CHALLENGES OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) INTEGRATED IN SECONDARY EDUCATION: A CASE OF NAKURU COUNTY, KENYA

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E55/CE/14324/2009

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL MANAGEMENT, POLICY AND CURRICULUM STUDIES IN PARTIAL FULFILLMENT FOR THE AWARD OF A MASTER OF EDUCATION (EDUCATIONAL PLANNING) DEGREE OF KENYATTA UNIVERSITY

JUNE 2012
DECLARATION

This research project is my original work and has not been presented for any of the study programmes in any university

__________________ Date____________________

NGUGI ELIAS KINUTHIA
E55/CE/14324/2009

This research project has been submitted to me/us for approval as the university supervisor(s)

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DEDICATION

This study is dedicated to my wife Salome and our children Hiram, Eric and Prince for their undying love. It is also dedicated to my parents Hiram and Julia; they taught me the virtues of hardwork.
ACKNOWLEDGEMENT
My sincere thanks go to my supervisors, Mr. Gatimu Kiranga and Dr. Norbert Ogeta for their advice, support and inspiration. Their guidance has been invaluable in developing this project to its potential.
I am grateful to all the principals of the participating schools for giving me access to their schools. To all the teachers and students who participated in the study, i say thank you. My thanks are extended to all friends and colleagues who have provided generous support throughout my study.
I am also deeply grateful to my wife for her support and belief in me.
God bless you all.
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### ABBREVIATIONS

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<td>BOG</td>
<td>Board of Governors</td>
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<td>DEO</td>
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<td>E-learning</td>
<td>Electronic learning</td>
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<td>ICT</td>
<td>Information Communication Technology</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>KIE</td>
<td>Kenya Institute of Education</td>
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<td>KCSE</td>
<td>Kenya Certificate of Secondary Education</td>
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<td>MOEST</td>
<td>Ministry of Education Science and Technology</td>
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<td>NFS</td>
<td>Non-Formal Schooling</td>
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<td>PTA</td>
<td>Parent Teachers Association</td>
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<td>UNESCO</td>
<td>United Nations Environmental, Social and Cultural Organization.</td>
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This study sought to investigate the challenges of information and communication technology integrated in education in Nakuru County, Kenya. This was following the ministry of education emphasis on adoption of electronic learning in educational institutions. While this policy is being implemented, the problem facing it is the slow up take of ICT integration in secondary school education. The specific objectives of the study were to: analyze the students’ enrolment rate of computer studies as one of the subjects offered in the curriculum in the last 5 years, establish the teachers’ and students’ perception towards integration of ICT in teaching and learning, determine the extent ICT is used in teaching and learning, find out the current status of infrastructural facilities of ICT integrated in education in Nakuru County and find out the problems teachers and students are facing in integrating ICT in education. The study adopted a descriptive survey design. The targeted population was 27 principals, 27 computer teachers and 503 computer studies students. The researcher used 40% of the principals’ population, 52% of the computer studies teachers’ population and 30% of the computer studies students’ population in the county. Purposive sampling was used to select principals and computer studies teachers while simple random sampling was used for the computer studies students. This gave a sample size of 179 respondents comprising 11 principals, 14 computer studies teachers and 154 computer studies students. Data were collected using interview schedule for principals of secondary schools and questionnaires for both teachers of computer studies and students of computer studies in these schools. The data collected was both quantitative and qualitative. Percentages and frequency distributions were used to analyze collected data with the aid of Microsoft excel and statistical package for social sciences (SPSS version 18.0). Data was presented using tables, bar charts and pie-charts. The study findings indicated that there was an increase in enrolment in computer studies in the last five years but this was not matched by a similar increase in the number of computers in schools while the teachers and students lacked the skills to use ICT in teaching and learning. It was recommended that the government through the appropriate agencies needs to equip the schools with enough computers to fully embrace ICT integration in education and also organize for in-service training for all teachers in computer skills. The relevant digital content should also be developed by K.I.E as additional resources for teaching and learning.
CHAPTER ONE

1.0 Introduction

This chapter presents the background to the study, statement of the problem, purpose of the study, the objectives of the study, research questions, the significance of the study, assumptions of the study, limitations of the study, delimitations, theoretical framework, and the conceptual framework.

1.1 Background to the study

According to the Republic Of Kenya (2006) there have been a rapid advancement in the field of information technology (IT) and a resultant explosion in growth of the information services sector. This has radically changed the world’s economic and social landscape. These changes have given rise to a new society based on information and knowledge. This has further resulted in new avenues of development, employment, productivity, efficiency and enhanced economic growth. Globally, IT- led growth is creating jobs, raising productivity, increasing incomes and opening many opportunities for increased trade and human development. Extensive application of information technology now provides opportunities for new ways to create wealth thus contributing significantly to poverty alleviation.

Further the government recognizes that there is a growing digital divide between the countries that are highly endowed and developed in the field of information technology and Kenya as well as between rural and urban areas in the country. The objective of the government is to initiate steps to reduce this divide by using IT to rapidly develop all sectors of the economy.
Further, the government recognizes information as a resource which must be generated, collected, organized, leveraged, secured and preserved for national prosperity.

In this respect the policy broad objective include: first ensuring that IT plays a key role as an empowerment tool, addressing gaps relating to gender, youth, people with special needs, rural and urban and disadvantaged groups.

Secondly, using of e-government as a tool to improve internal efficiency and the quality of public service delivery and help in the fight against corruption.

Another objective is to encourage the use of IT in schools, colleges, universities and other educational institutions in the country so as to improve the quality of teaching and learning.

In addition the use of IT to generate additional employment and promoting entrepreneurship for the new digital economy while encouraging and accelerating investments and growth in IT hardware, software, internet training, IT enabled services, telecommunicating and electronic commerce and finally the provision of adequate infrastructure in the country for IT sector to flourish.

The national ICT policy mentions some strategies which the government will adopt to realize the objectives among them being e-learning. On e-learning the government intends to employ the following strategies as: promoting the development of e-learning resources, facilitate public-private partnerships to mobilize resources in order to support e-learning initiatives. Others include promoting the development of integrated e-learning curriculum to support ICT in education and training as well as establishing a national ICT centre of excellence. Another strategy is the provision of affordable infrastructure to facilitate dissemination of knowledge and skills through e-
learning platforms. Moreover, the development of content to address the education needs of primary, secondary and tertiary institutions and creating awareness of the opportunities offered by ICT as an education tool would further enhance teaching and learning. However, the realization of the policy objectives will depend on the availability and adequacy of skilled human resource capacity. The government will support the creation of necessary capacity by:

a) Integrating IT subjects in the curriculum at all levels of education.

b) Establishing educational network for sharing educational resources and promoting e-learning at all levels.

This initiative of creating the necessary human capital is very noble. However, it has not taken root or impacted positively by significantly increasing the number of students taking up computer studies. This shows that there must be some underlying barriers or hindrances to the integration of ICT in education.

1.2 Statement of the problem

Attempts to enhance and reform education through ICTs require clear and specific objectives, guidelines and time bound targets, the mobilization of required resources and political commitment at all levels to see the initiative through.

Specifically, drivers and barriers to ICT use need to be identified including those related to curriculum and pedagogy, infrastructure, capacity building, language and content and financing.

Secondary school education is a major determinant of the capacity of a nation to develop the required manpower in the modern sector of the economy. Without sufficiently trained human resource any nation will not compete effectively in the
knowledge-based economy. The problem facing this initiative is the slow uptake of ICT integrated in education and in secondary schools in particular. Hence, this study sought to investigate the challenges of Information and Communication Technology integrated in education in Nakuru County.

1.3 **Purpose of the study**

This study focused on the challenges which schools in Nakuru County were facing as a result of ICT integrated in education.

1.4. **Objectives of the study**

The study was guided by the following objectives:

i) To analyze the students’ enrolment rate of computers studies as one of the subjects offered in the curriculum in the last 5 years.

ii) To establish the teachers and students perception towards integration of ICT in teaching and learning.

iii) To determine the extent ICT is used in learning/teaching of other subjects.

iv) To find out the current status of infrastructural facilities for the integration of ICT in education in the Nakuru county.

v) To find out the problems teachers and students are facing in integrating ICT in education in Nakuru County.

1.5. **Research questions**

The following research questions guided the researcher to achieve the stated objectives:
i) What is the trend of enrolment in computer studies as an examinable subject in public secondary schools?

ii) What are the teachers and students perceptions about integration of ICT in teaching and learning in public secondary schools?

iii) How often is ICT used in teaching and learning of other subjects in public secondary schools?

iv) What is the current status of the available ICT infrastructure in the public secondary schools?

v) What problems are teachers and students facing as a result of integrating ICT in teaching and learning in public secondary schools?

1.6. Significance of the study.

The researcher hoped that when this study is completed to the satisfaction envisaged, it will benefit the following groups:

1) The ministry of education for the purposes of policy making and effective implementation.

2) KIE for curriculum review and development.

3) Academicians and researchers in forming a basis for further studies in the area of ICT.

4) Teacher training colleges in integrating ICT in pre-service training.

5) Teachers in the field in recognizing the potential of using ICT.

