Journal of Education and Literature
Vol. 1, No. 2, 2014, 66-75

RESEARCH ACADEMY OF SOCIAL SCIENCES

Public Secondary Schools Preparedness to Implement E-Learning: A Case of Nakuru Municipality, Kenya

Daniel Karanja[1], Francis Abobo[2]

Abstract

This study sought to investigate E-learning readiness in public secondary schools in Kenya given the agreement by educators and policy makers around the world on the importance of ICTs to the future of education. The main objective of the study was to assess the level of preparedness of public secondary schools in Kenya to implement E-learning so as to enhance access, equity and quality in secondary education. The study employed a descriptive survey design. Head teachers, teachers and students of public secondary schools were targeted. Systematic sampling technique was used to select ten (10) schools while simple random sampling was used to select 24 students and five (5) teachers from each school. Questionnaires and an observation schedule were used to collect data. Descriptive statistics such as frequencies and percentages were used to analyze the data quantitatively. Qualitative data was analyzed according to themes based on the study objectives and thereafter, inferences and conclusions were drawn. The study revealed that public secondary schools in Kenya lack adequate ICT infrastructure, connectivity and teachers' capacity to support effective E-learning delivery. It recommended that education stakeholders finance provision of ICT infrastructure and also facilitate teachers training on how to integrate the ICT tools in teaching and learning.

Keywords: E-learning, preparedness, infrastructure, connectivity, capacity building.

1. Introduction

Information and Communication Technologies (ICTs) have the potential to enhance access, equity and quality in education across the board at primary, secondary and tertiary level and also support teacher training. Additionally, ICTs can enhance the effectiveness, efficiency and transparency in the management and administration of education. World Bank (2009) attest to this premise and assert that educators and policy makers are in agreement about the paramount importance of ICTs to the future of education and that they can help countries achieve their Millennium Development Goals (MDGs).

The MDGs are eight internationally agreed goals to be achieved by 2015 that respond to the World's main development challenges. Education receives special attention in MDG2, which focuses on enhancing primary education in terms of quality and access; in MDG3, which focuses on women's access to education; and in MDG8, which seeks to promote collaboration and develop a skilled workforce.

According to World Bank (2009) ICTs in education initiatives that focus on the following areas are most likely to successfully contribute to meeting these MDGs: Increasing access through distance learning; enabling a knowledge network for students; training teachers; broadening the availability of quality education materials; and enhancing the efficiency and effectiveness of educational administration and policy.

The use of ICTs in education promotes E-learning. E-learning refers to learning that is supported by electronic technology and use of Internet. E-learning integrates ICTs in the learning process. This gives rise

[1]University of Nairobi, Department of Extra Mural Studies, –Nakuru Extra Mural Centre P.O Box 1120 Nakuru
[2]Ph.D Candidate; Department of Educational Management, Policy & Curriculum Studies, Kenyatta University P.O. Box 43844-00100, Nairobi, Kenya

to different modes of learning such as Computer Based Training (CBT), Web Based Training (WBT), Synchronous and Asynchronous learning and Distance Learning (DL).

In Kenya, there are currently over 4000 public secondary schools and the recent massive increase in primary schools enrolment due to Free Primary Education (FPE) is putting pressure on the demand for and access to secondary schools. There are also concerns about the quality of secondary education which is characterized by poor performance in core subjects such as mathematics, science and languages (Republic of Kenya, 2005b). This study sought to establish how public secondary schools in the country are prepared to adopt E-learning as a mode of delivery so as to enhance access, equity and quality in secondary education and also help in production of e-literate learners who can properly fit in the global knowledge economy.

Kenya drafted an ICT policy in January 2006. Some of the strategies proposed in the growth and implementation of E-learning are that the government will:

i. Promote the development, sharing and integration of E-learning resources to address the educational needs of primary, secondary and tertiary institutions.

ii. Enhance the dissemination of E-learning initiatives through provision of affordable infrastructure (Republic of Kenya, 2006a).

The ICTs in Education Options paper for the Ministry of Education, Science and Technology (MOEST) discusses the ways in which ICTs can be leveraged to support and improve the delivery of quality education for all Kenyans (Republic of Kenya, 2006a). The ideas presented here respond to the educational priorities outlined in Sessional paper No. 1 of 2005 and the Kenya Education Sector Support Program (KESSP). The KESSP provides a roadmap for investment in E-learning and suggests provisional budgets to support educational activities. E-learning is identified in the following investment programs;

i. Primary Teacher In-service Training: This program aims at in-servicing teacher trainer on E-learning methodologies so that teachers can be equipped with the skills on how to integrate ICT in education.

ii.ICT in Education investment program: This program outlines the strategies and policies that will foster E-learning delivery systems, build the necessary capacity and promote the development of required ICT infrastructure and institutional management systems (Republic of Kenya, 2005b).

The Ministry of Education in collaboration with the private sector through the Kenya ICT Trust Fund developed a National ICT Strategy for Education and Training aimed at making ICT integration possible at all levels of education and training. The strategy outlines how Information and Communication Technology will be adopted and utilized to improve access, quality and equity in the delivery of education services in Kenya. It identifies the strategic pillars for sector ICT implementation as: Establishment of a policy framework; Digital equipments; Connectivity and network infrastructure; Technical support; Harnessing emerging technologies; Digital content development; Integration of ICTs in education; Training (capacity building including professional development); Research and development; Partnership and resource mobilization; Legal and regulatory framework and monitoring and evaluation (Republic of Kenya, 2006b).

