics.

2. **Computer Technology Resources.** In this study refers to available computer hardware and software, human resources (computer technician's computer teachers) and other applications like power point.

3. **ICT**-Is a set of technological tools and resources used to communicate and propagate mathematical information.

4. **Computer Technology integration** -Is the process of using Computer Technological tool in teaching of Mathematics.

5. **Policy –**The laid down plan on how computer technology integration in teaching of Mathematics.

6. **Teaching Experience**- in this study refers to number of years teacher has thought Mathematics.

7. **Teachers Attitude**-In this study refers to perception of teachers on integration of computer technology integration as measured in four likert scale.

8. **Technology**-Refers to resource materials used in teaching and learning of Mathematics.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

The literature review has been organized as per the three objectives. To: Establish influence of teaching experience, Establish influence of Computer Technology resources and to establish influence of teachers 'attitudes on use of Computer Technology in teaching of Mathematics**.** This study sought to assess influence of teaching experience, influence of Computer Technology resources and influence of teachers 'attitudes as some of factors that affect use of Computer Technology in teaching of Mathematics.

### 2.1.1 Teacher's teaching Experience and use of Computer Technology in Teaching of Mathematics

A lot of research had been done on use of computer technology ,some showed that teaching experience influenced the successful use of Computer Technology in classrooms (Wong & Li, 2008); while other research reported that teachers' experience in teaching did not influence their use of Computer Technology in teaching (Niederhauser & Stoddart, 2001). According to (Giordano, 2007; Hernandez-Ramos, 2005) teachers' teaching experience is widely linked with the use of Computer Technology. In an examination of teaching using computer technology in Italy, results showed that both personal theories of teaching and the level of experience with technology play a major role in how teachers use computer technology (Gobbo & Girardi, 2001).

According to( Bransford, Brown, & Cocking, 1999; Roschelle et al.,2001;diSessa, 2001), use of Computer Technology makes abstract ideas perceptible, teachers can easily build upon students' prior knowledge and skills, Stress more on the connections among mathematical concepts, Connect abstractions to real-world settings, Introduce more advanced ideas in

Teaching using Computer Technology hence improve Mathematics teaching. Mathematics' teachers can use Computer Technology in order to introduce Mathematics well (Roschelle et al., 2000). For example, teachers can focus less on memorizing facts and performing routine calculations and more on developing ideas, exploring consequences, justifying solutions, and understanding connections – the real heart of Mathematics (Heid, 1988).

In addition, more advanced mathematical topics could be introduced by Mathematics' earlier. However achievement of this is opposed by many related factors which affect its use in teaching**.** Research on improving education quality indicated that it could be done by making teachers more effective and have experience in teaching (Ewing, 1995; World Bank, 2006). The Working Group on Mathematics and Science Education (WGMSE) held firmly that teachers were a greater asset in education for dynamic evolution (Ministry of Education, 2007; SMASE, 2001) This is one of the reasons why teachers teaching experience in the use of Computer Technology was focused in the study).One important factor that influenced the use of Computer Technology in Mathematics teaching was Teachers' teachers 'teaching experience.

The findings of this research disagrees with Niederhauser and Stoddart, (2001), who asserts that teachers' experience in teaching did not influence their use of Computer Technology in teaching while most research showed that teacher experience was remarkably interrelated with the actual use of technology in teaching (Wong &Li, 2008;Giordano, 2007; Hernandez-Ramos, 2005). Gorder (2008) in her study revealed that effective use of computer technology was related to Computer technological comfort levels and the liberty to shape instruction to teacher-perceived student needs.

Also, Baek, Jong andKim (2008) claimed that experienced teachers were less ready to use Computer Technology into their teaching, this poses the question why. What length of

teaching experience are likely or do use Computer technology in teaching Mathematics remain unanswered question, thus this study established teachers' teaching experience on use of Computer Technology in teaching of Mathematics in secondary schools in Nakuru Town Sub-County Kenya.

According to the Ministry of Education, Science and Technology (Ministry of Education, 2007) report, the Government of Kenya (GOK) had continued to invest in quality education through cost sharing by funding In-Service Education and Training (INSET), providing free primary education and tuition-free secondary education. In addition to this, in the year 2012 Computers for Schools Kenya (CFSK) reported to have installed 18,000 computers in over 600 schools with 20 computers per school. The ICT Trust Fund had provided 200 schools with 20 computers each. The NEPAD e-schools project provided 6 schools with 20 computers each. The Rural School Project had provided 4500 computers to a number of unidentified schools. Overall, the analysis indicated that 15,450 computers had been disbursed to1300 secondary schools out of 4000 schools.

A project carried out in Kenya for both NEPAD and non-NEPAD schools found that the non-NEPAD schools had significantly less use of Computer Technology (Ayere, A., Odera F., & Agak. J.2010).The project had not given out the reasons behind this shortcomings and factors that influenced the use of Computer Technology in teaching as changes were expected in education sector. This project had not singled out each subject performance whether there was a positive or negative effect on the same and had not pointed out what could be done for schools with less use of Computer Technology.

Literature shows that the use of use of computer technology in schools is limited. According to Bingimlas (2009 cited in Kuvuuka (2013), "the process of using computer technology in teaching is a complex hence one can encountering a lot of challenges. A lot of factors

affecting use of computer technology in schools have been revealed which resulted to minimal use, hence leading to the capability deprivation of teachers to effectively deliver curriculum and to receive quality education using computer technology. These were grouped into personal, social and environmental factors.

According to (Manson, 2000; Lau & Sim, 2008), Such factors include teachers' confidence, knowledge and ability to evaluate the role of computer technology in teaching , and lack of training skills resulting to lack of confidence in utilizing computer technology in curriculum delivery. curriculum planning, technical support, training and personal development, the school council, the budget and the learning technologies committee were other major factors affecting use of computer technology Manson (2000). Access to equipment, time pressures, lack of mentors and opportunities for apprenticeship also effect teachers' ability to use computer technology in teaching (Slaouti & Barton,2007).

Several researchers have studied these barriers and classified them as either individual, school, system barriers, extrinsic or intrinsic. Becta (2004) classifies the barriers as either teacher level or school level barriers. Teacher level barriers include lack of time, lack of confidence and resistance to change while school level barriers consist of lack of effective training in solving technical problems and lack of access to resources. These studies classify the barriers at teacher, institution or system level. However, this study aimed at establishing the factors that influence the use of Computer Technology in teaching at secondary schools in Nakuru Town Sub-County. It therefore focused on influence of teacher teaching experience, adequacy of Computer Technology Resources and teachers' attitude on use Computer Technology in teaching.

Education being a key sector in the Kenyan economy has not been spared either. ICT provides an array of powerful tools that can help in transforming the present isolated, teacher-

centered and text-bound classrooms into technology enriched, student-focused and interactive knowledge environments. (Anita & Smriti, 2013) A case in mind is e-learning which is increasingly gaining momentum in Kenya. (Omwenga et al, 2004). Educational institutions are under increasing pressure to use the new information and communication technologies (ICTs) to teach students the knowledge and skills they need in the 21st century (Wan, 2011). Use of Computer Technology has the potential to transform the nature of education: where and how learning takes place and the roles of students and teachers in the learning process. Schiller (2003) highlights the link between on-site technical support and staff development, whereby the support can help teachers who wish to learn as they go, hence developing new technology skills whenever required

Researches done by Cox *et al* (1999); Mumtaz (2000); Grainger and Tolhurst, (2005) have shown that there are a wide range of factors which influence educators in using computer technology in their teaching. These include access to resources, quality of software and hardware, ease of use, incentives to change, support and collegiality in their school, school policies, commitment to professional learning and background in formal computer technology training (Cox *et al*, 1999; Mumtaz, 2000; Becta 2003). For many teachers who may have the capability to use computer technology, lack of self-confidence and in experience in using computer technology is noted strongly affect its use in teaching(Pelgrum, 2001; Becta 2003).

In a survey of almost 3000 teachers, Russell, O'Dwyer, Bebell and Tao (2007) argued that the quality of Computer Technology use was related to the teaching experience but no distinction has been shown as to which level of teaching experience do use computer technology while teaching as oppose to the other. This study was set to establish the influence of teachers teaching experience on use of Computer Technology in teaching of Mathematics.

Baek, Jong & Kim (2008) also claimed that experienced teachers are less ready to use computer technology into their teaching. Similarly, in United States, the (U.S National Centre for Education Statistics, 2000) reported that teachers with less experience in teaching were more likely to use computer technology in their teaching than teachers with more experience in teaching. The reason behind this may be that teachers with less experience do enjoy in using the computer technology. On the contrary, Lau & Sim (2008) conducted a study among secondary school teachers in Malaysia and their findings showed that teachers with more teaching experience regularly use Computer Technology in the classrooms more than the teachers with less teaching experience. These has left a gap as to which category actually do use Computer Technology in teaching Mathematics thus had left room for search of more research, reasons behind this and ascertains the extent of the truth and if it applies for secondary schools in Nakuru Town sub-County.

It has been known that Mathematics and Sciences subjects (Biology, Chemistry and Physics) are a thorn in the 'flesh' of most high school students in Kenya (Chiriswa, 2002; Kwaka, 2003**).** Mathematic teachings' education goal is to ensure the understanding of the subject matter by all students. Mathematics is considered as one of the most challenging and problematic subjects in the learning environment though, it is one of the most important areas of science, given that mathematical skills and knowledge are important in everyday life, and there are also many mathematical applications in other subjects and sciences. Christy (1993) in curie (2012) states that "Mathematics is a basic tool in analyzing concepts in every field of human endeavor. For these reasons, Mathematics is a subject which should be taken seriously. Teachers should focus on fostering the students' understanding of mathematical concepts and they should provide a quality education environment for them. Many students find it difficult to engage with mathematical concepts. For learning to take place, students

need to be actively engaged with the discovered concepts or objects – whether abstract or concrete (Liang & Sedig, 2010).

Ashburn and Floden (2006) also emphasize the importance of using technology in Mathematics, noting that tools that instantly relate the graphical and symbolic representations of mathematical expressions can help make understanding goals more accessible to students. "Simulations that make abstract concepts visible and manipulable can help students comprehend the nature and applications ''.

Notwithstanding this perception, performance in national examinations in the subject was still low. This fact is illustrated by the persistent poor performance by most of the students in the subjects. The dismal performance, according to most researchers could be attributed to teacher factor (experience in teaching, attitude), student factors and inadequate access to or use of instructional materials among others (Ogembo, 2012). This could be attributed also to abstract concepts in the subject. The use of computer technology in teaching abstract concepts would make it easier for learners to understand. This study sought to assess the teachers teaching experience in use of Computer Technology in teaching of Mathematics classroom teaching and thus this study borrows from this theory besides relying more on tutor tutee mode of instruction.

### 2.1.2 Adequacy of Computer Technology Resources on the use Computer Technology in Teaching of Mathematics

ICT refers to technologies that provide access to information through communication technologies like the internet, cell phones, instant messaging, social networking, videoconferencing, and wireless networks. ICT has allowed the world to become a "global village" and communicate with others around the world just like they were living next door to each other (Tech Terms, 2013). For teachers it makes it possible to have real-time interactions with their students in different areas of the world without ever leaving the classroom.

In today's classrooms computer technology is apparent in various forms from mobile labs, to interactive videos, computers, smartphones, iPads, iPods, tablets, shared stories, AT, and electronic blackboards. Having all this technology does come at a cost. It is hard to know about all of the different types and their functional uses, therefore decreasing a teacher's confidence level and use. That is why having computer technicians and professional training is so important. Computer technicians have knowledge and skills on use of the computer technology hence can provide the training and the ongoing support needed.

Global investment in computer technology to improve teaching in schools have been initiated by many governments. Old theories on using computer technologies in teaching includes theory developed by Papert and Harel (1991) in relation to the notion of constructionism: "learning-by-making" , a lot of examples of Microworlds, such as turtle geometry have been provided and defined them as worlds where ideas can be developed by exploring their properties. This was re-elaborated by Pea (1987) the psychological notion of cognitive tools for the case of technology in education. Computers have the potential for both intensifying and restructuring mathematical thinking. However, Pea argued that the one-way strengthening perspective, whereby tools allow the user to be more efficient and to increase the speed of learning, misses the more profound two-way reorganizational possibilities afforded by the computer technology.

Current developments of theoretical approaches in relation to studies on mathematical teaching with computer technology us focuses on: Situated abstraction which describes how learners construct Mathematical ideas reorganizing previously constructed Mathematics in a new Mathematics structure (Noss & Hoyles, 1996). Theory of Didactical Situations (Brousseau, 1998): within this framework the learning outcomes results from the use of an instrument at the practical level. Perceptuo-Motor Activity (Nemirovsky, 2003). Instrumental approach is one of the most dominant frameworks while considering the role of technology in

the teaching and learning of Mathematics, especially for the understanding of student-CAS interactions and their influence on teaching and learning. The theoretical foundations of this framework are both the cognitive theory (Verillon & Rabardel, 1995) and the anthropological theory of didactics (Chevallard, 1999).