6) Students in public secondary schools in recognizing the benefits of ICT.
1.7. Assumptions of the study

In this study, the following assumptions were made:-

i) All respondents would be cooperative and provide reliable responses.

ii) That all optional subjects offered in a school have equal chances to be selected by candidates sitting for KCSE.

iii) Some schools use other ICT syllabi a part from the KNEC syllabus.

iv) Teachers of other subjects have ICT skills.

1.8. Limitations of the study

The study was confined to students, principals and teachers of ICT in schools that offer computer studies as a subject in the curriculum.

1.9. Delimitations

This study was done in public secondary schools in areas or schools that were easily accessible along all weather roads in Nakuru County, although for more conclusive results all areas should have been covered. This might not be possible due to financial, time and other logistical constraints.

1.10. Theoretical framework

A theoretical framework is collection of interrelated ideas based on theories which attempt to clarify specific phenomena. The theory to be adopted in this study is Piaget’s Theory of Intellectual development. As Orodho (2010) asserts, in Piaget’s Theory, knowledge is assumed to have a specific goal or purpose – to aid a person in adapting to the environment. Knowledge is acquired and thinking process becomes
more complex and efficient as a consequence of the maturing child’s interactions with the world. Sloan (1985) explicates three aspects of Piaget’s theory: accommodation and assimilation, cognitive structures, and development stages. Once we have understood each of these concepts and their relevance to learning, the place (or misplacement) of computers in education gains clarity.

1.10.1 Accommodation and assimilation:

The polar processes of accommodation and assimilation form the logical centre of Piaget’s “genetic epistemology”. Although the newborn infant may completely lack all formal knowledge and according to Piaget, all static “cognitive structures”, the activities of accommodation and assimilation are sufficient to initiate cognitive development. Accommodation and assimilation can perhaps best be understood through their most vivid manifestations. In the case of accommodation, imitation serves this purpose, and in that of assimilation, symbolic play or imagination. The process of accommodation is one in which the subject transforms or creates inner structures in order to accommodate new object. This seems to be accomplished by a rehearsal, inner or outer, of the new experience. Piaget recognizes three levels of imitation: imitation action, deferred imitation, and interiorized imitation. These provide the vehicle for the constitution of both operative aspects of thought and, through the last form of imitation, that of mental imagery.

Equally important is the complimentary activity of assimilation, which Piaget defines as “the integration of external elements into evolving or completed structures of an organism”. When a child selects a nearby pine cone to become a loaf of bread, and a
stone to be its knife it is “assimilating” or integrating external elements (pine cone and stone) into an existing structure (domestic activity).

Assimilation is an essential ingredient in development; it provides for continuity and, indeed, is necessary for recognition itself. Yet if it existed alone, no development could occur.

The will and imagination to change one’s world, whether in play or later through technological invention, must be coupled with selfless capacity for accommodation.

1.10.2 Cognitive structures:

Out of the interplay of accommodation and assimilation arise what Piaget terms “cognitive structures”. Cognitive activities rely on the development of suitable mental structures, and the construction of these structures is predicated primarily on action, not language. Piaget writes: from the most elementary sensorimotor actions (such as pushing or pulling) to the most sophisticated intellectual operations, which are interiorized actions, carried out mentally (e.g. joining together, putting in order, putting in one-to-one correspondence), knowledge is constantly linked with actions or operations, that is, with transformations.
Table 1 An analysis of environment related variables in a conceptual model of instructional design.

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Table 2 An analysis of learner – Related variables in a conceptual model of instructional design.

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Source: Adams, 1985 pg 136
1.11 Conceptual framework

The conceptual framework in figure 1.1 shows the relationship between dependent variables and the independent variables. The independent variables for this study include: ICT infrastructure, teacher and students attitude, administrative support and availability of local digital content. The dependent variable in this study is effective integration of ICT in teaching and learning in public secondary schools.

Figure 1 Conceptual framework

Source: Researcher, 2011
1.12 Operational definition of terms

**Challenges:** difficulties encountered in the process of integrating ICT in education.

**Schoolnet:** grouping of schools that use ICTs to support education process or agencies that facilitate and develop the use of ICTs in the education context.
CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Introduction

Literature in this chapter is reviewed under the following headings: Global trends, ICT in Kenyan schools, Learner- centered environments, Teachers’ and students’ perception of ICT, Digital content, Educational planning, Finances and Motivation. Finally a summary and gaps in the reviewed literature is given.

2.2 Global trends

2.2.1 ICT in Canada

The dramatic growth of silicon valley in the last decades of the 20th century parallel the emergence of the ICT paradigm and sparked a dramatic interest in the process of cluster development in Canada. The ICT in Canada is a large and dynamic sector according to Lucas (2009). Of the almost 32,000 companies comprising the in 2005, 80% employed only one to nine people. There were only 120 companies with over 500 employees. There is also the emergence of schoolnets. Schoolnets can be defined as groupings of schools that use ICTs to support the education process or agencies that facilitate and develop the use of ICTs in the education context. Examples of these type of schools are: schoolnet Canada, European schoolnet, schoolnet South Africa, western Cape schoolnet, schoolnet India etc (UNESCO,2003).

2.2.2 ICT in Africa

Hung and Khine (2006) posits that ICT-enriched learner- centred environment requires a holistic approach that calls for changes at three levels, teacher schooling
environment and learning activities. Fundamentally, however, it is teachers who with support from parents administrators and policy makers can optimize the benefits of ICT-enriched environments to make learner – centred a reality.

They further argue that education reform is often a disappointing business. In the case of Information and Communication Technologies (ICT) in education, various countries have made massive injection of funds in the education sector, trying to enhance a new generation of ICT literature capable of rapidly applying ICT for enhancing economic competitiveness and quality of life.

Critics continue to emerge and highlight, on the one hand, the absence of evidence to show that reform efforts to make education ICT-driven have induced any significant impact and on the other hand, most students are still educated in the same way as their parents were - that is, text book based learning and teacher centred teaching.

The lack of teacher skills to frame pedagogy is a major obstacle affecting the use of ICT in learning and teaching.

According to Gebremichael et al (2006) as a continent, Africa represents 14% of the world’s total population, but accounts for less than 2% of the world’s internet usage. In sub-Saharan Africa, capital cities serve as the centers of economic, political, educational, technological activities. Thus, these cities traditionally maintain the highest concentration of ICT development and implementation. While these cities are less developed than many American and European cities, the adoption and development of various forms of information infrastructure have allowed urban residents of these areas to adapt to ICT changes more readily than those in rural areas.
2.3 ICT in Kenyan schools

The ministry’s policy framework indicates that there are a number of challenges concerning access to and use of ICT in Kenya, including high levels of poverty, limited rural electrification and frequent power disruptions. Very few secondary schools have sufficient ICT tools for teachers and students. Most of the schools with ICT infrastructure have acquired through initiatives supported by parents, the government, NGOs, or other development agencies and the private sector including the NEPAD e-school programme. The core problem is that Kenya lacks adequate connectivity and network infrastructure.

2.4 Learner-centered environments

According to Lee (2002b), it is only when ICT integration gains a foothold in schools, that the use of ICT-enriched learner centred environments will provide teachers with the opportunity to develop more engaging lessons and facilitate the communication in more dynamic ways than the non-interactive print media. As Chen (2011) argues students may not only expect the performance to improve, reduce efforts or increase social studies but also expect the e-learning system to conform to their specific learning requirements. The design and implementation of an e-learning system should carefully consider such an educational perspective. Sun, Tsai, Finger, Chen and Yeh (2008) posit that E-learning is emerging as the new paradigm of modern education worldwide, the e-learning has growth rate of 35.6%, but failure still exists. The great advantages of e-learning include liberating interactions between learners and instructors or learners and learners from limitations of time and space through the asynchronous and synchronous learning network model.
In an e-learning environment, several factors account for user satisfaction. Those factors can be categorized into six dimensions: Students, teacher course, technology, system design and environment.

According to Papamkolaou and Grigoriadocetal (2002) the internet and the World Wide Web in particular offer an innovative instructions delivery system that connects learners with education resources. The hypermedia form of the educational material in a web based educational system makes learning a task driven process, where learners are motivated to explore alternative navigational paths through the domain knowledge and different resources around the globe.

Bayler and Ritchie (2002) assert that computers when used as a tool to help students analyze, compare, contrast or evaluate resources. The computer facilitates the student’s internal cognitive process by serving as an extension to their intellectual capacity. This heightened capacity helps students think more critically as they manipulate information. In other words they impact positively on higher order thinking skills (HOTs).

### 2.5 Teachers and students perception of ICT

Regardless of the amount of technology or its sophistication, technology will not be used unless faculty members (teachers) have the skills, knowledge and attitudes necessary to infuse it into the curriculum (Baylor and Ritchie, 2002). Generally this comes through self education or professional development. Schools can assist by providing in service training that meets the needs of the faculty and by promoting continual growth both within and outside school boundaries.
Teachers attitude to change influences teachers willingness to integrate technology into classroom, there are teachers who see computers as tools to use in collecting, analyzing and presenting information and those who see them as teaching machines. The former are deemed to be more innovative with technology in the classroom. According to Christensen (2002), positive attitudes towards computers are positively correlated with teachers’ extent of experience with computer technology. With familiarity, anxieties and fears tend to decrease, and confidence increases. The amount of confidence a teacher possesses in using computers and related information technologies may greatly influence his or her effective implementation of technology methods in the classroom. Computer anxiety is a major cause of resistance to using computers. Increased computer experience reduces computer anxiety in many teachers.

Teachers are the main gatekeepers in allowing innovations to diffuse into the classrooms. Therefore one of the key factors for effecting an integration of computers in the school curriculum is adequate training of teachers in handling and managing these new tools in their daily practices. World Bank (2007) points out skilled human capital as a key role condition for success of ICT projects. Maintaining an ICT infrastructure and launching new ICT applications depend on available pool of skilled workers implying the need for technical training, general education and the capacity to commercially exploit the knowledge that ICT makes available.

World Bank (2007) further reports that in some low income countries notably China, India and other countries in East Asia – the ICT sector has proved to be a significant generator of employment and economic growth. Through the application of modern technologies coupled with increases in productivity, Vietnam’s ICT sector has quickly
gained in competitiveness. Jordan has made skills development a priority as part of its goal and become a regional centre and more importantly a knowledge economy. Its ICT initiative supports a national vision for realizing the potential of ICT through a set of actions that includes upgrading the skills of people across the country so that they can better use and develop new technologies. Thus all countries, regardless of income level, are in a position to learn from and incorporate the experience of more developed countries, which have mainstreamed ICT into all aspects of their economies.

The fundamental question is how to use ICT to foster productivity and innovation, stimulate growth and prosperity, increase competitiveness in global markets and help countries become genuine knowledge economies. In this regard education creates choices and opportunities, reduces poverty and gives people a stronger voice in society. It is the fundamental enabler of knowledge, economy. Well educated and skilled people are essential for creating, sharing, disseminating and using knowledge effectively in a global environment that is radically changing the type of skills needed for economic success.

2.6 Digital content

Content development is a critical area that is too often overlooked. The bulk of existing ICT based educational materials is likely to be of little relevance to education in developing countries especially primary and secondary levels. There is need to develop educational content (e.g. radio programs, interactive multimedia learning materials or CD-ROM or DVD, web based courses etc), adapting existing content and convert print based content to digital media. These tasks for which content
development specialist such as instructional designers, scriptwriters, audio and video production specialists, programmers, multimedia course authors and web developers are needed.

E-learning is the practical way to ensure access to higher education to most Kenyans. With increased number of university entrants, pressure on facilities is now a nightmare to institutions of higher learning. The initial arrangement to have classes in shifts – daytime, evenings, weekends and during holidays – are stale. With improved technology, and even the laying of fibre-optic cable, e-learning should now become a reality in the country. (Wanyama, 2010, p.34)

2.7 Educational planning

As Hernes (1972) puts it not only has ICT transformed the way learning institutions work, it also has changed the way we think about organized education, ICT has become a medium in the original sense of the word, something in the middle, between the substance to be learned and the student who is to master it. First, it liberates provision of education from the constraints of time and place. Many courses can be accessed from more or less anywhere and at any time. Second, training can be customized by allowing materials to be adapted to individual levels and tasks to be placed according to personal progress. The new education technologies alter the means and modes of studying. Students can link to other students across boundaries and across continents. Teachers in the remotest places can be encouraged to take part in important professional development projects.

The pressing problem for educational planners is how to reach within a reasonable time, the needs of the majority who are poor, uneducated and live in rural areas. The
question of equitable access is not just a question of who can use what is available on the internet, however, but also of who can produce it.

2.8 Finances

Lee (2001) lists lack of financial resources as one major factor that restrains information and communications investment in developing countries. Building ICT infrastructure requires vast amounts of investments. The cost of technology, its rapid evolution, and the special knowledge and skills required in its users poses substantial barriers to effective utilization. (Siddiqui and Mujibul, 2004)

2.9 Motivation

The idea that digital technology might help to motivate reluctant learners and provide more meaningful contexts for literacy has captured the attention of increasing number of educators (Caring and Robinson, 2010). Digital technology has been seen as key to transforming education through enabling new relationships between teachers and learners and allowing learners to take more control of their learning process. Adams (1985) puts it that, in the classroom, students with learning and development handicaps are benefiting from increasingly sophisticated instructional software. Computer-based instruction has the potential to analyze a student’s error and branch the learner to a tutorial, record his or her progress, and make appropriate assignment for next day. All teachers can use the computer as a valuable tool for both understanding and designing individualized instruction for their students. Adams (1985) lists ten generalizations about educational computing supported by research:
1) A variety of students can and do learn from the use of computers to aid instruction.

2) Teachers will remain the key to good instruction – computers will not replace them.

3) Time frames for learning are either slowed or quickened with computer instruction.

4) Computers can be misused (or underused) in educational settings.

5) Student motivation for learning may be improved with computers. The holding power of these machines must not be underestimated.

6) Management of anxiety and other human problems are major factors for teachers and students new to computers.

7) Interactive computer learning (with peers) seems far more effective than drill and practice on the computer alone.

8) Teachers and administrators need to be computer literate to integrate computers into the classrooms and make them effective.

9) The teaching/learning potential for instructional computing is increasing as the technology develops (the technology is changing so rapidly that studies are often outdated before they come out).

10) It is extremely difficult to measure the effectiveness of computer-assisted instruction empirically over a broad spectrum of experiences or subjects.

Osinl (1998) posits that in computer-assisted learning (cal), the student learns by interacting with a program stored in the computer. This program is designed to react to the students needs according to pre-determined pedagogical criteria. This has some benefits:
Each student may learn according to his or her cognitive level and learning speed, independently of his or her classmates. Each student receives individual guidance, with explanations tailored to perceived problems, and opportunities for in-depth learning according to individual interests. According to Siddiqui and Mujibul H (2004) new technology-based models of teaching and learning have the power to dramatically improve educational outcomes.

2.10 Summary and gaps in the reviewed literature

From the literature reviewed it emerges that ICT is a potential mover of the economy and is of great benefit to teachers and students, however, in the Kenyan context even where computer and the necessary peripheral equipment is available the rate of uptake is quite slow. This study wants to fill this gap by investigating the underlying problems facing the integration of ICT in education.
CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter is concerned with the description of procedures, strategies or actions that were used in the study. This section focuses on research design, locale, sample and sampling procedures, data collection techniques, research instruments, administration of research instruments and data analysis.

3.2 Research design

As Kerlinger (1973) puts it a research design is a plan, structure and strategy of investigating, which seek to obtain answers to various research questions. Kothari (2004) calls it ‘the advance planning of methods to be adopted for collecting the relevant data and the techniques to be used in their analysis’. Descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals (Orodho, 2003). This study was a descriptive survey since the researcher used interviewing and administered questionnaires to solicit the required information.

3.3 Study locale

The study was carried out in Nakuru County. The problem of ICT integrated in education existed in Nakuru County and had not been investigated on to the best knowledge of the researcher.
3.4 Target population

The target population for this study comprised of secondary schools in Nakuru County, head teachers of these schools, computer teachers in the schools and the students. The population comprised 27 principals, 27 teachers and 503 students.

3.5 Sample and sampling procedure

Due to lack of adequate funds and time, not all school headteachers, computer teachers and students participated in the study. The researcher used a sample population. Orodho (2010) defines a sample as a small part of large population, which is thought to be representative of the larger population. He continues to state that any statements made about the sample should be true for the entire population.

Study used purposive sampling to select 11 schools in Nakuru County distributed by type of school, boarding status and sex. The student respondents were selected using simple random sampling to give them equal chances of participating. 11 principals, 14 teachers and 154 students participated.

3.6 Research instruments

3.6.1 Principals interview schedule

Personal interviews as a method of collecting information are usually carried out in a structured way, (Kothari, 2004). The interviewer (researcher) follows a rigid procedure laid down asking questions in a form and order prescribed. The chief merits of this system are:

a) More information and that too in greater depth can be obtained
b) Interviewer by his own skills can overcome resistance, if any, of the respondents

c) There is greater flexibility under this method as the opportunity to restructure questions is always there.

d) Observation method can as well be applied in addition to recording verbal answers to various questions.

e) Personal information can as well be obtained more easily

f) Samples can be controlled more effectively as there remains no difficulty of the missing returns

The researcher will use both open and closed-ended approach so as to get a complete and detailed understanding of the challenges head teachers are facing during ICT integration in education.

3.6.2 Teachers’ Questionnaires

An ideal questionnaire possesses the same properties as a good law: it is clear, unambiguous and uniformly workable. According to Cohen and Manion (1995) its design must minimize potential errors from the respondents. And since peoples’ participation in surveys is voluntary, a questionnaire has to help in engaging their interest, encouraging their cooperation and eliciting answers as close as possible to the truth. The questionnaires helped the researcher cover a wide area and there were no bias on his side or the respondent.
3.6.3 Students’ questionnaire

The students’ questions proceeded in a logical sequence moving from easy to more difficulty ones as Kothari (2004) recommends. Some questions were dichotomous in nature while others were open-ended to elicit the feelings of the respondents. Brief directions with regard to filling the questionnaires were given.