On the semiotic approach, Semiotic mediation focused on the role of signs and symbols and their use or interpretation (Saenz-Ludlow & Presmeg, 2006). Through actions and tasks accomplished with artifacts, mathematical meanings are presented through different kinds of representatives – words, gestures, drawings – (Radford, 2003), disclosing the semiotic potential of the artifact. According to Newhouse (2002), computer technology -supported learning environments could be beneficial to a constructivist teaching approach. One of the most important components of the Constructivism Theory of learning is the concept of proximal learning, which accepts that a learner constructs his/her own knowledge for which scaffolding is initially required.

The scaffolding could be provided by a tutor or computer. Thus, the technology can be used to help create the types of learning environments and the types of support for learning that are known to be ideal; these are argued to have been ignored or failed to be widely implemented in the past (Newhouse, 2002). While computer technology may be used to either maintain a learning environment or used to support the learner in the constructivist classroom, it is advocated that a blend of instruction and construction is employed.

On Skinner's (1950) concept of programmed instruction stressed the need for total educational plan involving, recognizing objectives; ordering subject matter into logical sequences; preparing and trying instructional programs; and then implementing, testing, and revising them. Skinner's work emphasized the use of audio-visuals, which are well-illustrated in facilitating, individualized learning. This is the concept that Computer

Technology use in the teaching of Mathematics was hoped, would bring to the Kenyan classroom teaching.

Skinner's 'black box' theory and programmed instruction. B.F. Skinner's viewpoint is based on a definition of learning as an observable change in behaviour (Skinner, 1950). The potential of the computer technology as a teaching aid promises increasing design difficulty. In a teaching lesson, Computer Technology can present instructional input and require mastery of each step in ways that were not possible with the early machines. The sensitivity of the instructional designer to alternative patterns of student learning is the necessary key to total use of a Computer Technology capability. Well-designed intellectual games can provide appropriate environments in which to practice important problem-solving skills.

This theory is relevant in that the learning process is based on the principle of reinforcement and that the stimulus-response schema is based on the operant conditioning whereby an entirely new behavior is learnt to a familiar stimulus that is, Computer Technology instruction is equated to the conditioning of a desired behavior. The classroom is equated to the 'black box', with the Computer Technology as the device to be clicked by the student to give desired behaviour of positive results from the teaching process. This means that Computer Assisted instruction (CAI), has to present a stimulus, give feedback to the student's response (to the stimulus) and reinforces desired responses. The behavior to be learnt has to be split up in small components (computer tasks) which are presented to the student. The desired behaviour is reinforced through repetitions by the Computer Technology since it can go over and over a given concept several times based on the student's responses.

Skinner teaching machines provided programmed instruction, which allowed students to proceed through lessons by small steps, at their own pace, following an orderly sequence, and receiving immediate reinforcement for every correct response. Skinner's work emphasized the use of audio-visuals, which are well-illustrated in expediting individualized learning. This

is the concept that computer use in the teaching and learning of Mathematics was hoped, would bring to the Kenyan computer technology, infrastructure, equipment and professional development to improve education in many countries, using computer technology in teaching have been limited(International Journal of Education and Development 2012).

This study therefore assess factors influencing use of computer technology in teaching. The number of computers in secondary education has greatly increased. In United States, the computer to student ratio increased from 1:9 in 1996 to 1:4 in 2001. According to Market data Retrieval (2001), access to internet improved from 70% in 1997 to 92% in 2001. In New Zealand, the computer to student ratio is 1:6 in secondary schools (Lari, Pratt & Trewern, 2002) while 98% of all schools have internet connections (Mallard, 2003). Computer Technology is therefore tremendous as mode of instruction tool in teaching in the world. There have been a lot of studies on the importance of computer technologies in teaching. Louw, Muller and Tredoux (2008) argue that computer technology holds much promise for use in curriculum delivery. Thus, technology can effectively improve teaching capabilities, hence increasing learners' performances.

Use of Computer Technology in teaching has been shown to result to better educational outcomes. According to Kaput (2007) advanced tools are necessary as they help students learn by supporting computation and by giving abstract ideas a more perceptible form and Computer Technology applications are the right substantial form for secondary school. Computer Technology can support learning when appropriately used with teaching techniques, curriculum, and assessments (Means & Haertel, 2004). Educational capabilities increases when technology is improved. According to Deepark and Turner (2006), the emergence of cheap computer technology and mass storage media, including optical videodiscs and compact disks, has given instructional technicians better tools to work with . The newer technologies now being developed, they form commonplace in homes for both

entertainment and educational purposes. According to Nievergelt (1986) in Hung and Khine (2006); the appearance of microcomputers has initiated graphic animation and implementation of an increased variety of instructional strategies, such as simulation and modelling.

One of the goals for using computer technology in education is to enhance teaching practices thereby improving quality of education (Higgins, 2003). However, in most developing countries like South Africa, the potential of computer technology to support pedagogy is yet to be fully realized. To date most of the attention both on policy and research has been on how the lack of infrastructure and access to technology affect the use of computer technology in pedagogy (Koo, 2008). However, it has also been shown that even in cases where the infrastructure is available, few educators are effectively using computer technology in curriculum delivery (DeCorte, 1990; Becker, Ravitz, & Wong, 1999; Pelgrum, 2001; Becta, 2003). It can be said, therefore, that there are also non-technical factors that affect the use computer technology for curriculum delivery.

In South Africa, there have been a number of initiatives to make the technologies available in schools and to equip educators with computer technology skills to be used in the curriculum delivery. The Khanya project is one of the initiatives in the country. The project, which started in 2001, has been equipping schools with information, communication and audiovisual technology to improve teaching and learning, or curriculum delivery. According to the project, "by the start of the 2012 academic year, every educator in every school of the Province will be empowered to use appropriate and available technology to deliver curriculum to each and every learner in the province" (Khanya, 2008).

According to the 2008 report 59% of schools in the province each had a computer laboratory, 11% of these schools were being facilitated, 70% of educators were trained and 71% of

learners had access to computer technological resources in their schools (Khanya, 2008). ICT provides fast and accurate feedback to learners (Becta, 2003). It is also believed that the use of ICT's in education could promote 'deep' learning and allow educators to respond better to the different needs of different learners (Lau & Sim, 2008). Schools are also working to incorporate computer Technology into classrooms. The need for computer literacy in the 21st century has put an additional strain on school budgets and local resources Deepark and Turner, (2006) in Manyoro (2013). Schools have struggled to catch up by providing computer technology equipment and instruction and by making Internet connections available.

Computer Technology has come to play a major role in education today. As a result of the increasing digital world which now exists, Computer Technology is almost everywhere and essential to almost everyone. When technology was first introduced into education, it was used mostly for administrative tasks, such as taking attendance, keeping records, and browsing the Internet. Software are available that can solve most of the exercises in today's Mathematics textbooks Bhagwan, (2005) in Manyoro (2013)). As advancements were made in the field of technology though, technology's role in education changed from a means of general housekeeping to an interactive instructional tool in classroom teaching. In today's competitive global market, an individual without computer technology is more disadvantaged. This is because a lot of occupations require computer technologically literate workers. As the technology improved, educational capabilities increased correspondingly.

According to Deepark and Turner (2006), the emergence of inexpensive computer technology and mass storage media, including optical videodiscs and compact disks, has given instructional technologists better tools with which to work. Compact disks (the CD-ROM and CD-I) are used to store large amounts of data, such as encyclopedias or motion pictures. In the new interactive delivery stations with computers and CD-ROM, CD-I, or videodiscs, a

student who is interested in a particular topic can first scan an electronic encyclopedia, then view a film on the subject or look at related topics at the touch of a button (Garrison & Anderson, 2003). These teaching stations combine the advantages of reference materials, still pictures, motion pictures, television, and computer-aided instruction. With even newer technologies now being developed, such learning stations are now commonplace in homes for both entertainment and educational purposes.

The widespread availability and use of Mathematical manipulation software has resulted in significant changes in emphasis and examples used in school Mathematics teaching .Proper use of symbolic manipulation software with application problems would change the focus of instruction and assist students through a conceptual and applied understanding of real-world Mathematics (Garrison and Anderson, 2003.Current educational reform aims at the integration of instructional Computer Technology to support active student learning and quality teaching; as a result, a significant amount of money has been invested to supply schools with Computer Technology resources (Palak & Walls, 2009). Computer Technology-based teaching is believed to be important and improves student performance (U.S. Department of Education, 2010) there is a need for schools to become centres of learning designed to close the gap between the technology-rich and exciting experiences that govern students' lives outside of school while preparing them for success in today's competitive global marketplace (Duncan, 2010, Para. 8).

Challenging what students already know about technology is a great task and helping them to learn and produce engaging teaching and learning experiences that are significant, related, and realistic to their personal lives now and in the future is also a great challenge to teachers (U.S. Department of Education, 2010). Not only can Computer Technology help teachers in

teaching but can also help, build their capacity in order to model connected learning communities (U.S. Department of Education, 2010).

According to Deepark and Turner (2006), teachers must feel comfortable using computer technology and have an awareness of applications and to effectively use computer technology in teaching. The use of computer technology in Mathematics teaching, it was suggested that , using the chalkboard and overhead projector should be a commonplace to teachers as computer technological tools allow greater realism in teaching. An increasing number of school libraries have computer labs with computer workstations, software, and Internet connections Mahapatra (2005) in Monyoro (2013).

Governments of the world over have invested heavily on the provision of computer technology tools in public schools, the United Kingdom in the 2008/09 financial year budgeted 2.5 billion pounds while the USA used $ 6 billion in the same period for the provision of ICTs in education Nut, (2010) in (Monyoro ,2013). As early as 1990s, secondary schools in Kenya increasingly acquired computers. Initially this was driven by pressure from education stakeholders such as parents, communities as well as politicians. Most of these computers came in form of donations and were basically used for administrative duties such as typing and printing of examinations, maintaining students‟ and fees records.

Transforming the curriculum and teaching-learning process to provide students with the skills to function effectively in this dynamic, information-rich, and continuously changing environment is the challenge confronting our educational institutions. To meet these challenges, learning institutions must embrace the new computer technologies and appropriate Computer Technology tools for teaching. They must also move towards the goal of transforming the traditional paradigm of teaching (Marshall, Kinuthia & Taylor,

2009).Computer technology have the potential to increase learner independence and ensure pupils' active participation in school (Newhouse, 2002).Teachers could also benefit from the use of Computer technology in teaching like smart phones, modems, internet, computer hardware and software through their usage in various teaching and learning activities but how and in which activities can Computer technology be used in order to achieve its aims in teaching remain unanswered. This is called for a research on it.

Research has shown that Computer Technology facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries. Technologies that provide access to information through telecommunications includes; televisions, radios, satellite, the Internet, wireless networks, cell phones, and other communication mediums. Computer Technology applications like PowerPoint and Excel could be used in lesson presentation. These resources were important in using Computer Technology but information about their availability is lacking and if available how were they utilized in teaching (Gulbahar, 2008).

Egbert, Paulis, and Nakamichi (2002) had participants of twenty English as a second language and foreign language teachers in their sample. They used surveys and follow-up interviews on use of computer technology in class. They concluded that lack of time, support and computer technological resources barred the use of computer technology by the teachers in their teaching.

Warschauer (2002) discussed the training of teachers in Egypt about the use of Computer Technology. He said that an Egyptian university lecturer in expressing his view said: we have the hardware, we have the software, but we lack the human ware. Ridgway and Passey (1991) stressed out the importance of exploiting the use of computer technology more than as a word processor in teaching. Software availability and teacher willingness to use the software can

have positive effects on the teachers‟ attitudes towards the adoption of technology in the classroom (Sepehr & Harris, 1995).

On the contrary , lack of Computer Technology resources results in teachers low confidence in using the technology, Thus high anxiety towards Computer Technology and could lead to negative attitudes hence teaching process would be negatively impacted (Dupagne & Krendl, 1992).Teachers could also benefit from the use of technology resources in education like smart phones, modems, internet, computer hardware and software through their usage in various teaching activities but knowledge about their availability is not known. This research sought to fill this gap.

According to SMASE report of 2008, Poor results posted by Kenyan secondary schools for several years have been attributed to various factors ranging from lack of teaching and learning resources and poor instructional methods to negative attitude towards the subject. In order to address this factors, the Ministry of Education and other stakeholders have embarked on various large-scale capacity building seminars and workshops that are aimed at strengthening the teaching of mathematics and the sciences in Kenyan secondary schools (SMASSE, 2008). The government has also allocated grants to public secondary schools for the purchase of basic resources like textbooks. The Ministry of Education also introduced the use of scientific calculators for instruction and examination of candidates at KCSE aimed at enhancing performance in the subject (Ministry of Education, 2005). All these efforts were expected to promote teaching hence resulting to improved performance by solving perennial problems inherent in the subject. However, the problem of poor performance continues to persist as clearly indicated by the Kenya National Examination Council report (KNEC report, 2008).In recent years, it has increasingly become evident that the use of computer together with skilful support by the teacher enhances the learning of science and mathematics and any

other areas that are generally abstract or have a high cognitive demand for the students (Cox, et al, 2001). Public view also has it that the computer technology represents both an excellent curricula tool and innovatory classroom teaching that can help students get important gains in learning and understanding of mathematical concepts(Polonoli 2001, & Goddard,2002). Thus computer technology is seen as a powerful and realistic tool for the classroom teaching in that it helps make teachers' work easier and more efficient (Pelgrum, 2001; Kozma & Anderson, 2002; Makau, 1990). Furthermore, they help the student become less dependent on the teacher as a source of knowledge. African nations have begun designing new policies and investing large sums of capital aimed at using computer technology into the classrooms. In Kenya, the effort is to develop human resources (computer technicians and computer teachers) skilled who would promote industrialization by 2030 through the use computer Technology in education and training (National ICT policy, 2006). This initiative was published in Sessional Paper No.1 of 2005 where Information and Communication Technology (ICT) in education is given fame. The target was to equip secondary schools and other learning institutions with computer technologies and adapt their curriculum to meet challenges of information society. To achieve these, every educational institution, teacher, learner and respective community should be equipped with appropriate computer technology related resources and skills needed to enhance use of computer technology in teaching up to date Kenyan secondary schools are far from meeting this target. Thus, this study sought to assess factors influencing use of computer technology in teaching Nakuru Town sub-county.