3.7 Piloting of research instrument

The researcher conducted a pilot study to determine the validity and reliability of the instruments. In piloting, 5 convenient secondary schools were selected but were not involved in the main study. The researcher administered the study instruments to the randomly selected respondents in these schools.

3.7.1 Validity

Content validity refers to the degree to which a test samples the content area which is to be measured (Ary, Jacobs and Razavieh, 1972). In order to pre-test validity of the instruments and to perfect the questionnaires and interview items’ concepts and wording, content validity of the instrument will be used to measure the extent to which the items represent specific areas covered by the study. Kasomo (2006) defined validity as the qualitative procedure of pre-testing or a prior attempt to ascertain that research instruments are accurate, correct, true, meaningful and right in eliciting the intended data for the study. According to Orodho(2003), the validity of an instrument is measured by its repeated reviews by experts and field tests. To validate the instruments the researcher checked whether they were ambiguous, confusing and poorly prepared items. The instruments were tested to ascertain their validity and
suitability in collecting the required data. The draft questionnaires were given to lecturers in the department of Educational management, Policy and Curriculum Studies of Kenyatta University who are experts to appraise the items suitability in obtaining information according to research objectives. The researcher followed the recommendations of the experts.

3.7.2 Reliability

Mugenda and Mugenda (1999) explained that reliability is a measure of degree to which a research instrument yields consistent results or data after an accepted number of repeated trials. The test-retest technique of the research instruments was used to eliminate biasness in order to fit within the required goals. The instruments were tested in 5 schools and then re-tested after one week in the same schools. Twelve responses from each of the 5 principals, 5 teachers and 5 students were used as raw data points to calculate the correlation coefficient between the corresponding data points for the two times the instruments were administered. The Pearson product-moment correlation coefficient formula given below was used to calculate the correlation coefficient in which: X values were the data points that is, number of respondents of corresponding questions for the first trial and the Y value are the data points obtained in the second trial.
\[ r = \frac{\sum xy - (\sum x)(\sum y)}{n} \times \sqrt{\frac{(\sum x^2 - (\sum x)^2)}{n}} \times \sqrt{\frac{(\sum y^2 - (\sum y)^2)}{n}} \]

Where \( \sum xy \) = sum of the gross products of the values of variables X and Y

\( (\sum x)(\sum y) \) = product of the sum of x and the sum of y

\( \sum \) = sigma (meaning sum of) sum of the values obtained in piloting.

\( \sum x^2 \) = sum of squared values of x

\( \sum y^2 \) = sum of squared values of y

3.7.2.1: Reliability of principal’s interview schedule

The researcher used 12 questions of the principal’s interview schedule in the pilot study to calculate the correlation coefficient (r). In the working shown below, x and y were the data points obtained in the 1st and 2nd times of test-retest of the principals interview schedule.
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\[ \sum (\_)=39 \quad 40 \quad 152 \quad 151 \quad 160 \]

\[
r = \frac{\sum xy - (\sum x)(\sum y)}{n}
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\[
r = \frac{\sqrt{(\sum x^2 - (\sum x)^2)(\sum y^2 - (\sum y)^2)}}{n}
\]

\[
r = \frac{152 - (39)(40)}{12}
\]

\[
r = \frac{\sqrt{(151-39)^2(160-40)^2}}{12}
\]

\[
r = \frac{21}{\sqrt{(24.25)(26.67)}}
\]

\[
r = \frac{21}{25.43} \quad r = + 0.825
\]
3.7.2.2: Reliability of teachers of computer students’ questionnaires

The researcher used 12 questions of the teacher of computer studies questionnaire used in the pilot study to calculate the r value. X and Y were the data points obtained in the two periods that the questionnaires were administered to the 5 selected pilot schools.

<table>
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</tbody>
</table>

\[ \Sigma(\cdot) = 49 \]

\[ \Sigma xy = 217 \]

\[ \Sigma(\Sigma x) = 217 \]

\[ \Sigma(\Sigma y) = 221 \]

\[ r = \frac{\Sigma xy - (\Sigma x)(\Sigma y)}{n} \]

\[ \sqrt{\left( \frac{\Sigma x^2 - (\Sigma x)^2}{n} \right) \left( \frac{\Sigma y^2 - (\Sigma y)^2}{n} \right)} \]
\[ r = \frac{217 - (49)(49)}{12} \sqrt{\frac{(217-49)^2}{12} \frac{(221-49)^2}{12}} \]

\[ r = \frac{16.92}{\sqrt{(16.92)(20.92)}} \]

\[ r = \frac{16.92}{18.815} \]

\[ r = +0.8993 \]

### 3.7.2.3: Reliability of students of computer studies questionnaires

Twelve items from the students of computer studies questionnaires were used in the pilot study to calculate the value \( r \) value. X and Y were the data points obtained in the two periods that the questionnaire was administered to the 5 selected students in the five pilot schools. The working is as shown below.
\[ r = \frac{\sum xy - (\sum x)(\sum y)}{\sqrt{\frac{(\sum x^2 - (\sum x)^2)}{n} \frac{(\sum y^2 - (\sum y)^2)}{n}}} \]

\[ r = \frac{231 - (51)(52)}{\sqrt{\frac{(229-(51)^2}{12} \frac{(238-(52)^2}{12}}} \]

\[ r = \frac{10}{\sqrt{(12.25)(12.67)}} \]

\[ r = +0.8027 \]
The correlation coefficient $r$ values of +0.8258, +0.8993 and 0.8027 shown above were very high.

According to Kasomo (2006) there are five value categories denoting distinct variable relationship, namely:

a) Very high; $r = 0.8$ to $0.79$

b) high; $r = 0.6$ to $0.59$

c) moderate; $r = 0.4$ to $0.39$

d) Low; $r = 0.2$ to $0.19$

e) negligible, $r = 0$ to $0.19$

This proved that the instruments were consistent in eliciting similar data in the two times they were answered by the respondents. Hence the instruments were reliable and were used for data collection in the study. The pilot study was used to modify the research instruments in the wording and format where necessary to make them valid and reliable.

3.8 Data collection techniques

The researcher first got authorization letter from Kenyatta University and a research permit from the permanent secretary in the ministry of Education. With these documents permission sought from individual school principals. The primary data was collected by use of the pre-tested questionnaires for teachers and students. These questionnaires were administered and the interview schedule for the principals conducted by the researcher in person.
3.9 Data analysis

The data collected was both quantitative and qualitative. Qualitative data was analyzed using descriptive statistics. Where necessary the statistical package for social sciences (SPSS) was used. Qualitative data was analyzed thematically i.e. organizing them according to the main themes, objectives and research questions. Thereafter inferences, conclusion and recommendations were drawn.

3.10 Logistical and Ethical considerations

Orodho (2009) underscores the critical importance of logistical issues and the need for the researcher to be aware of them prior to starting the research project. Before proceeding to the field the researcher sought a permit from the National Council of Science and Technology, Provincial Director of Education, Rift valley; prepared a budget, timetable and packaged the instruments safely. During the field visits the researcher adhered to strict discipline and punctuality was observed. After collecting the data the instruments were serialized and edited. Direct consent was sought from the participants who were assured of strict confidentiality and that the information would only be used for this study.
CHAPTER FOUR

4.0 DATA ANALYSIS, PRESENTATION AND DISCUSSION

This chapter contains the results and presentation of the findings. The study targeted three categories of respondents namely; 11 principals, 14 computer teachers and 154 students of computer studies totaling 179 respondents. An interview schedule was used for principals and two sets of questionnaires administered to the teachers of computer studies and students of computer studies in the sampled schools. This study aimed at establishing the challenges of information and communications technology integrated in education in Nakuru County. The findings were presented based on the study research questions. The data collected was coded and entered in SPSS package where analysis was done. Descriptive statistics were used to present the findings upon which interpretations and conclusions were made.

4.1 Background information of the respondents

4.1.1 Background information of the principals

The researcher sought to establish the sampled principals’ experience as principal. The illustration in figure 2 shows the demographic information of principals interviewed in terms of the duration of their service in the current position.
The findings presented in figure 2 show that 18% of the principals had an experience of less than 5 years, 45% had an experience of between 5 and 10 years while 37% had over 10 years experience.

4.1.2 Background information of computer studies teachers

Table 3 shows the background information of teachers of computer studies in terms of gender, age, experience and level of education.
Table 3 Background information of teachers’ of computer studies.