The use of computer technology in education is a complex process that requires immense resources. Most Kenyan schools lack the level of resources required for this process hence creating "barriers" (Schoepp, 2005) to the successful use of computer technology in the teaching. A computer resource book for algebra authored by Dwyer, who was the director of project solo and Margot a researcher with the project, illustrates how the ideas for teaching

Mathematics emanating from project solo could be used in high schools in Kenya that have access to computers (Hung and Khine, 2006, as cited in Monyoro 2013). Computer Technology use in teaching had been limited the reason behind this is not known thus this study is set to assess the adequacy of Computer Technology resources as one of factor influencing use of Computer technology in teaching of Mathematics**.**

Currently there is a growing awareness among global policy makers and educators that the education system needs to be reformed if it is to effectively equip students with the knowledge, attitudes and skills that they will need to succeed and thrive in the knowledge society. Nowadays a shift towards use of computer technology pedagogy which for the purpose of this study means the use of computers and computer-related technologies for educational purposes is being witnessed. The challenge confronting learning institutions is how to change the curriculum and teaching-learning process to provide students with the skills to function effectively in this dynamic, information-rich, and continuously changing environment. To meet these challenges, learning institutions must embrace the new technologies and appropriate computer technological tools for learning. They must also move towards the goal of transforming the traditional paradigm of teaching (Marshall, Kinuthia & Taylor, 2009).

Kenya has not been left behind; it has developed computer technology policy that advocates for accessibility, equity and infrastructure development, with the aim of reducing the digital divide among the citizens (Ministry of Education, Science and Technology report, 2006). Use of Computer technology is very important in all aspects of human life. Its effectiveness, efficiency and accuracy cannot be overlooked. In Kenyan secondary schools, there is inadequacy in the use of Computer Technology pedagogy within the school curriculum. Computer technology use has been lowered to the periphery with teachers sticking to the traditional „chalk and talk‟ approach to teaching and learning. To realize the potential

inherent in computer technology, there is a need for innovative Computer technology pedagogies in secondary school education. This requires relevant research on the use of Computer Technology in the teaching in secondary schools, (Monyoro, 2013).

As early as 1990s, secondary schools in Kenya increasingly acquired computers. Initially this was driven by pressure from education stakeholders such as parents, communities as well as politicians. Most of these computers came in form of donations and were basically used for administrative duties such as typing and printing of examinations, maintaining students‟ and fees records. Most Kenyan schools lack the level of resources required for this process hence creating "barriers" (Schoepp, 2005) to the successful use of computer technology in the teaching process. In 1996 Kenya Institute of Education (KIE) currently the Kenya Institute of Curriculum Development (KICD) developed the first computer studies syllabus for use in secondary schools. This made secondary schools acquire computers for teaching and learning purposes, however the huge resources required at the time made many schools to shy away from the subject.

The private sector has not been left behind in encouraging schools to use computer technology in the teaching. One such non-governmental organization is Computer for Schools – Kenya (CFSK) whose mission is to provide Kenya‟s youth with access to modern technology through donation of computers to Kenyan public secondary schools (Reddick, 2010). Up to 2013 CFSK had sourced for 50,000 computers which were then distributed to about 3000 learning institutions. During the same period, Kenya School net initiated a Trainer of Trainers training program with the aim of equipping personnel with skills and knowledge to facilitate learning of computers in Kenya.

There are numerous efforts made by the government and the private sector toward this e integration of computer technology but despite all this, the question is, "are these Computer Technologies being used to enhance teaching in our secondary schools?" This study sought to

assess how mathematics teachers' use computer technology in teaching mathematics in secondary schools in Nakuru Town sub-counties. In the 8-4-4 system, computer studies is a separate subject under Group Four of the subjects examined by Kenya National Examinations Council (KNEC) and therefore is optional. In the subject, learners are being taught how to be computer literate, and not how to use computers to enhance learning. The general trend is moving away from "teaching computer" toward using Computer Technology as educational tools. (Muriithi, 2005). Computer Programs have been developed to assist both the teacher and the learner to designate computer technology in the development and presentation of lessons in an interactive way. This has encouraged the use of computer technology in teaching and learning processes.

There was need to ascertain the adequacy of appropriate and adequate technology resources available in Nakuru Town Sub-County have benefitted from these donations only 18 schools are confirmed to have adequate computers and at most two projectors these have benefited from ADP project III .The adequacy of these resources was not known. This study would assess Computer Technology resources in teaching in Nakuru Town sub-county secondary schools.

### 2.1.3 Attitudes of Teachers' towards the use of Computer Technology.

Computer technology in the classroom provides multiple opportunities for students to gain knowledge O'Hara and Pritchard (2010). They also reported that research has found that positive effects of computer technology can be seen in the learning of the material and in the use of the technology itself

(O'Hara and Pritchard, 2010). Given this evidence of technology's success, why would a teacher not use it? Brown, Higgins, and Hartley (2001) suggest that another element teachers must work at is changing their attitudes toward the use of computer technology in classroom

teaching. Teachers have to be proactive in teaching with computer technology to help reduce the computer technology gap that exists in and out of school for our students (Brown et al., 2001). It is the teacher who is the determining factor in whether technology is successfully used into the classrooms and schools (Brown et al., 2001).

Lengel (2013) wrote an article on why teachers need to know how to use computer technology for teaching. He explained that computer technology is important is because; it is in the classrooms, the students own it, it works, and it is required. He also describes that educators need training to be competent and comfortable in their use of technology, so that they may be able to implement it effectively (Lengel, 2013). Prensky (2001) notes the importance of training or learning for the Digital Immigrant (educator), so that they may gain knowledge and be successful in their own use of technology as well as in their classroom teaching. He also wrote that just because technology is present, does not guarantee its use (Prensky, 2001).

In the classroom teaching, some important variables such as the teacher's attitudes towards the effective use of computer technology have not been paid attention. Knowledge of teachers' attitudes towards computer technology use in teaching provides them the opportunity to design and implement effective teaching. Computer technology provided many resources and opportunities that have brought about new tools, approaches, and strategies in Mathematics teaching. The achievement of any initiatives to implement Computer Technology in an educational program depends on the support and attitudes of teachers involved. This creates a need to conduct more research on how attitude of teachers influence computer technology use.

It has been recommended that if teachers believed computers not to be fulfilling their own or their students' needs, they are likely to resist any attempts to introduce computer technology

into their teaching (Askar & Umay, 2001). In most cases, the teacher is key to effective implementation of the use of computers in the educational system and given that teachers have tremendous potential to transmit beliefs and values to students, it is important to understand the biases and stereotypes that teachers may hold about the use of computers and the factors that act as facilitators to teachers‟ positive computer usage. Teachers' attitudes whether negative or positive affect the successful use of computer technology in the classroom. This in turn affects the way students view the importance of Computer Technology in schools (Teo, 2006) and affects current and future computer technology use in teaching.

According to Bandura (1994), self-efficacy beliefs determined how people felt, thought, motivated them and behaved. Efficacy involved one‘s own attitude or thinking about his or her ability and connected to motivation. People‘s thought and attitudes influence their actions and motivate them to attempt or restrain from certain behavior (Bandura, 2002). With regard to teacher effectiveness, teachers' attitudes about their teaching abilities would affect their teaching behavior (Henson, 2002). This behavior included but was not limited to how they plan and prepare for instruction, the strategies they implement, the tools they use during instruction, and their personal presence when delivering instruction**.** Mcalister et al., (2005), in their study of teachers‟ use of computers to teach Mathematics, found that overall attitudes towards the use of computer technology were very positive, although many of them had limited experience with computers Technologies.

It was found that the successful initiation and implementation of educational technology in school's program depends strongly on teachers and students' attitude. It is believed that if teachers perceive use of computer technology does not fulfill their needs and their students' needs, it was likely that they would not use the technology into their teaching. Among the

factors that influenced successful use of Computer Technology into teaching were teachers' and students attitudes towards technology. It was revealed that positive attitude towards computers had a direct positive influence on the use of Computer technology by the teacher. This was not known if it is true for Nakuru Town Sub-County Mathematics' teachers. Christensen (1998) stated that teachers‟ attitudes toward computers affect not only their own computer experiences, but also the experiences of the students they teach. In fact, it has been suggested that attitudes towards computer technology affect teachers' way of computer technology use in their teaching.

Positive attitudes often encourage less technologically capable teachers to learn the skills necessary for the use of Computer Technology in technology-based activities in the teaching. The attainment of any initiatives to use Computer Technology in an educational program depends on the support and attitudes of teachers involved. It had been suggested that if teachers believed computer technology was not fulfilling their own or their students‟ needs, they were likely to resist any attempts to introduce Computer Technology into their teaching (Askar & Umay, 2001). In most cases, the teacher was key to effective implementation of the use of computer technology in the teaching and given that teachers have great potential to convey beliefs and values to students, it is important to understand the biases and stereotypes that teachers may hold about the use of computer technology in their teaching.

Teachers' attitudes towards the use of computer technology affect its success in teaching and these attitudes, whether positive or negative, affect how teachers respond to the use of technology now an in future. Considering the importance of teachers‟ attitudes towards the use of computer technology, Zhao, Tan and Mishra (2001) provided evidence to suggest that the teachers‟ attitudes are directly related to computer technology use in the teaching. For

example, teachers often view the computer technology as a tool to accomplish housekeeping tasks, manage their students more efficiently, and to communicate with parents more easily.

The success of student learning with computer technology depended on the attitudes of teachers, and their enthusiasm to use the computer technology (Teo, 2006). Positive reception of the teachers‟ attitudes towards computer technology use might give out useful insights into the reception and use of computer technology in teaching Mathematics .The extent to which Computer technology use is implemented depends on teachers having a positive attitude towards it (Huang & Liaw, 2005). Allan and Will (2001) measured Chinese teachers‟ attitudes toward the pedagogical use of computers. Teachers' attitudes were enabling and on the other hand disabling factor in the adoption of technology (Bullock, 2004). Similarly, Kersaint, Horton, Stohl, and Garofalo (2003) found that teachers who have positive attitudes toward computer technology feel more comfortable in using it into their teaching.

Research had shown that teachers' attitudes towards technology use influenced their acceptance of the usefulness of technology into teaching , Huang &Liaw (2005).Many current students lack investigation and exploration skills (Oduor, 2009) Evidence suggested that majority of teachers who reported negative attitude towards the use computer technology into teaching processes lacked knowledge and skills that would allow them to make "informed decision" (Al-Oteawi, 2002) Research showed that an average number of teachers in Malaysian schools only used Computer Technology equipment for about 29 hours in the two year period which is considered to be very low (MHS, 2005).

The successfully initiation and implementation of educational technology in school's program depends strongly on the teachers' attitudes. It is believed that if teachers perceived the use of technology does not fulfill their needs and their students' needs, it is likely that they will use the technology into Mathematics teaching. Among the factors that influence

successful use of Computer technology into teaching is teachers' attitudes towards technology. Hew and Brush, 2007; Keengwe and Onchwari, 2008). If teachers' attitudes are positive toward the use of educational technology then they can easily provide useful insight about the use of Computer technology into teaching processes.

Demici (2009) conducted a study on teachers' attitudes towards the use of Geographic Information systems (GIS) in Turkey. The study revealed that though barriers such as lack of hardware and software existed, teachers positive attitudes towards GIS was an important determinant to the successful use of GIS into geography lessons.No one study has been done secondary school mathematics thus this study assessed factors influencing use of Computer technology in teaching of Mathematics subject to ascertain if the same implies to it. In addition, Teo (2008) conducted a survey on pre-service teachers' attitudes towards computer use in Singapore. He found that teachers were more positive about their attitude towards computers and intention to use computer also, Drent and Meelissen (2008) conducted a study about factors which influenced the innovative use of computer technology by teacher educators in the Netherlands. Their study revealed that positive attitude towards computers have a direct positive influence on the use of Computer technology by teachers as their positive computer attitudes of were expected to foster the use of computer technology in the classroom (Van Braak, Tondeur & Valcke, 2004). This was not known for Nakuru Town Sub-Counties Mathematics, thus this study was set to determine the teachers' attitude towards the use of Computer technology in teaching Mathematics.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter discusses research design, area of study, study population, sample size and sampling technique, research instruments: Mathematics teachers questionnaires, lesson observation schedule and interview guide for principals and (CQASO) .It also discusses population of study, Validity and reliability of research instruments, data collection procedure, data analysis and processing.

## 3.2 Research Design

This study employed descriptive design to obtain data on factors that affect the use of computer technology in teaching of Mathematics in Nakuru Town sub-counties. The researcher collected qualitative data using questionnaire and interviews and statistically analyzed to describe trends about responses to questions. The sample selected represented a large population .This study determined relationship between the dependent variable which was use of Computer Technology and the independent variables which were: teachers' teaching experience, attitude and Computer Technology resources.

## 3.3 Area of Study

The study was conducted in 25 public secondary schools in Nakuru Town sub-county, Nakuru County in Kenya. Nakuru Town Sub-County were formerly Nakuru Town District consisting of two Sub-Counties namely; Nakuru Town East and Nakuru Town West. The sub-counties have 3 divisions. Nakuru Town East have 5 wards( Biashara, Kivumbini, Flamingo, Menengai and Nakuru East) Nakuru west have 6 wards( Barut, London, Kaptembwa, Kapkures, Rhoda and Shabab).Nakuru Town east lies in an area of 97.6 KM $^{2}$with population of 177,560 and Nakuru Town West Its lies at an area of 251 KM$^{2}$ $^{2}$with

population of 172, 013 ( Sub-Counties Information On Administrative Units 2019) It lies at latitude of 0.3031 and longitude of 36.08 and lies about 1850m above sea level.

In respect to education, both Sub-counties are served under umbrella of Nakuru Education Office. Records at the Education ministry and the Kenya National Examinations Council (KNEC) show a decline in academic performance in the County over the past four years. According to Nakuru County Education Director, the region posted a mean of 3.5 in year 2017 KCSE compared to 6.8 recorded in 2015.This had left parents, teachers and students worried. In the year 2017 Kenya Certificate of School Education results the County had 11,314 candidates from the region that scored Es in Mathematics indicating poor performance especially by the sub-counties.

Nakuru Town sub-county secondary schools were the area of study. The study involved the CQASO, principals, and specifically SMASE trained Mathematics teachers in the selected schools, and tried to assess the use of Computer Technology in teaching of Mathematics. Appendix E shows location of Nakuru Sub-County. The study population comprised of 60 Mathematics teachers, 25 secondary schools principals and 1 CQASO in Nakuru Town Sub-County.

### 3.4 Population Size

The study population consisted of 25 principals, 60 Mathematics teachers and 1 CQASO from 25 public secondary schools in Nakuru Town sub-county.

### 3.5 Sample Size and Sampling Techniques.

The sample size for the study involved 10 principals, 10 SMASE trained Mathematic teachers and One County Quality Assurance and Standard Officer (CQASO). A pilot study was done in which 2 mathematics teachers and 2 principals were used. The researcher employed purposive sampling techniques based teachers who had trained with SMASE those who have

not trained with SMASE were excluded around 35 teachers as the researcher is most assured of the teachers who trained with SMASE having skills on using technology and help researcher to understand if they use or not and what factors affects their use of technology in teaching. The population and sample contribution is given in Table 3.1.

**Table 3. 1: Summary of Population of Study and Sample size**

| Subject | Population(N) | Sample (n) | Percentage (%) |
|---|---|---|---|
| Mathematics Teachers | 60 | 10 | 16.7 |
| Principals | 25 | 10 | 40 |

### 3.6 Research Instruments

Research instruments that were used to collect data were questionnaires, lesson observation schedule and interview schedule. The instruments were developed by the researcher with help of the supervisors who ascertained the face validity and validated them. The instruments were used to collect data on the use of computer technology by secondary schools in the Sub-County.

Questionnaire was chosen because it is easy to plan, construct and administer and when the respondents are scattered far and wide, it will be a better tool as compared to the tools like interview or observation. It permits even international coverage. It makes possible contact with many who could not otherwise be reached. It permits group administration and is adaptable to any objectives. It can cover a large group at the same time. Interviews schedules were significant as they help investigate in an in-depth way, use of the technology ,technology resources, and they allow more detailed questions to be answered, respondent own words are recorded and interviewees are not influenced by others in the group.

### 3.6.1. Mathematics Teachers' Questionnaire (MTQ)

The Purpose of Mathematics teachers' questionnaire was to collect data on teachers' teaching experience, attitude, and their knowledge on Computer Technology resources in using Computer Technology in teaching of Mathematics .This questionnaire consisted of closed and open ended items. The MTQ is attached as Appendix A.

### 3.6.2 Principals' Interview Schedule (PIS)

The Principal's Interview Schedule was used to collect information from principals on their assessment of computer technology resources, how their mathematics teachers use computer technology in teaching, how often do their mathematics teachers use computer technology in teaching, factors that inhibit their mathematics teachers from using computer technology in teaching and suggestion on possible solutions on stated factors. The schedule focused on teacher teaching experience, Computer Technology resources and attitudes of teachers towards the use of Computer Technology in teaching of Mathematics. The PIS is attached as Appendix B.

### 3.6.3 Interview Schedule for CQASO (ISCQ)

The purpose of the interview schedule was to find out from CQASO information on availability and adequacy of computer technology resources, how mathematics teachers' use computer technology in teaching mathematics, the attitude of teachers towards use of computer technology in teaching and reasons supporting the given answers. The instrument consisted of a few guiding questions. However, there were probing questions as well in the course of interview session seeking clarification on emerging issues during the interview. The ISCQ is attached as Appendix C.

### 3.6.4.Computer Technology Lesson Observation Tool (CTLOT)

On the date of appointment made to the respondent, each Mathematics teacher was observed by the researcher once during a single lesson delivery on lesson preparation, lesson development computer technology resource and evaluation. This computer integration lesson observation tool was meant to gather information on how the SMASE trained Mathematics teachers use Computer Technology in their teaching. The CTLOT is attached as Appendix D.

## 3.7 Validity and Reliability of the Research Instruments

Validity encompasses the entire experimental concepts and establishes whether the results obtained meet the entire requirement. The researcher employed face validity as it helped to determine the extent the instrument will measure what is supposed to measure**.** Reliability is a concept used for testing consistency of research tools. Patton (2001) states that validity and reliability are factors that a researcher should consider while designing a study, analyzing results and judging quality of the study.

### 3.7.1 Validity of the Research Instruments

The researcher employed face validity **.**To ensure the validity of the instruments, the researcher availed the instruments to experts on the topic who checked on the language, comprehensiveness of contents, relevance and length of the items. The researcher made adjustments in response to the comments made by the experts. The experts include the research supervisors.

### 3.7.2 Reliability of the Research Instruments

According to Rindskopf, Neil, Smelser and Baltes (2001) reliability of a measurement or test is considered reliable if it produces consistent results over repeated tastings. It refers to "how well we are measuring whatever it is that is being measured (regardless of whether or not it is the right quantity to measure)."Reliability of the questionnaire was established through test

retest method and then accepted at Pearson value of 0.7 and above at alpha of 0.05. A pilot study was conducted in 2 secondary schools out of 25 in Nakuru Town East and West Sub-Counties. The reliability of lesson observation schedule was 0.83.The purpose of the pilot study was to find out how dependable, steady, predictable and accurate the instrument is in order to test the research objectives.

**Table 3. 2: Reliability Analysis**

| Variable | Pearson Correlation | No. of items | Decision |
|---|---|---|---|
| Teachers' Experience | 0.85 | 10 | Reliable |
| Teachers' Attitude | 0.77 | 11 | Reliable |
| Adequacy of the Computer Technology Resources | 0.89 | 7 | Reliable |
| Lesson observation | 0.83 | 10 | Reliable |
| Overall reliability Index | 0.835 | | Reliable |

From Table 3.2, all the variables returned a coefficient above 0.7 indicating that they were reliable. The overall Pearson r value is 0.835 indicating that the question was reliable.

### 3.8 Procedure of Data Collection

The researcher sought permission from relevant authorities that included; National Commission for Science and Technology and Innovation (NACOSTI),Ministry of Education (M.O.E), Nakuru Director of Education Nakuru County and County commissioner Nakuru County. Letters of permission for research are attached as appendices F,G,H & I respectively. After researcher clearance was done, the researcher visited the schools and made appointments for the days to collect the data.

The researcher administered the research questionnaires to the sampled population in the area some questionnaire were filled same day of visitation and others were filled after one week.

During the day of visitation most principals were interviewed while others gave a different date for interview. Lesson observation was done after one week after seeking appointment with teachers .The researcher sat behind the class as she observed and score the teacher during lesson observation. After collection of the questionnaires, scoring of lesson observation schedule and conduction of interviews for both the principals and CQASO the researcher went through them and did the analyses.

### 3.9. Data Processing and Analysis

In analyzing the data this research focused on qualitative analysis involved grouping together all data that was similar in content and being organized in relation to research objectives. Analysis of data on teachers experience, computer technology resources and teachers' attitude was done by calculating the mean scores and expressing in percentages on Smase trained Mathematics teachers' questionnaire.

The numerical scores were assigned to four response options given to each items, score values were assigned as follows : Strongly agree ( SA) =4; Agree (A) =3 ; Disagree (D) =2 ; Strongly Disagree (SD) =1 .However, for negatively stated items, the scoring was done as follows : Strongly agree ( SA) =1; Agree (A) =2 ; Disagree (D) =3 ; Strongly Dis agree (SD) =4. On analysis of level of integration (appendix D) ,responses scored as follows: Very Low (VL)= 1;Low ( L)= 2; High (H)= 3;Very High (VH)= 4.

### 3.10 Ethical Considerations

The respondents were assured of confidentiality, anonymity and their consent was sought by asking them to sign if they agree to participate before they were fully engaged on the exercise. This was achieved by coding instruments in order not to reveal the identity of respondents. However, any voluntary withdrawal of participants was dully acknowledged,

while the voluntary participating respondents were treated with utmost discretion. Coded data were stored in Microsoft excel file that was available only to the researcher.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1. Introduction

This chapter presents the results and discussion of findings on use of Computer Technology and factors influencing it, namely: teachers' teaching experience, Computer Technology resources and teachers' attitude. The data is presented under the following themes:

i. Use of computer technology in teaching Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.
ii. Teachers' teaching experience and use of computers in teaching of Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.
iii. Adequacy of Computer Technology resources on the use of Computer technology in teaching of Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.
iv. Attitudes of teachers towards use of computer technology in teaching of Mathematics in secondary schools in Nakuru Town Sub-County, Kenya.

## 4. 2 Use of computer technology in Teaching Mathematics

In this study, analysis of teachers' use of Computer Technology was done using the data collected in questionnaires, interview schedules and lesson observation schedule .In lesson observation schedule, the interpretation were : Very High 4 points meaning computer technology is being used in that particular item mostly, High , 3points used moderate , Low,2point low use of computer technology and Very Low ,1 point used minimally or even no use of computer in that item , each respondent scores on the four items: lesson preparation, lesson development, resource use and evaluation and were assigned the following values during analysis Very High (VH)= 4,High (H) =3, Low (L) =2 and Very Low( VL) =1. The total scores and mean scores obtained by each respondent were computed in relation to the use of Computer Technology in teaching. The mean of each respondent

was obtained by dividing by 4. Table 4.1 shows total scores and mean score for each respondent on level of using computer technology in teaching.

**Table 4.1: Teachers' Level of Use of Computer Technology in Teaching**

| Teacher SN | Lesson Preparation | Lesson development | Resource Use | Evaluation | Total Score | Mean score |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1.5 | 1 | 4.5 | 1.13 |
| 2 | 1.5 | 2.5 | 2.5 | 3 | 9.5 | 2.38 |
| 3 | 1 | 1.5 | 2 | 2 | 6.5 | 1.63 |
| 4 | 1.5 | 1.5 | 1 | 1 | 5 | 1.25 |
| 5 | 2 | 1.5 | 1.5 | 1.5 | 6.5 | 1.63 |
| 6 | 2.5 | 3 | 2.5 | 2 | 10 | 2.50 |
| 7 | 1.5 | 2 | 1 | 1.5 | 6 | 3.00 |
| 8 | 1 | 3 | 1 | 1.5 | 6.5 | 1.63 |
| 9 | 1 | 1 | 1 | 1 | 4 | 1.00 |
| 10 | 1.5 | 1.5 | 1 | 1 | 5 | 1.25 |
| **Overall mean score** | | | | | **63.5** | **1.74** |

**Key:Very High (VH) = 4,High (H) =3, Low (L) =2 and Very Low( VL) =1.**

The overall teachers' level of using Computer Technology was obtained by summing up the mean scores of all respondents and dividing by the number of respondents (n=10) on lesson observation schedule. Table 4.1 has information on use of Computer Technology as assessed on lesson observation schedule. From the finding it was observed that the overall mean for teachers' in using Computer Technology in teaching mathematics in classroom was 1.74 indicating that teachers' use of Computer Technology in teaching was low**.** This findings agrees with some literature done which showed that, the use of computer technology in schools is limited like in Bingimlas (2009: 237) cited in Kuvuuka (2013), "the process of using computer technology in teaching is a complex hence one can encountering a lot of challenges. A lot of factors affecting use of computer technology in schools have been revealed which resulted to minimal use, hence leading to the capability deprivation of

teachers to effectively deliver curriculum and to receive quality education using computer technology.