<table>
<thead>
<tr>
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<th>frequency</th>
<th>percent</th>
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<td></td>
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<td>14</td>
<td></td>
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<tr>
<td>Age</td>
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<td>14.29</td>
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<tr>
<td>21-29 years</td>
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<td>30-39 years</td>
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<td></td>
<td>57.14</td>
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<tr>
<td>0-50 years</td>
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<td></td>
<td>0</td>
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<tr>
<td>Total</td>
<td>14</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Experience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 1 year</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>1-4 years</td>
<td>5</td>
<td></td>
<td>35.71</td>
</tr>
<tr>
<td>5-10 years</td>
<td>4</td>
<td></td>
<td>28.57</td>
</tr>
<tr>
<td>Over 10 year</td>
<td>3</td>
<td></td>
<td>21.42</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Level of education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>certificate</td>
<td>1</td>
<td></td>
<td>7.14</td>
</tr>
<tr>
<td>Diploma</td>
<td>11</td>
<td></td>
<td>78.57</td>
</tr>
<tr>
<td>Degree</td>
<td>1</td>
<td></td>
<td>7.14</td>
</tr>
<tr>
<td>Masters</td>
<td>1</td>
<td></td>
<td>7.14</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
The findings presented in table 3 show that male computer studies teachers were more at 78.57 percent than female at 21.43 percent. Further, majority were in the 30-39 years age bracket (57.14 percent). Those in the 40-50 years age bracket were 21.43 percent. All the teachers had an experience ranging from 1 year to 10 years. The majority (78.57%) had a diploma as the highest educational qualification while certificate, degree and masters were 7.14% each.

4.1.3 Background information of students of computer studies.

Table 4 shows the background information of students of computer studies in terms of gender and the present class.

Table 4 Background information of students of computer studies

<table>
<thead>
<tr>
<th>Demographic Characteristics</th>
<th>Scale</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>121</td>
<td>78.57</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>33</td>
<td>21.43</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form I</td>
<td>8</td>
<td>5.20</td>
<td></td>
</tr>
<tr>
<td>Form II</td>
<td>25</td>
<td>16.23</td>
<td></td>
</tr>
<tr>
<td>Form III</td>
<td>66</td>
<td>42.86</td>
<td></td>
</tr>
<tr>
<td>Form IV</td>
<td>55</td>
<td>35.72</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

The findings presented in table 4 shows that 78.57 percent of the respondents were male and 21.43 percent female. The respondents comprised 5.2% form ones, 16.23% form twos, 42.86% form threes and 35.72% form fours.
4.2 Trend of enrolment in computer studies.

4.2.1 Principals views on the trend of enrolment in computer studies.

Table 5 shows the principals’ views on the trend of enrolment in computer studies. This was divided into form 1 and form 2 and those continuing to KCSE.

**Table 5 Trend of enrolment in computer studies.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are all students exposed to computer studies at form 1 and 2?</td>
<td>Yes</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
</tr>
<tr>
<td>Changes in the number of students taking computer studies at KCSE level.</td>
<td>Increasing</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Decreasing</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>No change</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

The principals were asked whether all the students in form 1 and 2 were exposed to computer studies. The findings presented in table 5 shows that 54.45 percent studied computer studies at form 1 and 2 whereas 45.45 percent did not.

The principals (54.55 %) also indicated an increase in the number of students who took computer studies up to form 4 in the last five years, 36.36 percent of the principals registered a decrease and only 9.09 percent encountered no change.

4.2.2 Teachers’ views on the trend of enrolment in computer studies.

Figure 3 show the teachers’ of computer studies views on the number of students taking computer studies up to form 4 in the last 5 years.
40

As illustrated in figure 3, 50% of the teachers indicated an increase, 7.14% a decrease while 28.57% and 14.29% indicated irregular and no change respectively.

4.2.3 Students’ views on the trend of enrolment

Table 6 shows the students’ views on the trend of enrolment in computer studies. Those in form 1 and form 2 were asked whether they intended to continue with it up to form 4 and those in form 3 and form 4 were required to say how they ended up taking computer studies. They were also asked whether there were others who wanted to take computer studies but were denied the opportunity and if so what were the reasons for limiting the number of the students.
Table 6 Trend of enrolment in computer studies

<table>
<thead>
<tr>
<th>Query</th>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you intend to continue taking Computer studies up to form IV?</td>
<td>YES</td>
<td>21</td>
<td>63.64</td>
</tr>
<tr>
<td>(form 1 and form 2)</td>
<td>NO</td>
<td>12</td>
<td>36.36</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td>How did you end up taking computer Studies</td>
<td>I was selected by my teacher</td>
<td>4</td>
<td>2.60</td>
</tr>
<tr>
<td></td>
<td>I selected myself</td>
<td>150</td>
<td>97.40</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>154</td>
<td>100</td>
</tr>
<tr>
<td>Are there others who wanted to take up computer studies but were</td>
<td>YES</td>
<td>54</td>
<td>35.06</td>
</tr>
<tr>
<td>denied the opportunity?</td>
<td>NO</td>
<td>100</td>
<td>64.94</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>154</td>
<td>100</td>
</tr>
<tr>
<td>Reason for limiting the number of students in computer studies</td>
<td>Inadequate number of computer teachers</td>
<td>44</td>
<td>67.69</td>
</tr>
<tr>
<td></td>
<td>Lack of computer teachers</td>
<td>8</td>
<td>12.31</td>
</tr>
<tr>
<td></td>
<td>Poor performance in mathematics</td>
<td>4</td>
<td>6.15</td>
</tr>
<tr>
<td></td>
<td>Poor performance in computer studies</td>
<td>9</td>
<td>13.85</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>65</td>
<td>100</td>
</tr>
</tbody>
</table>

As illustrated in table 6, those who showed willingness to continue were 63.64 percent. However, the number that takes up the subject is limited. The reason for limiting the number was given as inadequate number of computers as indicated by 67.69 percent of the respondents, 12.31 percent cited lack of computer teachers. According to 6.15% and 13.85% of the respondents, poor performance in
mathematics and poor given respectively as the main reason of being denied the opportunity to continue with computer studies.

4.3 Perceptions about Information and Communications Technology integrated in education.

4.3.1 Perceptions of teacher of computer studies about ICT integrated in education.

The respondents were asked various questions related to their perception of ICT integrated in education. A likert scale comprising of: strongly disagree, disagree, not sure, agree and strongly agree was used and the results were as presented in table 7.
Table 7: Perception of teacher of computer studies about ICT integrated in education.

<table>
<thead>
<tr>
<th>Query</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Using ICT can make abstract concepts more concrete</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>b) Use ICT in teaching can increase retention rates</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>c) Use of ICT motivates students to learn</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>d) Use of ICT makes learning students centered with the teacher being facilitator.</td>
<td>8</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>e) Use of ICT will make the teacher irrelevant</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>f) Use of ICT will make the work of the teacher easier</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>g) Use of ICT increases the resources available to the teacher</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>h) ICT makes communication between teachers and students easier e.g. through email</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>i) ICT makes collaboration between teachers easier e.g. email</td>
<td>1</td>
<td>7.14</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>j) ICT makes it easier to respond to the needs of students</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>k) ICT makes classes more interactive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

The respondents were asked whether using ICT would make abstract concepts more concrete. The majority (57.14%) strongly agreed and 35.71% agreed. When asked
whether use of ICT in teaching would increase retention rates, 50% agreed while 42.86% strongly agreed giving a combined respondent rate of 92.86%. On whether use of ICT motivates students to learn, 92.86% answered in the affirmative (64.29 agreed and 28.57% strongly agreed).

4.3.2 Perceptions of students of computer studies about ICT integrated in education.

Table 8 presents the findings on the perception of students about information and communications technology integrated in education. A variety of questions were asked and a five point Likert scale was used which comprised of: strongly disagree, disagree, not sure, agree and strongly agree.
When asked whether the use of ICT made abstract concepts more concrete, more than half (51.94%) either agreed or strongly agreed. The use of ICT motivated students to learn more as indicated by 94.16% of the respondents. However, the majority of the students do not share information with peers and teachers through the internet as shown by a combined 77.27% for those who strongly disagreed, disagreed or were not sure.
sure. On the other hand, many felt that ICT made classes more interactive (83.01%). The respondents also indicated that ICT had a lot of benefits in education (92.86%).

4.4 Use of ICT in teaching and learning other subjects apart from computer studies.

4.4.1 Principals’ views on the use of ICT in teaching other subjects apart from computer studies.

Table 9 shows the principals’ views on the use of ICT other subjects apart from computer studies.

<table>
<thead>
<tr>
<th>Query</th>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do your teachers use ICT in teaching other subjects?</td>
<td>Yes</td>
<td>8</td>
<td>72.73</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3</td>
<td>27.27</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>How would you rate the use of ICT facilities in teaching other subjects apart from computer studies?</td>
<td>Adequate</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Inadequate</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100</td>
</tr>
<tr>
<td>Other than the cost of installing ICT facilities, what costs are involved?</td>
<td>Hiring service</td>
<td>8</td>
<td>72.73</td>
</tr>
<tr>
<td></td>
<td>Updating software</td>
<td>3</td>
<td>27.27</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100</td>
</tr>
</tbody>
</table>

As illustrated in table 9, the principals were asked if their teachers used ICT in teaching other subjects where 72.73 percent responded in the affirmative. However, all these principals considered the use of ICT in teaching these subjects as inadequate. Other than installing the ICT facilities, more costs were incurred in hiring services and updating the software.
4.4.2 Teachers’ views on the use of ICT in teaching other subjects apart from computer studies.

Table 10 shows the information on teachers’ use of ICT in teaching other subjects apart from computer studies.