Analysis of whether Mathematics teachers like using of computer technology in teaching. They were expected to indicate YES or NO. The finding revealed were as in Table 4.2.

**Table 4. 2: Teachers views on whether they like teaching using computer technology**

| **Response** | **Teachers frequency** | **Percent** |
|---|---|---|
| Yes | 3 | 30 |
| No | 7 | 70 |
| Total | 10 | 100.0 |

Table 4.2 revealed that 2 teachers (20%) responded YES expressed that they like teaching using computer technology while 8 teachers (80 %) responded NO indicated that they don't like teaching using technology. This indicates that largest percentages of teachers do not use computer technology effectively in teaching .Thus this findings agree with DeCorte, 1990; Becker, Ravitz, and Wong, 1999; Pelgrum, 2001; Becta, 2003 who asserted that even in cases where the infrastructure is available, few educators are effectively using computer technology in curriculum delivery. It can be said, therefore, that there are also non-technical factors that affect the use computer technology for curriculum delivery. This study tried to go deep and find out reasons that may clearly state the factor influencing the use of computer technology in teaching.

Teachers were asked to give reasons as to why they like or they don't like using Computer Technology. On reasons why they like using Computer Technology in teaching mathematics, the respondents reported that: It creates and arouse interest in teaching and learning of math, Some use to Projecting class examples using PowerPoint, Use application to draw graphs in illustrating abstract concepts (loci, reflections). This is done by projecting illustrations on

board, teaching. Furthermore, they said that they used computer technology on geogebra to draw graphs, demonstrations of, transformations, to download clips in you tube, to give assignment to students as well as the PowerPoint.

On reasons why they don't use Computer Technology in teaching mathematics**,** respondents Responded gave the following reasons: Time consuming, Students available are slow learners and their entry behavior is very low, Absenteeism and lack of students interest in ICT but want other social media platforms, facilities are inadequate such as internet and power supply and Power blackouts.

Teachers were also asked to state factors that inhibit their use of computer technology in teaching mathematics teachers had the following responses that: Student characteristics that is in ability to hear, Technological shortcoming ,Some content cannot be integrated, Less computers in schools laboratory hence students overcrowded, Some programme are quite technical and video clips are limited ,Most students are computer illiterate making difficult to teach using computer integrated technology, Lack of enough projectors, Its quite tasking ,In adequate Facilities, Timetable, Time factor in getting materials ready and that Internet not available at times.

Furthermore, Teachers were also asked to suggest possible solution to the stated factors that inhibit the use of computer technology in teaching mathematics teachers had the following responses**:** That there is need to avail enough facilities**,** Review of the content in the syllabus**,** Sharing efficiently few resources**,** Capacity building for teachers**,** More computer programme be invented**,** More computer book be bought ,Provision of uninterrupted power supply**,** The institution consider getting computer resources and making sure that Internet should be made available in school.

In accessing the level of use of Computer Technology in Teaching Mathematics, descriptive analysis was applied and presented accordingly in Table 4.3.

**Table 4. 3: Use of Computer Technology**

| Statement | VH | H | L | VL |
|---|---|---|---|---|
| Evaluation by Oral testing | 0<br>0.0% | 3<br>30.0% | 1<br>10.0% | 6<br>60.0% |
| Evaluation by projects | 0<br>0.0% | 1<br>10.0% | 5<br>50.0% | 4<br>40.0% |
| Evaluation by written tests | 1<br>10.0% | 1<br>10.0% | 2<br>20.0% | 6<br>60.0% |
| Resource Utilization in Computer student interaction | 0<br>0.0% | 1<br>10.0% | 6<br>60.0% | 3<br>30.0% |
| Resource Utilization by Computer based resources | 0<br>0.0% | 1<br>10.0% | 3<br>30.0% | 6<br>60.0% |
| Lesson Development by Lesson conclusion | 1<br>10.0% | 1<br>10.0% | 4<br>40.0% | 4<br>40.0% |
| Lesson Development in lesson delivery | 0<br>0.0% | 2<br>20.0% | 1<br>10.0% | 7<br>70.0% |
| Lesson Development by introduction | 0<br>0.0% | 1<br>10.0% | 4<br>40.0% | 5<br>50.0% |
| Lesson preparation in scheme of work | 1<br>10.0% | 1<br>10.0% | 2<br>20.0% | 6<br>60.0% |
| Lesson preparation in Lesson plan | 1<br>10.0% | 1<br>10.0% | 1<br>10.0% | 7<br>70.0% |

**Key: VH= Very High; H= High; L = Low; VL = Very Low; and %=Percentages.**

According to Table 4.3, it is seen that the level of use of computer technology in teaching in evaluation by oral testing, projects and written tests were low. As regards resource utilization, it was observed that Computer student interaction and Computer based resources were up to 90% and 80% low respectively hence affecting the extent of their use in teaching. Similarly, it was observed that Lesson Development by introduction, lesson delivery and conclusion were 10%, 20% and 20% high. Equally, integration of computer technology in Lesson plan and preparation of scheme of work was 20% respectively high.

This findings agree with Cuban, Kirkpatrick and Pack (2001), Hoyles, Legrange, Son and Sinclair (2006) and Ruthven and Hennessey (2002) who in their research found out that the use of Computer technology in teaching was very little in Mathematics classroom and that inadequacy of Computer technology resources, negative attitude of teachers' and teachers

teaching experience are the main factors that influence the use of Computer technology in teaching.

Principals were interviewed on the teachers' use of Computer Technology in Teaching Mathematics in secondary schools. Typical responses from sampled principals were as follows;

Principal 001 said:

*The teachers who use computer technology, use it to project their work on the board to illustrate concepts, use it to teach mathematics concepts and project it on the board for the learners to write notes.*

Principal 002 said;

*Some of my teachers use computer technology to give learners assignment and others use it to project three dimensional materials to explain abstract concepts in three dimensional geometry.*

Principal 003 said;

*The teachers in my school occasionally use computer technology to teach recorded programs on CDs.*

Principal 004 reported that;

*Mathematics' teachers use computer technology to download you-tube clips on different topics and sometimes teachers use of power point to slide show their work while teaching.*

Principal 005 responded that;
*During their teaching, mathematics' teachers use computer technology in demonstration, Use computer technology to teach hard topics like loci, reflection radiation to help student understand the concepts better.*

Principal 006 said;

*Mathematics teachers use computer technology to Project video clips from u-tube in different topics in math and also use Geogebra programs to teach transformations during their lessons.*

Principal 007 said;
*My teachers rarely use Computer Technology in Teaching during their lessons.*

Principal 008 responded that:

*Mathematics teachers use computer technology in Sourcing exams and revision materials and project their work on the board.*

Principal 009 said;
*Teachers use computer technology to teach mathematics concepts, write notes then project it on board and use it to give learners assignment to do.*

Principal 010 responded that;

*In my school mathematics teachers use computer technology as teaching resource and use to prepare for their own lessons.*

From the responses of the principals regarding the teachers' use of Computer Technology in Teaching Mathematics it is clear that the uses of computer technology in teaching mathematics were varied include: using as a teaching resource, writing notes for learners, give assignments to learners and use it to teach abstract concepts. This findings is supported by assertion that the use of Computer Technology can increase students' understanding of mathematical concepts as there are various uses of Computer Technologies in Mathematics education. Computer Technology can provide multiple representations of concepts. However it is not clear why this findings differ from lesson observation results where computer technology use is seen to be low.

Principals were also required to give reasons why they don't use computer technology in teaching and their responses were as follows;

Principal 004 responded that;
*Some mathematics teachers lack interest in using computer technology while other see as time consuming.*

Principal 007 responded that;

*Many teachers have reported that during lesson, presentation students see as entertaining and some learners divert their attention for other things like movies so it is not the best for teaching effectively.*

Principal 010 responded that;
*Lack of practical experience by the teachers in using computer technology in classroom limit their use of computer technology in teaching.*

Beside this, 70% of the principals responded that majority of their mathematics teachers have negative attitude towards the use of computer technology.

Further, Principals were asked to state factors that inhibit their Mathematics teachers' from using computers technology in teaching Mathematics and their responses were as follows:.

Principal 001 responded that*:*

*Lack of Adequate time for preparing and teaching using computer technology and Negative attitude by some teachers inhibit their use.*

Principal 002 responded that;

*Inadequate computer- based Resources inhibit teachers from using computer technology and also, most teachers don't like using it as it is time consuming.*

Principal 008 responded that
*Some teachers' lack of positive attitude and inadequate of materials for Example one LCD projector in the school.*

Majority reported that their teachers had a negative attitude towards use of computer technology in teaching this formed 70% of the respondents. The successful initiation and implementation of educational technology in school's program depends strongly on teachers and students' attitude. It is believed that if teachers perceive use of computer technology does not fulfill their needs and their students' needs, it was likely that they would not use the technology into their teaching.

Principals were also asked to suggest possible solution to factors inhibiting their Mathematics' teachers from using computers technology in teaching and suggestion they gave included:

Principal 001 responded that;

*Provision of enough computer technology resources will boost the use of computer technology in teaching of mathematics.*

Principal 003 responded that;

*Teachers need to be motivate to change their attitude toward the use of computer technology.*

Principal 004 responded that;

*Training of teachers to get skills in using technology will help a lot in the use of computer technology.*

Principal 005 responded that;

*There is need to adapt curriculum to suit learners who are hearing impaired as they rely more on visual considering that most e-learning materials are audio.*

Principal 006 responded that;

*There is need to create double lesson in Mathematics to enable use of computer technology in teaching it.*

Principal 007 responded that;

*In service training of mathematics teachers to know how to use computer technology will help much.*

Principal 008 responded that;

*There is need to Source for more computer technology resources for use in teaching.*

Principal 009 responded that;

*Training teachers to change attitude towards the use of computer technology resources.*

Some of the respondents 30% reported that adequate provision of technology resources is required which is a challenge to most schools. It is also apparent that training of teachers, creating of more time will enhance use of computer technology in teaching.

Quality Assurance and Standards officer of Nakuru County was interviewed on the use of Computer Technology in Teaching Mathematics in secondary schools Mathematics and had the following responses:

*We usually undertake general supervision not only on specific subject and during supervision, we found that the level of use of computer technology in teaching is below 50%.*
Quality Assurance and Standards officer of Nakuru County was also asked to comment on attitude of mathematics teachers' towards the use of computer technology in teaching mathematics .He responded that :

*Majority seem to have negative attitude*

On giving reason to support his answer he said that:

*Majority do not use computer technology while teaching*
*Inadequate ICT related materials and lack of trained teachers in ICT hindered the use of computer technology in teaching*.

The findings of this research, agrees with Egbert, Paulis, and Nakamichi (2002) who during their research used surveys and follow-up interviews on use of computer technology in class concluded that lack of time, support and computer technological resources barred the use of technology by the teachers in their teaching. Also this findings agrees with Cuban, Kirkpatrick and Peck (2001); Hoyles, Legrange, Son, and Sinclair (2006); Ruthven and Hennessey ( 2002), Wallace (2004) use of Computer Technology in teaching was very little in Mathematics classrooms and that inadequacy of Computer Technology resources, negative attitude of teachers and teachers' level of experience are the main factors that influence use of Computer Technology into teaching process .

### 4.3 Teachers' Teaching Experience and use Computer Technology in Teaching Mathematics.

According to research findings of this study, teachers teaching experience in teaching Mathematics was categorized as follows: 1 year and below ,above 1 to 2years,above 2 to 3years and finally, 4 years and above . Teachers were assigned points based on the number of years they had taught. The teachers who had taught for 1 year and below were awarded 1 point; above 1 year to 2 years, 2 points; above 2 years to 3 years; 3 points and 4 years and above ; 4 points. The total scores and mean scores obtained by teachers from teachers'

questionnaire were computed in relation to teaching experience. The interpretation for this teaching experience was as follows:1-2 points ,means less teaching experience,3points means moderate teaching experience and 4 points indicates more teaching experience in this study .Table 4.4 has this interpretation.

**Table 4. 4: Score Points and its Interpretation**

| Score points | Interpretation |
|---|---|
| 1-2 | Less experience |
| 3 | Moderate |
| 4 | More experienced |

Table 4.5 has the information on teachers teaching experience in the use of computer technology.

**Table 4. 5: Teachers' Teaching Experience in Teaching Mathematics**

**(n =10)**

| Teaching Experience | No of Teachers | Total points |
|---|---|---|
| Below 1 year | 2 | 2 |
| Above 1 to 2 years | 4 | 8 |
| Above 2 to 3 years | 3 | 9 |
| 4 years and above | 1 | 4 |
| **Overall mean points** | **10** | **2.3** |

This findings showed that, 6 teachers had up to 2 years of teaching experience, 3 teachers had 3 years of teaching experience, 1 teacher had 4 years of teaching experience. According to research findings of this study, majority of teachers had 2 years of teaching experience and therefore had less teaching experience. The average mean points for teachers teaching experience was 2.3 as indicated in Table 4.5 showing that less experienced teachers do use computer technology more than experienced teachers. This finding agrees with Baek, Jong and Kim(2008) who claimed that experienced teachers are less ready to use computer technology into their teaching. This is confirmed by 1respondent who had 4 years of teaching experience. The findings were strengthened by majority of principals who during their interview were asked to state which level of teaching experience do teachers who use computer technology more fall in and had the following responses:

Principal 001 responded that;

*In my school majority of teachers who use computer technology in teaching are young people.*

Principal 006 responded that;

*Mostly Middle aged teachers use computer technology in teaching as compared to older teachers.*

Principal 007 responded that;

*Newly employed teachers use computer technology in teaching mathematics more frequently .They seem to enjoy using it.*

Principal 008 responded that;

*Less experience mathematics teachers in profession enjoy using computer more than older teachers.*

Principal 009 responded that;

*In my school mostly, young teachers who are from university use computer technology in teaching as compared to.*

Principal 010 responded that;

*Youngsters seem to enjoy using computer technology more than old teachers.*

From this findings, it is clear that teachers who are less experienced, young teachers middle aged teachers, teachers who are fresh from university and newly employed teachers are willing and enjoy using computer technology in teaching .This can be concluded that teachers with less teaching experience do use and enjoy computer technology in teaching mathematics more than experienced teachers. This finding concurs with (Wong & Li, 2008) who suggested that teaching experience influence the successful use of computer technology in classrooms. This findings also agrees with Jong and Kim, (2008) who claimed that experienced teachers are less ready to use computer technology into their teaching. This is confirmed by 1 respondent who had 4 years of teaching experience which in this study was the highest level of teaching experience.

### 4.4. Computer Technology Resources used in teaching mathematics

The Computer Technology variable was assigned the following values during analysis: Very Adequate (VA =4), Adequate (A = 3), Inadequate (I =2) and Very Inadequate (VI = 1). The total scores and mean scores obtained by individual Teacher respondent were computed in relation to Computer Technology resources. Total score were obtained by adding scores of individual respondent on each item then divided by total number of items to get individual mean score. Table 4.6 has the information on Computer Technology resources as given by individual teacher respondent in their respective schools.

**Table 4. 6: Individual Respondent Score on Computer Technology Resources**

| Teacher S. No. | LCD projector | Computer software | Computer application | Computer Hardware | Mathematics teachers | Technicians | Internet access | Total Score | Mean Score |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 15 | 2.14 |
| 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 10 | 1.43 |
| 3 | 1 | 1 | 1 | 1 | 2 | 4 | 2 | 12 | 1.71 |
| 4 | 4 | 3 | 2 | 2 | 3 | 3 | 2 | 19 | 2.71 |
| 5 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 17 | 2.43 |
| 6 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 17 | 2.43 |
| 7 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 16 | 2.29 |
| 8 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 21 | 3.00 |
| 9 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 20 | 2.86 |
| 10 | 2 | 2 | 1 | 3 | 3 | 4 | 2 | 17 | 2.43 |
| **Overall mean score** | | | | | | | | | **2.1** |

Each respondent response on each of seven computer technology resource was assigned value and mean calculated as shown on last column as in table 4. 6 above. From the findings in Table 4.6,it was observed that the overall mean for respondents on Computer Technology Resources was 2.1, indicating that this resources were Inadequate and that an adequate Computer Technological resource is ideal for using computer technology resources in teaching. Current educational reforms aim at using Computer instructional technology to support active student learning and quality teaching. This study sought to assess Computer Technology resources used in teaching.

The mean score for each item on adequacy of computer Technology resource was computed and results presented on table 4.7 below.

**Table 4.7: Adequacy of the Computer Technology Resources**

| Computer Technology Resource | VA (4) F | A (3) F | I (2) F | VI (1) F | Total Score | Mean Score |
|---|---|---|---|---|---|---|
| Internet access | 1 | 3 | 4 | 3 | 20.00 | 3.33 |
| Computer Technology Technicians | 1 | 2 | 4 | 3 | 21.00 | 2.10 |
| Mathematics' Teachers | 1 | 0 | 6 | 3 | 19.00 | 2.7 |
| Computer Hardware | 0 | 3 | 3 | 4 | 19.00 | 3.16 |
| Computer application e.g. Power point, excel, word process | 1 | 2 | 4 | 3 | 21.00 | 2.10 |
| Computer software | 1 | 2 | 3 | 4 | 20.00 | 2.00 |
| LCD projector | 1 | 3 | 2 | 4 | 21.00 | 2.1 |
| **Overall mean** | | | | | | **1.75** |

**Key: Very Adequate(VA)= 4;Adequate(A)= 3; Inadequate(I) = 2; Very Inadequate(VI) = 1; f=frequency of teachers.**

The finding indicated that resources such as Internet access Computer Hardware and Computer software were adequate with response 7 teachers respectively. It was noted that only LCD projector and Computer application e.g. Power point, excel, word process were inadequate confirmed by 3 teachers. Regarding human resource, technicians and teachers were inadequate to use Computer Technologies in their schools. This finding therefore indicates that Computer Technology resources are inadequate though no reason was known as to why internet access seem to be adequate while all other computer resources are inadequate. It was also noted that majority of teachers, 7 of them rarely use Computer Technology in teaching Mathematics while only 2 teachers often use Computer Technology in teaching Mathematics.

This implies that when there is adequate Computer Technology Resources, use of Computer Technology in teaching of Mathematics improves. It can be observed that all computer based resources are vital in using Computer technology in teaching and its decline may affect the use of technological advancement in teaching. This finding agrees with Gulbahar (2008) who

stated that the inadequacy Computer Technological resources is one of the factors that greatly influence effective use of Computer technology by teachers. Equally, Egbert, Paulis, and Nakamichi (2002) concluded that lack of time, support and computer technological resources barred the use of technology by the teachers in their teaching.

Principals' during their interviews were asked to assess the degree of adequacy of listed computer technology resources ( computer laboratory, mathematics computer software computer hardware LCD projector, computer technicians and internet ) in teaching Mathematics in secondary schools in Nakuru Town sub-county. They were expected to rate as either very adequate, adequate inadequate or not available.

Responses of principals' on the listed computer technology resources were as shown in table 4.8 below .

**Table 4. 8: Principals' Responses on the degree of adequacy computer technology resources**

| | **Degree of Adequacy** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Computer Technology Resources** | **Very Adequate** | | **Adequate** | | **In adequate** | | **Not Available** | |
| | **f** | **%** | **f** | **%** | **f** | **%** | **f** | **%** |
| Computer laboratories | 0 | 0.0 | 0 | | 2 | 20.0 | 8 | 80.0 |
| Mathematics computer soft ware | 0 | 0.00 | 0 | 0.0 | 5 | 50.0 | 5 | 50.0 |
| Computer hardware | 0 | 0.00 | 0 | 0.00 | 6 | 60.0 | 4 | 40.0 |
| LCD projector | 0 | 0.0 | 2 | 20.0 | 7 | 70.0 | 1 | 10.0 |
| Comp. Technicians | 0 | 0.00 | 0 | 0.00 | 0 | 0.00 | 10 | 100 |
| Internet | 1 | 10.0 | 0 | 0.00 | 4 | 40.0 | 5 | 50.0 |

The finding indicated that resources such as Computer laboratories, Hardware and Computer software were inadequate with response 2(20%) teachers,5(50%) teachers and 6 (60%)

teachers respectively. It was noted that 7(70%), teachers reported that LCD projector are inadequate but only two teachers reported to be adequate. Regarding computer technicians it was reported that they were not available and only 1(10%) teacher reported that internet was adequate. This finding therefore indicates that Computer Technology resources were inadequate.

Quality Assurance and Standards officer of Nakuru County was asked to rate the adequacy of computer technology resource in Nakuru Town sub-county secondary schools and he responded that:

*there are few resources and insecurity of Computer Technology related materials in schools who have them.*

This indicated that computer technology resources are inadequate for teaching mathematics using computer technology

Computer technology resources available for use in teaching mathematics were generally inadequate in schools. This revelation implies that shortage of these resources could hinder the use of Computer Technology in teaching of Mathematics in secondary schools. This findings concurs with other researches done which has shown that Computer Technology facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries. Technologies that provide access to information through telecommunications includes; televisions, radios, satellite, the Internet, wireless networks, cell phones, and other communication mediums. Computer Technology applications like PowerPoint and Excel could be used in lesson presentation. Also this findings addresses Gulbahar,(2008)who said that these resources were important in using Computer Technology but information about their availability is lacking and if available how were they utilized in teaching.

On frequency of using computer technology in teaching Mathematics, Mathematic teachers were asked to indicate how often they use computer technology in teaching Mathematics .the results were as follows. This was done descriptively. The finding is presented in Table 4.9.

**Table 4. 9: Frequency Using Computer Technology in Teaching Mathematics**

| Statement | Very often | Often | Rare | Very rare | Never |
|---|---|---|---|---|---|
| How often do you use computer Technology in teaching Mathematics | 0<br>0.0% | 2<br>20.0% | 3<br>30.0 % | 5<br>50.0% | 0<br>0.0% |

**Key: %=Percentages.**

It was observed that 80% reported that they rarely use computer Technology in teaching Mathematics. It can be argued that perhaps teachers had challenges that hindered them in the use of computer in teaching. Regarding factors inhibiting use of computer technology in teaching of Mathematics, Mathematics Teachers were asked to state factors that inhibit them in the using of computer technology in teaching of Mathematics. They gave their views as follows: inadequacy of facilities (projectors, computers, internet connectivity, inadequate time, time consuming, and inability to hear for learners who are hearing impairment as well as that some content cannot be taught using technology lack of skills in technology in teaching in secondary schools Mathematics.

Current educational reforms aim at the integration of instructional computer technology to support active student learning and quality teaching. This study sought to assess computer technology resources in teaching.

The finding indicated that resources such as Internet access, Computer Hardware and Computer software were adequate. It was noted that only LCD projector and Computer application e.g. Power point, excel, word process were inadequate. Regarding human resources (technicians and teachers) were inadequate to use Computer Technologies in their schools. This finding therefore indicates that Computer Technology resources affect use of

Computer Technology in teaching Mathematics. It was also noted that majority of teacher rarely use Computer Technology in teaching Mathematics while a few often use Computer Technology in teaching Mathematics.

### 4.5 Attitude of Teachers towards use of computer technology in teaching

It was found that the successful initiation and implementation of educational technology in school program depend on teachers' attitude. In this study analysis of teachers' attitude was done using the data collected , each respondent scores on the teachers' attitude variable was assigned the following values during analysis Strongly Disagree(SD)= 1, Disagree(D) =2, Agree(A) =3 and Strongly Agree(SA) =4

The total scores and mean scores obtained by individual teacher respondent were computed in relation to Attitude towards use of computer technology. Total score were obtained by adding scores of individual respondent on each item then divided by total number of items to get individual mean score. Table 4.9 has the information on Attitude of individual teacher towards use of Computer Technology in teaching Mathematics. The overall attitude of teachers towards use of Computer Technology was obtained by summing up the mean scores of all respondents and dividing by the number of respondents (n=10) on SMASE trained Mathematics teachers' questionnaire. Table 4.7 has the information on attitude of teachers and mean score for use of Computer Technology.

**Table 4.10: Individual Respondent Score on Attitude towards Use of Computer Technology**

| Teacher No. | Statement Number | | | | | | | | | | | Total Score | M. S for Attitude | M.S for using Comp. Technology |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | | | |
| **1** | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | **19** | **1.73** | **1.13** |
| **2** | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 1 | 1 | 3 | ***23*** | **2.09** | **2.38** |
| **3** | 1 | 1 | 1 | 1 | 1 | 4 | 3 | 1 | 2 | 3 | 3 | **21** | **1.91** | **1.63** |
| **4** | 1 | 2 | 1 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 3 | **20** | **1.82** | **1.25** |
| **5** | 2 | 3 | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 3 | 2 | **22** | **2.00** | **1.63** |
| **6** | 1 | 2 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | **22** | **2.00** | **2.50** |
| **7** | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | **19** | **1.73** | **3.00** |
| **8** | 1 | 1 | 2 | 1 | 2 | 1 | 3 | 2 | 1 | 3 | 2 | **21** | **1.91** | **1.63** |
| **9.** | 3 | 2 | 3 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | **19** | **1.73** | **1.00** |
| **10.** | 2 | 1 | 2 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 3 | **20** | **1.82** | **1.25** |
| **Total** | 19 | **20** | **19** | **19** | **19** | **21** | **17** | **19** | **19** | **20** | **26** | | **1.67** | **1.74** |
| **Mean** | **1.90** | **2.00** | **1.90** | **1.90** | **1.90** | **2.10** | **1.70** | **1.90** | **1.90** | **2.0** | **2.60** | | | |
| **Overall mean** | | | | | | | | | | | | | **1.671** | |

**Key: Strongly Disagree (SD)= 1, Disagree (D) =2, Agree (A) =3 and Strongly Agree( SA) =4**

From the findings it was observed that the overall mean for Attitude of teachers towards the use of Computer Technology in teaching is 1.671 indicating that teachers have negative attitude**.** An analysis was conducted to examine the extent to which Teachers Attitude affect use of computer technology in teaching of Mathematics. The finding is illustrated in Table 4.11.