**Table 10 Teachers’ use of ICT in teaching other subjects.**

<table>
<thead>
<tr>
<th>Query</th>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you teach any other subject apart from computer studies?</td>
<td>Yes</td>
<td>8</td>
<td>57.14</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Do you incorporate computer skills in teaching these other subjects?</td>
<td>Yes</td>
<td>6</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>8</td>
<td>57.14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Do other teachers use ICT facilities in their day-to-day work?</td>
<td>Yes</td>
<td>8</td>
<td>57.14</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>6</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>How would you rate the use of ICT facilities for teaching other subjects?</td>
<td>Inadequate</td>
<td>11</td>
<td>78.57</td>
</tr>
<tr>
<td></td>
<td>Adequate</td>
<td>3</td>
<td>21.43</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>

As illustrated in table 10, the respondents were asked whether they taught any other subject apart from computer studies. Those who taught another subject were 57.14% while 42.86% did not. When asked whether they incorporated computer skills in teaching these other subjects, 42.86% responded in the affirmative while 57.14% did not. They also rated the use of ICT facilities by other teachers as inadequate (78.57%).
4.4.3 Students’ use of ICT in learning other subjects apart from computer studies.

Table 11 presents the students’ responses on the use of ICT in learning other subjects apart from computer studies.

Table 11 Students’ use of ICT in learning other subjects apart from computer studies.

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequencies</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>78</td>
<td>50.65</td>
</tr>
<tr>
<td>No</td>
<td>76</td>
<td>49.35</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
</tr>
</tbody>
</table>

As depicted in table 11, those who use ICT to learn other subjects were 50.65% while who did not use it were 49.35%. When asked whether their teachers helped them search for additional resources using ICT in other subject apart from computer studies (table 4.12), 49.35% agreed while 50.65 disagreed.

Table 12 shows the students’ responses on their teacher’s help in searching for additional information using ICT in other subjects apart from computer studies.

Table 12 Student’s view of their teacher’s help to search additional resources using ICT in other subjects apart from computer studies.

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequencies</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>76</td>
<td>49.35</td>
</tr>
<tr>
<td>No</td>
<td>78</td>
<td>50.65</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 12 depicts that 49.35% of the teachers help their student in searching for additional information while 50.65% do no
Figure 4 shows the students’ personal rating of using ICT to learn other subjects. A scale of: often, sometimes, not sure, rare, and never was used.

As illustrated in figure 4, 14% of the respondents never use ICT to learn other subjects while 26% rarely did. Another 3% were not sure. Only 37% used it sometimes and 20% used it often.

4.5 Current status of ICT infrastructure

4.5.1 Teachers’ views on the status of ICT infrastructure

Figure 4.7 illustrates the number of computers in the schools that participated in the research.
As shown in figure 5, the schools which had 10 computers were 9.09%, those with 20, 25 or 30 computers each were 27.7% while only 9.09% had 50 computers.

Table 13 shows the teachers’ of computer studies views on the rate/ speed of the computers in the schools. A scale of: fast, slow or moderate was used.

**Table 13 Teachers’ views on the rate (speed) of the computers in schools.**

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>3</td>
<td>21.43</td>
</tr>
<tr>
<td>Slow</td>
<td>4</td>
<td>28.57</td>
</tr>
<tr>
<td>Moderate</td>
<td>7</td>
<td>50.00</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>
A great number of computers used in schools had a moderate speed as indicated by 50% of the teacher respondents (table 13). Only 21.43% regarded their computers as fast while 28.57% considered theirs as slow. On whether the computers are networked or not, 64.29% were networked while 57.14% were connected to the internet. The most popular mode of connection to the internet was through modem at 50% and the source of power for the computers was given as mains electricity (100%) with only one school having a generator as stand-by.

4.5.2 Students’ views on the status of ICT infrastructure.

Figure 6 show the number of students sharing a computer in school.

Figure 6 Students sharing a computer

As the figure 6 depicts, 60% of the student taking computer studies share a computer in school.
Figure 7 shows the students’ rating of the computers in the school. A scale of: fast, slow or moderate was used.

**Figure 7 shows the students’ rating of the computers in schools.**

![Bar chart showing student ratings of computer speed.]

As illustrated in figure 7, 46.1% observed that the computers in schools were of a moderate speed, 29.87% said they were fast while 24.03% thought they were slow.

Table 14 shows the views of the students on networking of the computers in the schools.

**Table 14: Students’ views on networking of computers**

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>100</td>
<td>64.94</td>
</tr>
<tr>
<td>No</td>
<td>54</td>
<td>35.06</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
</tr>
</tbody>
</table>
The majority of the students said that the computers are networked as presented by 64.94% while those who said theirs were not were 35.06% as illustrated in table 14.

Table 15 shows the students’ views on connection of the computers in school to the internet.

**Table 15 Students’ views on connection to the internet.**

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>84</td>
<td>54.55</td>
</tr>
<tr>
<td>No</td>
<td>70</td>
<td>45.45</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>100</td>
</tr>
</tbody>
</table>

On whether the computers are connected to the internet, 54.55% of the respondents answered in the affirmative while 45.45% said they were not connected as shown in table 15.

Table 16 shows the views of the students on the mode of connection to the internet.

**Table 16 Students’ views on mode of connection to the internet.**

<table>
<thead>
<tr>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone</td>
<td>26</td>
<td>31.70</td>
</tr>
<tr>
<td>Modem</td>
<td>48</td>
<td>58.54</td>
</tr>
<tr>
<td>Other (wireless)</td>
<td>8</td>
<td>9.76</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>100</td>
</tr>
</tbody>
</table>

Most of the computers in schools were connected through the modem as given by 58.54% of the respondents. Other modes of connection were through telephone (31.70%) and wireless, 9.76 percent as illustrated in table 16.
4.6 Problems teachers and students face in using ICT integrated in education.

4.6.1 Principals’ views on problems teachers and students face in using ICT integrated in education.

Table 17 shows the principals’ views on the problems teachers and students encounter while integrating ICT in education.

**Table 17 Principals’ views on problems teachers and students face in use of ICT integrated in education.**

<table>
<thead>
<tr>
<th>Question</th>
<th>Responses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the school have ICT support staff?</td>
<td>yes</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9</td>
<td>81.82%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td>Are there times you experience breakdown in ICT equipments.</td>
<td>Yes</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100%</td>
</tr>
<tr>
<td>Who repairs the breakdowns?</td>
<td>Computer teacher</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td></td>
<td>Hire(from outside)</td>
<td>7</td>
<td>63.64%</td>
</tr>
<tr>
<td></td>
<td>Computer laboratory assistant</td>
<td>2</td>
<td>18.18%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11</td>
<td>100%</td>
</tr>
</tbody>
</table>

The principals were asked whether the schools had ICT support staff. Only 18.18% of the respondents employed ICT support staff. However, 100% of the respondents experienced breakdown of ICT equipments of which the majority hired repair services from outside (63.64%) while the rest indicated that repairs were done by the computer teacher and computer laboratory assistant at 18.18% each as shown in table 17.
4.6.2 Teachers’ views on the problems facing teachers and students in using ICT integrated in education.

Table 18 shows the teachers’ views on the problems teachers are facing in using ICCT integrated in education.

Table 18 Teachers’ views on the problems facing teachers in using ICT integrated in education.

<table>
<thead>
<tr>
<th>Query</th>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there computers available to teachers for use in teaching?</td>
<td>Yes</td>
<td>2</td>
<td>14.29</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>12</td>
<td>85.71</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Where are the computers kept?</td>
<td>Classroom</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Staffroom</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Cyber room</td>
<td>2</td>
<td>14.29</td>
</tr>
<tr>
<td></td>
<td>Computer laboratory</td>
<td>12</td>
<td>85.71</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Does the school have ICT support staff?</td>
<td>Yes</td>
<td>5</td>
<td>35.71</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9</td>
<td>64.29</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Who services the computers?</td>
<td>Computer teacher</td>
<td>4</td>
<td>28.57</td>
</tr>
<tr>
<td></td>
<td>Computer laboratory assistant</td>
<td>4</td>
<td>28.57</td>
</tr>
<tr>
<td></td>
<td>Hired (from outside)</td>
<td>6</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>Do the teachers in school have ICT skills?</td>
<td>Yes</td>
<td>6</td>
<td>42.86</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>8</td>
<td>57.14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>14</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 18 presents the views of teachers on the problems facing teachers in using ICT integrated in education. When asked whether computers were available to teachers for teaching, 85.71% indicated that they had no access to the computers as most of them were kept in restricted areas such as computer laboratory as indicated by 85.71% of the respondents. Majority of the respondents said the schools did not have ICT support staff while a good number (57.14%) indicated that teachers lacked computer skills.

Figure 8 shows ICT skills among teachers.

**Figure 8 ICT skills among teachers**

As figure 8 illustrates, 57.14% of the teachers sampled did not have computer skills and only 42.86% were computer literate.
4.7 Discussion

4.7.1 Trend of enrolment in computer studies

The study sought to find out the trend of enrolment in computer studies in last five years. The findings show that there was a general increase in the number of students enrolling in the subject. The number of students wishing to continue with computer studies was also high. However the number that took up the subject was limited due to inadequate facilities and lack of enough computer teachers. Different methods for limiting the numbers included their performance in mathematics and computer studies.

Given the importance of ICT as a tool in education, it would be prudent to allow many more learners acquire the necessary skills.

4.7.2 Perception of teachers and students about ICT integrated in education

Many teachers and students believed that ICT integrated in education was of great benefit in terms of making abstract ideas more concrete, increasing retention rate and motivating learners. Both perceived ICT in education positively.

4.7.3 Use of ICT in teaching and learning

The use of ICT in education was rated as inadequate largely due to lack of the necessary facilities and lack of computer literate teachers. For initiative to succeed these problems must be addressed.
4.7.4 Current status of ICT infrastructure

The number of computers in schools was inadequate. One computer was shared between two or three students. This would definitely affect the effectiveness of learning. More computers need to be put in place to address the problem.
CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study aimed at establishing challenges facing information and communication technology integrated in education in Nakuru County. This chapter is organized in the following sub-sections: Introduction, summary of the findings, conclusions, recommendations and suggestions for further research.

5.2 Summary of the findings

This study was conducted amongst principals, Teachers of computer studies and students of computer studies in secondary schools in Nakuru County. The study sought to establish the challenges that face ICT integrated in education.

5.2.1 Trend of enrolment in computer studies.

The study established that the enrolment of students in computer studies was increasing as indicated by 54.55% of the principals and 50% of the teachers of computer studies. This was also replicated by the students’ expression of intention to continue with computer studies up to form four as indicated by 63.64% of the students. However, there were challenges such as inadequate number of computers as indicated by 67.69%, lack of computer studies teachers as shown by 12.31% of the students.
5.2.2 Perceptions about information and communications technology integrated in education

The study established that the ICT made abstract concepts more concrete as indicated by an overwhelming 92.85% of the teachers and also increased retention rates as shown by 92.86% of the respondents. It was also established that ICT had a lot of benefits in education as indicated by 92.86% of the respondents.

5.2.3 Use of ICT in teaching and learning other subjects apart from computer studies.

The use of ICT in teaching other subjects was inadequate as indicated by 100% of the principals. This also replicated by the teachers as 78.57% rated the use of ICT as inadequate. The students use ICT was rated at 50.65% which was considered to be low.

5.2.4 Current status of ICT infrastructure.

The study established that the number of computers in schools was very low and this made students to share a computer. Sixty percent of students shared a computer especially in lower forms. However, most of the computers were of moderate speed as indicated by 50% of the respondents. Most of the computers were networked and also connected to the internet as indicated by 64.29% and 57.14% respectively. Mains electricity was the main source of power for the computers as 100% of the schools had electricity.
5.2.5 Problems teachers and students face in using ICT integrated in education.

The study established that most schools did not have the ICT support staff as indicated by 81.88% of the principals and hired repair services from outside whenever there was breakdown in the ICT as shown by 63.64% of the respondents. Another major problem was that teachers lacked computer skills which were a prerequisite in order to integrate ICT in education.

5.3 Conclusion:

The purpose of this study was to establish the challenges faced in information and communications technology integrated in education in Nakuru County. The study found out that there was increased enrolment in computer studies in the last five years. However, the increase was not marched by a similar increase in the number of computers in schools. In addition the qualifications of the teacher who taught computer studies were found to be diploma while the teachers in other subjects did not have the prerequisite skills to deliver using ICT. The number of ICT teachers was inadequate if all the students were to be introduced to computer studies. The perception of both the teachers and students to ICT was positive showing that they supported its use to enrich the teaching/learning environment. The lack of support staff also made hiring of services from outside a costly venture.

5.3.1 Recommendations:

According to the findings, the researcher has made the following recommendations:

i. The government through the appropriate agencies needs to equip the schools with enough computers to fully embrace ICT integration in education.
ii. The government through the ministry of education should organize for in-service training for all teachers in computer skills.

iii. The curriculum development agency, i.e K.I.E, should equip schools with the relevant digital content so as to give more resources to the teachers.

iv. The government should encourage school B.O.G’S and P.T.As to put up the necessary ICT infrastructure and give incentives for the same.

v. The government should introduce an award scheme for ICT innovations in schools to encourage full participation.

vi. The required support staff should recruited.

5.3.2 Suggestions for further research:

The researcher focused on challenges of ICT integrated in secondary education.

Further studies need to focus on:

i. Challenges of ICT integrated in primary school education

ii. Challenges of ICT integrated in pre-service teacher training institutions

iii. Effect of in- service training of teachers in ICT on teaching and learning.

iv. Barriers to use of ICT in education administration
REFERENCES


Wang, T. (April 2008). using ICT to enhance academic learning; Pedagogy and Practice: *Educational Research and Review Volume 3(4).*


DATE:

DEAR RESPONDENT,

I am a postgraduate student at Kenyatta University pursuing masters of education degree. As partial fulfilment of the course, I am conducting a study on the challenges of information communication and technology (ICT) integration in education: A case study of Nakuru County. For this reason I would appreciate if you would kindly spare a few minutes of your time to fill in the blanks in the attached list of questions to the best of your knowledge.

The information in this questionnaire will be treated strictly confidential and at no instance will your name be mentioned in this research. Also, the information will not be used for any other purpose other than for this study. Your assistance in facilitating the same will be highly appreciated. A copy of this research paper will be available to you upon request.

Thank you in advance.

Yours faithfully,

Ngugi K. Elias

Kenyatta University
Appendix II: Interview schedule for Principals of Secondary Schools

Serial No. ……………………………..

Researcher: How are you Mr/Madam Principal?

Principal: ________________________________

Researcher: It is a pleasure to visit your school today and thank you very much for sparing some time for this interview despite your busy schedule. The researcher would like to assure you total confidentiality and that the information gathered will be used for the purposes of this research. So you are much welcome and thank you one again.

Principal: ________________________________

Researcher: This research is about the challenges of Information and Communication Technology (ICT) Integration in teaching and learning.

Section One: Demographic information

1. How long have you been a principal?

2. What is the total enrolment of students in this school? ________________

3. Are you computer literate?
   
   Yes
   
   No

4. How many teachers does the school have?
Section Two: Trend of enrolment in computer

5. Are all the students exposed to computer studies at Forms one and two?
6. How are the students taking computer studies at form three and four selected?
7. Has there been any changes in the number of students taking computer studies over the last five or so years at Form 4.

Section Three: Perception of teachers and students about Information and Communication Technology (ICT) Integration in teaching and learning

8. Would you say your teachers are interested in the use of ICT in teaching?
9. What makes you think so?
10. What are the benefits of integrating ICT in teaching and learning?

Section Four: Use of ICT in teaching other subjects other than computer studies.

11. Do your teachers use ICT in teaching other subjects apart from computer studies?
12. How would you rate the use of ICT facilities for teaching in other subjects apart from computer studies? Fair? Extensive? Or not at all?
13. What do you think would improve the use of ICT in teaching other subjects apart from computer studies?

Section Five: Current status of ICT infrastructure.

14. Would you say the computers in the school are adequate or inadequate for both teachers and students?
15. Are the computers networked?
16. Does the school have access to internet? ________________
17. How do you manage the cost of accessing materials from the internet?
18. Besides the cost of installing the ICT infrastructure, are there other expenses in running the ICT facilities in teaching and learning that would make it prohibitive?

Section Six: Problems teachers and students are facing in ICT integration in teaching and learning.

19. Does the school have ICT support staff?

20. Are there times you experience breakdowns in the equipments?

21. How do you sort them out?

22. In your view, what are the most pressing problems faced by teachers and as a result of integrating ICT in teaching and learning

Thank you for your cooperation and may God bless you.
Appendix III: Questionnaires for computer studies teachers

Serial No. ……………………………..

This questionnaire is meant to collect information and challenges facing Information and Communication Technology (ICT) integration in education. A case of Nakuru County. Kindly answer the questions by writing a brief statement or ticking in the box provided as will be applicable. The information provided will be treated strictly as confidential as possible and at no instance will your name be mentioned in this research.

Section One: Demographic Information

1. What is your gender?
   1. Male
   2. Female

2. Indicate your age category
   1) Below 20 years
   2) 22-29 years
   3) 30-39 years
   4) 40-50 yeas
   5) Above 50 years

3. How long have you been teaching?
   1) Less than one year
   2) Between 1-4 years
3) Between 5-10 years
4) Over 10 years

4. What is your highest level of education?
   1) Certificate
   2) Diploma
   3) Degree
   4) Other (specify) ___________________

Section Two: Trend of enrolment in computer studies

5. How many streams are there in the school.
   1) One stream
   2) Two streams
   3) Three streams
   4) Four streams
   5) Other (specify) ___________________

6. How many students are taking computer studies per stream
   a) Form 1
      1) All
      2) Other (specify) ________________
   b) Form 2
      1) All
      2) Other (specify) ________________
   c) Form 3
      1) All
2) Other (specify) ______________________

d) Form 4

1) All

2) Other (specify) ______________________

7. How are the students taking computer studies selected?

What limits the number of students wishing to take computer studies?

1) Number of computers available
2) Number of computer teachers available
3) Other (Specify) ______________________

8. a) What is view concerning the number of students taking computer studies up-to form four in the last 5 years.