**Table 4. 11: Frequencies of Teachers' Attitude Towards computer technology**

| Statement | SA | A | D | SD |
|---|---|---|---|---|
| I have self-doubts, lack of interest or knowledge about computer Technology | 0<br>0.0% | 3<br>30.0% | 3<br>30.0% | 4<br>40.0% |
| Using Computer Technology assist in understanding Mathematics | 0<br>0.0% | 2<br>20.0% | 6<br>60.0% | 2<br>20.0% |
| I love using Computer Technology in Teaching Mathematics as it Promotes interactive classroom learning | 0<br>0.0% | 3<br>30.0% | 3<br>30.0% | 4<br>40.0% |
| Using Computer technology is good for private studies and not teaching | 1<br>10.0% | 1<br>10.0% | 4<br>40.0% | 4<br>40.0% |
| I enjoy attending refresher course on ICT | 0<br>0.0% | 3<br>30.0% | 3<br>30.0% | 4<br>40.0% |
| Computers enable my students to understand Mathematics | 1<br>10.0% | 2<br>20.0% | 4<br>40.0% | 3<br>30.0% |
| I feel using Computer Technology requires a lot of time | 0<br>0.0% | 3<br>30.0% | 3<br>30.0% | 4<br>40.0% |
| Students lack release time to learn how to use computers or internet to source for information | 0<br>0.0% | 2<br>20.0% | 5<br>50.0% | 3<br>30.0% |
| I am always willing to use computer Technology in teaching mathematics. | 0<br>0.0% | 3<br>30.0% | 3<br>30.0% | 4<br>40.0% |
| Use of Computer in teaching is tedious | 0<br>0.0% | 3<br>30.0% | 4<br>40.0% | 3<br>30.0% |
| I enjoy using Computer technology in teaching Mathematics | 0<br>0.0% | 6<br>60.0% | 4<br>40.0% | 0<br>0.0% |

**Key: SD = Strongly Disagree; D=Disagree; SA = Strongly Agree; A = Agree; and %=Percentages**

The finding revealed that up to 30% reports that some teachers have self-doubts, lack of interest or knowledge about computer technology. Respondents affirm that integration of computer technology assist in understanding mathematics (20%) while 80% gave a contrary opinion. In addition only 30% reported that they love using Computer Technology in teaching mathematics as it promotes interactive classroom learning. This view was consistent with 20% who declared that use of Computer technology is good for private studies and not teaching. On the other hand, it was unclear why up to 70% disagreed that they enjoyed

attending refresher course on ICT and that Computer technology enable students to understand mathematics.

Other respondents feel use of Computer Technology requires a lot of time (30%) and that student's lack release time to learn how to use computers or internet to source for information (20%). It was noted that teachers (30%) are always willing to use computer Technology in teaching. Similarly 60% reported that they enjoy using of Computer technology in teaching Mathematics while only 30% reported that use of Computer in teaching is tedious.

This finding disagrees with Mcalister *et al*., (2005), in their study of teachers' use of computers to teach Mathematics, found that overall attitudes towards using computer technology were very positive, although many of them had limited experience with computers technologies. The findings also shows clearly that majority of the teachers have negative attitude towards use of computer technology in teaching and concurs with (Albion, 1999; Ross, Hogaboam-Gray, & Hannay, 1999).who said that experiences with using technology highlight the teacher attitudes toward use of computer technology seriously affected the success of professional development programs. Therefore, there was need to consider it seriously. Ridgway and Passey (1991) stressed out the importance of exploiting the use of computer technology more than as a word processor in teaching. Software availability and teacher willingness to use the software can have positive effects on the teachers‟ attitudes towards the adoption of technology in the classroom (Sepehr & Harris, 1995).

This findings also agrees with Dupagne and Krendl, (1992) who affirmed that lack of Computer Technology resources results in teachers' low confidence in using the technology, thus high anxiety towards Computer Technology and could lead to negative attitudes hence teaching process would be negatively impacted.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1. Summary of Findings

The summary of findings was discussed as per the three objectives of the study: Teacher's Teaching Experience, Computer Technology Resources and Teachers Attitude toward use of computer technology in teaching. Conclusions and recommendations were based on the results of the findings.

### 5.1.1 Teacher's teaching Experience

The analyzed data on teaching experience showed that, 6 teachers had up to 2 years of teaching experience, 3 teachers had 3 years of teaching experience, 1 teachers had 4 years of teaching experience. This shows that less experienced teacher use computer technology more than experienced teachers this conclusion agrees with other research findings who claimed that experienced teachers are less ready to use computer technology into their teaching.

### 5.1.2 Computer Technology Resources Used in Teaching Mathematics

The study found out that when there is adequate Computer Technology Resources, use of Computer Technology in teaching of Mathematics improves and that all computer based resources are vital in use of computer technology and its decline may affect use of technological advancement in teaching.

### 5.1.3. Attitude of Teachers towards use of computer technology in Teaching Mathematics

The study showed that some teachers have self-doubts, lack of interest or knowledge about computers and belief that use of computer technology assist in understanding Mathematics, some love use of Computer Technology in teaching Mathematics as it promotes interactive

classroom learning. However, it was unclear why some teachers disagreed that they enjoyed attending refresher course on use of computer technology and that Computer technology enable students to understand Mathematics.

## 5.2. Conclusions

### 5.2. 1 Teacher's Teaching Experience

This finding showed that the use of Computer Technology in Teaching of Mathematics is more done by less experienced teachers and that teachers' acquaintance with computer based resources, technical applications, technological errors associated with computer technology use, the nature of curriculum and students' characteristics are contributing factors. According to research findings of this study, majority of teachers had 2 years of teaching experience and had more points of using computer technology in teaching. It can be concluded that less experienced teachers use computer technology while teaching more than experienced teachers. This finding agrees with Baek, Jong & Kim (2008) who claimed that experienced teachers are less ready to use computer technology into their teaching.

### 5.2 Computer Technology Resources Used in Teaching Mathematics

The finding of the analysis shows clearly that resources such as internet access Computer Hardware and Computer software were inadequate with a response of 7 teachers. It was noted that only LCD projector and Computer application e.g. Power point, excel, word process were adequate with 3 respondents. Regarding human resource, technicians and teachers were inadequate with 7 teachers and 9 teachers respectively who use computer technologies in their schools. This finding therefore indicates that Computer Technology resources affect use of computer in teaching Mathematics. Basing on this study it is clear that when there is adequate Computer Technology Resources, use of Computer Technology in teaching of Mathematics improves. It can be observed that all computer based resources are vital in use

of computer technology and its decline may affect use of technological advancement in teaching.

### 5.2.3 Attitude of Teachers towards use of computer technology in Teaching Mathematics

The finding of the analyzed data revealed that 3 teachers reported that some teachers have self-doubts, lack of interest or knowledge about computers. Respondents affirm that use of Computer Technology assist in understanding Mathematics 2 teachers while 8 teachers gave a contrary opinion. In addition only 3 teachers reported that they love use of Computer Technology in teaching Mathematics as it promotes interactive classroom learning. This view was consistent with 2 teachers who declared that use of Computer Technology is good for private studies and not teaching. Conversely, it was unclear why 7 teachers disagreed that they enjoyed attending refresher course on use of computer technology and that Computers enable students to understand Mathematics.

Other respondents felt that the use of Computer Technology requires a lot of time 3 teachers and that student's lack release time to learn how to use computers or internet to source for information 2 teachers. It was noted that 3 teachers are always willing to use computer Technology in teaching. Similarly 6 teachers reported that they enjoy use of Computer technology in teaching Mathematics while only 3 teachers 30% reported that use of Computer in teaching is tedious. It can be concluded that as teachers develops a positive attitude towards computer based learning, use of Computer technology will be enhanced.

Other respondents feel use of Computer Technology requires a lot of time 3 (30%) teachers and that student's lack release time to learn how to use computers or internet to source for information 2 ( 20%) teachers. It was noted that 3 (30%) teachers are always willing to use computer Technology in teaching. Similarly 6 (60%) teachers reported that they enjoy use of Computer technology in teaching Mathematics while only 3 teachers 30% reported that use

of Computer in teaching is tedious. It can be concluded that as teachers develops a positive attitude towards computer based learning, use of Computer technology will be enhanced.

### 5.3. Recommendations

#### 5.3. 1 Teacher's Teaching Experience

From the research finding, the study recommends that:

i. Mathematics teachers should be trained on the use of computer technology in teaching to enable them have hands on experience.

ii. Teacher training colleges should adjust their curricula to incorporate use of computer technology in teaching.

#### 5.3.2 2 Adequacy of Computer Technology Resources Used in Teaching Mathematics

i. Management of Secondary schools should provide adequate computer resources so as to facilitate realization of using computer technology in teaching Mathematics.

ii. Management of school should provide the computer technology technicians to help teachers while using the technology**.**

iii. Lesson time length is revised to cater for the use of computer technology if possible Mathematics double lesson be restored.

iv. Curriculum developers to consider learners with special needs and develop signed e-learning material for learner with hearing impairments.

#### 5.3.3. Teachers' Attitude Towards use of computer technology in Teaching Mathematics

i. Teachers should be motivated to develop a positive attitude towards the use of computer technology in teaching of Mathematics to expedite its implementation may be by rewarding best teacher in using computer Technology.

ii. Teachers should be motivated to love, develop interest and enjoy the use of computer technology in teaching.

iii. More refresher courses on using computer technology be made available for teachers and be made compulsory for each teacher.

### 5.4. Suggestions for Further Research

A research should be carried out on use of computer technology on learners with hearing impairments and come up with other factors which will possibly influence its use other than those three which the study has focused.

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## APPENDICES

### Appendix A: SMASE Trained Mathematics' Teachers Questionnaire (MTQ)

This questionnaire is strictly for the purpose of my study at Maseno University in assisting me to collect data on Assessing Factors influencing use of Computer technology in teaching of Mathematics in Nakuru Sub-County secondary schools. Kindly fill in the spaces provided or tick (√) where applicable. The information will be treated with utmost confidence**.** If you accept to participate in this study, please sign in the spaces provided below:

Informant sign…… Date……..

Researcher name…….. Sign…….

(1) Do you like using Computer Technology in teaching Mathematics?

YES ( ) NO ( )

What reasons do you have for answers you have given?

i…….

ii……

(2). For how long have you using Computer Technology in teaching Mathematics?

(a) 1 Year and below ( ) (b) Above 1 to 2 years ( ) (c) Above 2 to 3 years ( ) (d) 4 years and above ( )

Please indicate how you use computer technology in teaching Mathematics

i……..

ii……

(3) How often do you use computer Technology in teaching Mathematics?

……..

(4) (a)What factors inhibit you from using computer technology in teaching Mathematics?

i.……

ii……

iii.……

(b) Suggest possible solutions to the stated factors.

i……

Give reason for your choices above.

……

5. Below are statements on your attitude towards using Computer Technology in teaching Mathematics? (Tick where appropriate)

| S/NO | Statement | Strongly Agree | Agree | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 1 | I enjoy using Computer technology in teaching Mathematics | | | | |
| 2 | My use of Computer in teaching is tedious | | | | |
| 3 | I am always willing to use computer Technology in teaching Mathematics | | | | |
| 4 | My Students lack release time to learn how to use computers or internet to source for information | | | | |
| 5 | I feel use of Computer Technology requires a lot of time | | | | |
| 6 | Computers enable my students to understand Mathematics | | | | |
| 7 | I enjoy attending refresher course on use of Computer technology in teaching | | | | |
| 8 | Computer technology use is good for my private studies and not for teaching | | | | |
| 9. | I love the use of Computer Technology in Teaching Mathematics as it Promotes interactive classroom learning | | | | |
| 10. | Use of Computer Technology assist me in understanding Mathematics | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | I have self-doubts, lack of interest or knowledge about computers | | | | |

(6) Indicate in the table the adequacy of the following Computer technology resources in using Computer Technology in teaching Mathematics.

**(Tick where appropriate)**

| **Resources** | **Very adequate** | **Adequate** | **Inadequate** | **Very Inadequate** |
|---|---|---|---|---|
| LCD projector | | | | |
| Computer software | | | | |
| Computer application e.g. Power point, excel, word process | | | | |
| Computer Hardware | | | | |
| Mathematics Teachers | | | | |
| Computer Technology Technicians | | | | |
| Internet access | | | | |

**Appendix B: Principals' interview schedule**

**Introduction**

I am a postgraduate student in Maseno University currently carrying out a research on Assessment of Factors influencing use of Computer Technology in teaching of Mathematics in Nakuru Town sub-counties. All your responses for the questions shall be treated with confidentially and shall only be used for the purpose of this study. Your participation in this study is completely voluntary. As an indication of your voluntary agreement to participate in this study, please sign below:

Informant sign…… Date……..

Researcher name…… sign……

1. Kindly assess the degree of adequacy of the following resources in your school. Computer laboratory, Mathematics-Computer software, computer hardware, LCD projector ,computer technicians and internet. You are required to state whether they are Very adequate, adequate inadequate or not available.

2. Please state how Mathematics teachers use Computer Technology in teaching Mathematics?

i.……

ii……

3. How often do your Mathematics teachers use computer technology in teaching Mathematics? …….

4. What factors inhibit your Mathematics teachers from using computers technology in teaching Mathematics?

i.……

ii.……

iii.……

Suggest possible solutions to the stated factors.

5.What level of teaching experience do most mathematics teachers who use computer technology in teaching have ?

**Appendix C: Interview schedule for the County Quality Assurance and Standards Officer Nakuru County**

**Introduction**

I am a postgraduate student in Maseno University currently carrying out a research on Assessment of factors influencing use of Computers Technology in teaching of Mathematics in Nakuru Town sub-counties. All your responses for the questions shall be treated with confidentially and shall only be used for the purpose of this study

Informant sign…… Date……..

Researcher name…… sign……

(1)How can you rate the adequacy of computer technology resources in Nakuru Town sub-counties?.....

(2) Asses how Mathematics' teachers use computer technology in teaching mathematic in Nakuru Town sub-counties……

(3) What is the attitude of Mathematics teachers towards using computer technology in teaching Mathematics?

Give reasons to support your answer

……

……

***Thank you for your participation***

**Appendix D: Instrument for Assessment of using Computer Technology in Teaching Mathematics**

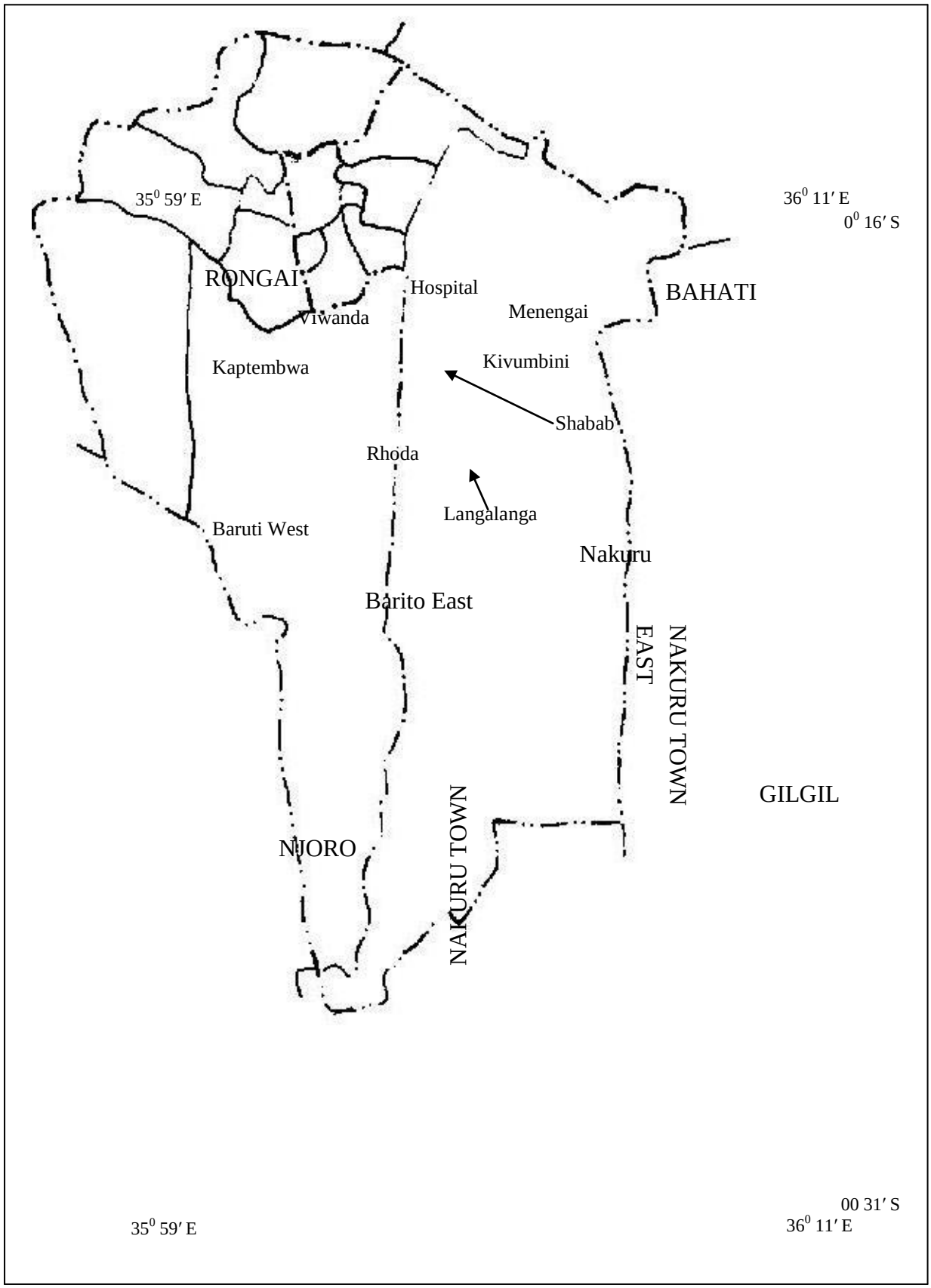
Name of school:…… Subject……

Topic:…….. Time:…….

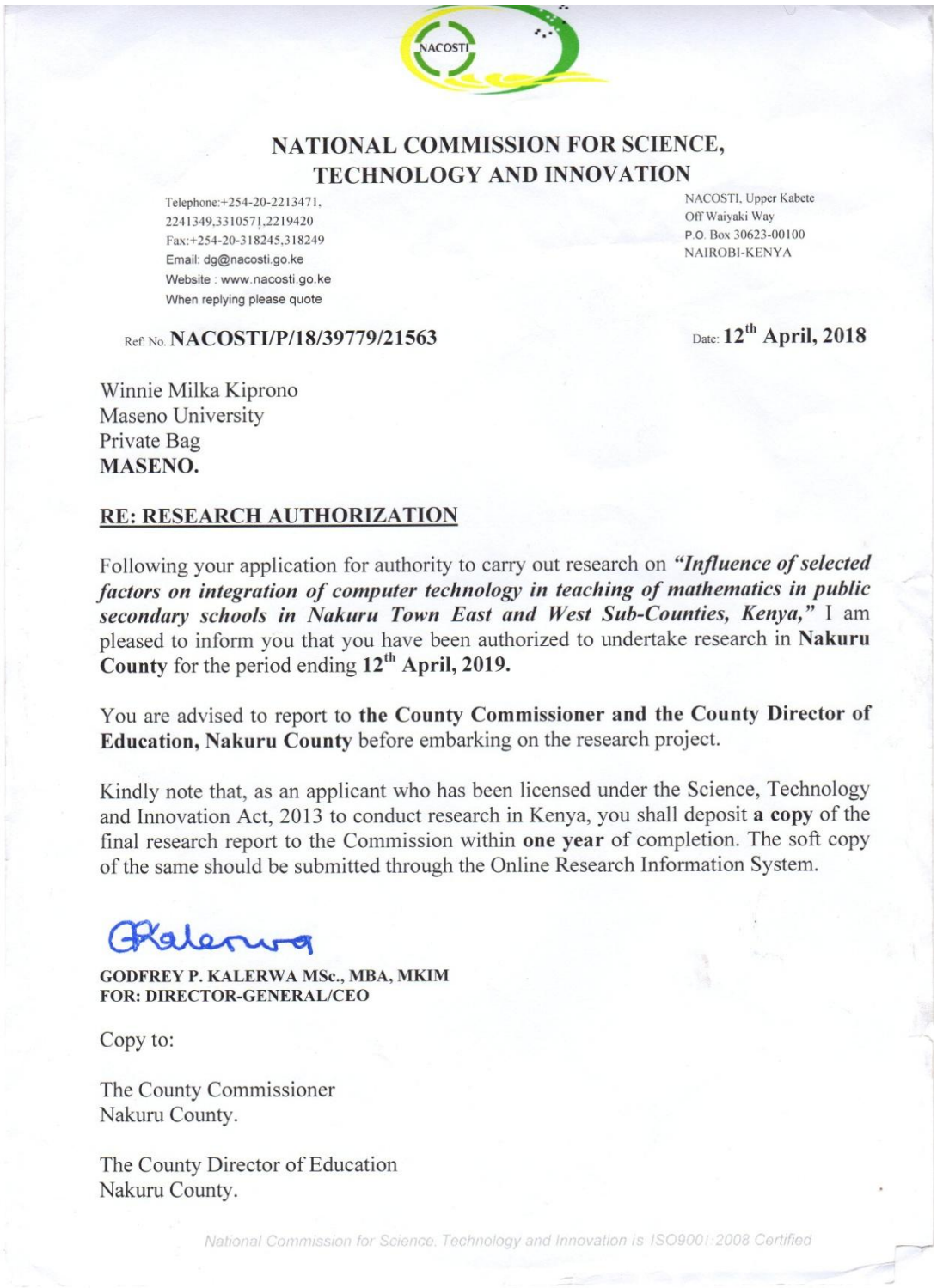
| **Item for Use** | **Level of use** | | | |
|---|---|---|---|---|
| | Very low or No Use (1) | Low (2) | High (3) | Very High (4) |
| Lesson preparation<br>(a) Lesson plan<br>(b) Scheme of work | | | | |
| Lesson Development<br>( a) Introduction<br>(b) Lesson delivery | | | | |
| Resource Utilization<br>(a) Computer based resources<br>(a) Computer student interaction | | | | |
| Evaluation<br>(a) written tests<br>(b) projects/Oral testing | | | | |

Key: Very High (VH) = 4,High (H) =3, Low (L) =2 and Very Low( VL) =1.

**Appendix E: Map of Nakuru Town East and West Sub–Counties**



## Appendix F: Research Authorization Letter



NACOSTI

**NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION**

Telephone:+254-20-2213471, 2241349,3310571,2219420
Fax:+254-20-318245,318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/18/39779/21563**

Date: **12th April, 2018**

Winnie Milka Kiprono
Maseno University
Private Bag
**MASENO.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on ***"Influence of selected factors on integration of computer technology in teaching of mathematics in public secondary schools in Nakuru Town East and West Sub-Counties, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **12th April, 2019.**

You are advised to report to **the County Commissioner and the County Director of Education, Nakuru County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**GODFREY P. KALERWA MSc., MBA, MKIM**
**FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

## Appendix G: Research Permit

THIS IS TO CERTIFY THAT:
*MS. WINNIE MILKA KIPRONO*
of MASENO UNIVERSITY, 12197-20100
NAKURU,has been permitted to conduct
research in *Nakuru County*

on the topic: *INFLUENCE OF SELECTED FACTORS ON INTEGRATION OF COMPUTER TECHNOLOGY IN TEACHING OF MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN NAKURU TOWN EAST AND WEST SUB-COUNTIES, KENYA.*

for the period ending:
*12th April,2019*

.....
*Applicant's Signature*

Permit No : NACOSTI/P/18/39779/21563
Date Of Issue : 12th April,2018
Fee Recieved :Ksh 1000

.....
*Director General*
*National Commission for Science, Technology & Innovation*

**Appendix H: Research Authorization from Deputy County Commissioner**

**THE PRESIDENCY**
**MINISTRY OF INTERIOR AND**
**CO-ORDINATION OF NATIONAL GOVERNMENT**

Telegram: "DISTRICTER" Nakuru
Telephone: Nakuru 051-2212515
When replying please quote

COUNTY COMMISSIONER
NAKURU COUNTY
P.O. BOX 81
NAKURU.

Ref No. CC. SR .EDU 12/1/2 VOL.111/178)

26th November, 2018

DEPUTY COUNTY COMMISSIONER
- NAKURU WEST SUB COUNTY
- NAKURU EAST SUB COUNTY

**RE:- RESEARCH AUTHORIZATION – WINNIE MILKA KIPRONO**

The above named student from Maseno University has been authorized to carry out research on "***influence of selected factors on integration of computer technology in teaching of mathematics in public secondary schools in Nakuru Town East and West Sub counties***", Nakuru County for a period ending 12th April, 2019

Please accord him all the necessary support to facilitate the success of his research.

**JUDITH ONYANGO**
**FOR COUNTY COMMISSIONER**
**NAKURU COUNTY**

## Appendix I: Research Authorization from Ministry of Education

MINISTRY OF EDUCATION

STATE DEPARTMENT OF EARLY LEARNING OF BASIC EDUCATION

Telegrams: "EDUCATION",
Telephone: 051-2216917
When replying please quote
Email:cdenakurucounty@gmail.com
Ref.CDE/NKU/GEN/4/1/21 VOL.VIII/54

COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY
P. O. BOX 259,
NAKURU.

26th November, 2018

TO WHOM IT MAY CONCERN

**RE: RESEARCH AUTHORIZATION –WINNIE MILKA KIPRONO**
**PERMIT NO. NACOSTI/P/18/39779/21563**

Reference is made to letter NACOSTI/P/18/39779/21563 dated 12th April, 2018.

Authority is hereby granted to the above named to carry out research on ***"Influence of selected factors on integration of computer technology in teaching of Mathematics in public secondary schools in Nakuru Town East and West Sub-Counties, Kenya"*** *for* a period ending ***12th April, 2019.***

Kindly accord her the necessary assistance.

FOR: COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY

**G.N. KIMANI**
**FOR: COUNTY DIRECTOR OF EDUCATION**
**NAKURU**

Copy to:

- Maseno University
  Private Bag
  **MASENO**