1) Increasing
2) Decreasing
3) Irregular
4) No change

b) What would you attribute to the pattern observed above?

1) _________________________________
2) _________________________________
3) _________________________________
Section Three: Perceptions of teachers about information and communication technology (ICT) integration in education:

The following scale has been provided. Use the scale to fill the table below by ticking in the appropriate box in the Likert scale:

Key: 1 = strongly disagree  
     2 = Disagree  
     3 = Not sure  
     4 = Agree  
     5 = Strongly Agree

<table>
<thead>
<tr>
<th>Questions</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Using ICT can make abstract concepts more concrete</td>
<td></td>
</tr>
<tr>
<td>b) Use of ICT in teaching can increase retention rates</td>
<td></td>
</tr>
<tr>
<td>c) Use of ICT motivates students to learn more</td>
<td></td>
</tr>
<tr>
<td>d) Use of ICT makes learning student-centred with the teacher being the facilitator</td>
<td></td>
</tr>
<tr>
<td>e) Use of ICT will make the teacher irrelevant</td>
<td></td>
</tr>
<tr>
<td>f) Use of ICT will make the work of the teacher easier.</td>
<td></td>
</tr>
<tr>
<td>g) Use of ICT increases the resources available to the teacher.</td>
<td></td>
</tr>
<tr>
<td>h) ICT makes communication between teachers and students easier e.g.</td>
<td></td>
</tr>
<tr>
<td>through email</td>
<td></td>
</tr>
<tr>
<td>i) ICT makes collaboration between teachers easier e.g through email.</td>
<td></td>
</tr>
<tr>
<td>j) ICT makes it easier to respond to the needs of the students.</td>
<td></td>
</tr>
<tr>
<td>k) ICT makes classes more interactive.</td>
<td></td>
</tr>
</tbody>
</table>
Section Four: Use of ICT in teaching other subjects apart from computer studies

10. Do you teach any other subject apart from computer studies?
   Yes
   No

11. a) Do you incorporate computer skills in teaching those subject?
   Yes
   No
   b) If no, why? ______________________________

12. Do other teachers use the ICT facilities in their day-to-day work?
   Yes
   No

13. How would you rate the use of ICT facilities for teaching in other subjects?
   1) In-adequate
   2) Adequate

14. What do you think would improve the use of ICT in teaching other subjects other than computer studies?
   ____________________________________________

Section Five: Current status of ICT infrastructure

15. How many computers are currently operational? ________________________

16. How would you rate the computers?
   1) Fast
   2) Slow
   3) Moderate

17. Are the computers networked?
   ____________________________________________
18. a) Are the computers connected to the internet?

Yes

No

b) If yes how?

1) Telephone
2) Modem
3) Mobile Phone
4) Other (specify) ____________________________

19. What is the source of power for the computers?

1) Electricity (mains)
2) Generator
3) Solar
4) Other specify

Section Six: Problems teachers are facing in integrating ICT in education

20. Are there computers available for all teachers use in teaching

Yes

No

21. If yes, where are they kept?

1) Classroom
2) Staffroom
3) Computer laboratory
4) Other (specify) ____________________________

22. Does the school have ICT support staff?

Yes
No

23. Who services the ICT facilities (computers)?

1) Computer teacher
2) Computer laboratory assistant
3) Hired (from outside)

24. Are teachers in the school trained in computer skills? Yes [ ] No [ ]

25. In your view what are the most pressing problems limiting teachers to integrate the ICT teaching?

1) _____________________________________
2) _____________________________________
3) _____________________________________
4) _____________________________________
5) _____________________________________

Thank you for your cooperation and may God bless you.
Appendix IV: Questionnaire for students of computer studies

This questionnaire is meant to collect information on challenges of Information and Communication Technology (ICT) integration in education. A case of Nakuru County. Kindly answer the questions by writing a brief statement or ticking in the box provided as will be applicable. The information will be treated strictly as confidential and at no instance will your name be mentioned in this research.

Section one: Demographic information

1. What is your gender?
   1. Male
   2. Female

2. Indicate your Class
   1) Form one
   2) Form two
   3) Form three
   4) Form four

Section Two: Trend of enrolment in computer studies

3.a) Do you intend to continue taking computer studies up to form four.
   Yes
   No
   b) If your answer in 3(a) is NO, why

__________________________________________

4. How did you end up taking computer studies?
   1) I was selected by my teacher
2) I selected computer studies myself.

3) Other (specify) ________________________________

5. Are there other students who wanted to take computer studies but were denied the opportunity?

   Yes □ □
   No □ □

6. If yes in 5 above, why do you think, they were denied the chances of computer study continuation?

   1) Inadequate number of computers □ □
   2) Lack of enough computer teachers □ □
   3) Poor performance in mathematics □ □
   4) Other (specify) ________________________________
### Section Three: Perception of students about Information and Communication Technology (ICT) integration in education.

**Instruction:** Use the following scale to answer the questions by ticking in the appropriate box in the Likert scale:

Key: 1= strongly disagree  2= Disagree  3= Not sure  
4= Agree  5= Strongly Agree

<table>
<thead>
<tr>
<th>Questions</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Use of ICT make abstract concepts more concrete</td>
<td></td>
</tr>
<tr>
<td>b) Use of ICT increase retention of concepts</td>
<td></td>
</tr>
<tr>
<td>c) Use of ICT motivates students to learn more</td>
<td></td>
</tr>
<tr>
<td>d) Use of ICT makes learning student friendly</td>
<td></td>
</tr>
<tr>
<td>e) I search for additional educational information from the internet</td>
<td></td>
</tr>
<tr>
<td>f) I share educational information with peers and teachers through email.</td>
<td></td>
</tr>
<tr>
<td>g) ICT makes classes more interactive</td>
<td></td>
</tr>
<tr>
<td>h) IC in education has a lot of benefits.</td>
<td></td>
</tr>
<tr>
<td>i) Our lessons are boring with ICT</td>
<td></td>
</tr>
<tr>
<td>j) Use of ICT in learning is time wasting</td>
<td></td>
</tr>
</tbody>
</table>
Section Four: Use of ICT in learning other subjects apart from computer studies

8. Do you use ICT in learning other subjects?
   Yes
   No

9. Do your teachers help you to search for additional resources using ICT in other subjects apart from computer studies?
   Yes
   No

10. How would you rate your use of ICT in learning other subjects?
    1) Often
    2) Sometimes
    3) Not sure
    4) Rare
    5) Never

Section Five: Current status of ICT infrastructure

11. Do you share a computer in your class
    Yes
    No

12. If yes in 11 above, how many students share one computer.

   ______________________

13. How would you rate the computers you use in school?
    1) Fast
    2) Slow
    3) Moderate
14. Are the computers networked?

Yes

No

15. Are the computers connected to the internet?

Yes

No

16. If yes in 15 above, how?

1) Telephone

2) Modem

3) Mobile Phone

4) Other (specify) ____________________________

Thank you for your cooperation and may God bless you.
Appendix V: Work plan

This section presents the work plan for the entire study

<table>
<thead>
<tr>
<th>Activity</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr</td>
<td>May</td>
</tr>
<tr>
<td>Proposal writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection of data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis of data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report writing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Submission first draft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correction and submission</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix VI: Budget for the Study

This section presents the cost of conducting the whole research project from scratch through data collection to compilation of the final research project report.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit Cost in KShs.</th>
<th>Total Cost in KShs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>i). Stationery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Duplicating papers (reams)</td>
<td>5</td>
<td>500.00</td>
<td>2,500.00</td>
</tr>
<tr>
<td>2 File</td>
<td>3</td>
<td>100.00</td>
<td>300.00</td>
</tr>
<tr>
<td>3 Biropens</td>
<td>10</td>
<td>25.00</td>
<td>250.00</td>
</tr>
<tr>
<td>4 Computer services (internet access)</td>
<td>12   (1 per month)</td>
<td>2000.00</td>
<td>24000.00</td>
</tr>
<tr>
<td>5 Typing, Printing and binding</td>
<td>12</td>
<td>3000.00</td>
<td>36000.00</td>
</tr>
<tr>
<td>6 Transport during consultation</td>
<td>12</td>
<td>2,500.00</td>
<td>30000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub-total stationery 93,050.00</td>
</tr>
<tr>
<td>ii). Other expenses (During Data collection)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Lunch</td>
<td>20 days @ 500.00</td>
<td>20</td>
<td>500.00</td>
</tr>
<tr>
<td>2 Out of pocket</td>
<td>20 &quot; @ 200.00</td>
<td>20</td>
<td>200.00</td>
</tr>
<tr>
<td>5 Transport</td>
<td>20 &quot; @800</td>
<td>20</td>
<td>800.00</td>
</tr>
<tr>
<td>4 Assistant researchers @ 4,000</td>
<td>4</td>
<td>4000</td>
<td>16,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub-total other expenses 46000.00</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>= 139050.00</td>
</tr>
</tbody>
</table>

10% Miscellaneous cost = 10/100 x 139050 = 13,905

iii). Grand total = 152,955.00
APPENDIX VII: A map of Kenya showing the counties

Source: Kenya maps, jpeg (accessed on 23rd March, 2012)
Appendix viii: Research permit