Following the above efforts by the government and other stakeholders to leverage use of ICT in education, schools in Nakuru municipality seem to be implementing E-learning initiatives going by the vacancies for computer teachers advertised in the municipality by the Teachers Service Commission (TSC) on 15th August, 2010 in Sunday Nation News paper. Some of the schools however, may be lacking the basic E-learning resources like infrastructure, digital equipment, connectivity and adequately trained personnel. It is against this background that the researcher sought to assess the actual E-learning readiness in public secondary schools in Nakuru municipality as the Ministry of Education prepares to roll out the E-learning curriculum in schools.

Statement of the Problem

Despite the various efforts by the government and other stakeholders to leverage use of ICTs in education, there are concerns over institutions E-learning preparedness in terms of infrastructure, connectivity, and adequately trained human resource required in order to realize the full benefits of ICT use in education. For instance, during the 1st Regional Education Conference on E-learning held in Nairobi between 29th-31st March, 2010 at Kenya Institute of Education (KIE), the Minister for Education noted that although much had been done on ICT integration, capacity building, and localization of digital content, a paradigm shift in implementation strategy would go beyond just putting computers on the desks by dealing with the other strategic pillars for sector ICT implementation as well (S. Ongeri, Ministers speech, March 30th, 2010). It is in this context that the current study sought to investigate the question: How prepared are public secondary schools in Kenya to implement E-learning so as to facilitate acquisition of quality and relevant secondary education?

Objectives of the Study

The objectives of the study were:

i. To assess the availability of E-learning infrastructure like computer laboratories, computer hardware and software programs for E-learning in the schools.

ii. To determine the schools connectivity to the Internet.

iii. To establish the teachers and students preparedness in terms of skills and training for using ICT tools for teaching and learning respectively.

2. Literature Review

Status of E-Learning in the World

According to the Commission of The European Communities (CEC) (2008), member states meeting in Lisbon identified ICT as a core component of the knowledge society and a necessary instrument for adopting education to it. As a result, E-learning initiatives and programs were adopted with specific funding and strong support from stakeholders. CEC (2008) continues to state that all member states have programs and actions to integrate ICT in education. This translated into intensive efforts to provide equipment and train teachers in ICT skills. This has led to wider use of ICT in schools in Europe. The European Union aims at promoting digital literacy, setting up European virtual campuses and e-twinning of schools which refers to partnering schools where students and teachers share academic and social knowledge with their counterparts in other countries. ICT use in Europe is widespread in higher education, nearly all universities have websites and nine out of ten have Intranet.

Elina (2008) observes that in a study carried out in Romania between August 2007 and May 2008, to investigate ICT use in education, seven out of ten teachers preferred to teach using computers. The teachers linked good performance in their disciplines to use of ICT. This study indicated that students considered the most important effect of using ICT for school lessons as a simplified learning process followed by easier understanding of content.

In another survey of ICT and Education conducted in the Caribbean, Gaible (2008) notes that the base of ICT infrastructure in schools has the potential to contribute to education system more effective response to policy goals and to internal and external forces affecting the Caribbean today. Most secondary schools and some primary schools provide access to computers and, where the telecommunications systems permits, to the Internet. Several countries- Jamaica, Trinidad and Tobago, Barbados and others- have major technology implementations in process or nearing completion. However, the study concludes that computers and the Internet have had limited impact in Caribbean primary and secondary education beyond serving as a base supporting students achievement on the practical portions of the CXC IT examinations. Major barriers to

effective education, such as teacher's capacity, the relevance of the curriculum, information management, and graduates competencies have not been affected by the past decade's investments in ICT.

Status of E-Learning in Africa

In a survey of ICT and Education in Africa, Farrell and Shafika (2007) found that there was a great deal of variance in ICT policies for education among the 53 African countries surveyed. South Africa clearly is unique in terms of being able to move its ICT agenda forward. Several of the countries of North Africa that have both resources and high bandwidth connectivity with Europe have also been able to make excellent progress implementing their ICT plans. Those countries that are steadily moving to sustainable economies (Mauritius, Ghana, and Botswana, for example) constitute another group making remarkable progress. The survey added that the largest group is made up of those countries that are in transition from a sustained period of conflict and economic instability and are looking to ICT applications to help them meet myriad challenges particularly the development of their human resource capacity. They are among the neediest in terms of assistance. Unfortunately there remains a group of countries that are still plagued with political instability and internal conflicts that make progress on the ICT for education agenda impossible.

In terms of ICT Infrastructure for education in Africa, Farrell and Shafika (2007) noted that most countries surveyed have, or are in the process of liberalizing their telecommunications policies to enable more competition and diversity of service providers in the industry. While this is having the effect of lowering the cost of access to information and telecommunication infrastructure, the cost of connectivity remain unaffordable for most educational institutions. Furthermore, there are huge gaps between urban and rural areas in terms of access to ICT infrastructure.

For the case of Infrastructure in schools, the survey observed that African Ministries of Education have begun to be more proactive in coordinating and leading the development of ICT infrastructure in schools systems as their ICT policies and implementation plans have taken shape. However, civil society, principally the Non Governmental Organizations (NGOs) working with donor agencies, continue to play a major role in providing computers to schools and lobbying governments to take a leading role.

As pertaining to teacher professional development, the survey noted that most countries surveyed have had some investment in developing the capacity of teachers to use ICTs as a teaching and learning resource through both in-service and pre-service programmes. Most teacher training programmes in Africa involve the development of basic ICT skills, sometimes as an end in itself, although in some cases these include the application of ICTs as learning tools for teachers.

The issues of leadership and commitment by African governments as well as the reliance of the developed and richer international community in providing the ingredients to help bridge the widening digital divide between Africa and the rest of the world were proposed in the Infinedo (2005) study.

Status of E-Learning in Kenya

A survey conducted by Kenya Education Network (KENET) in 2006 which sought to assess the level of preparedness of higher education institutions to use ICT in teaching, learning, research and management and the capacity of readiness of the institutions to use electronic learning to improve the quality of education found out that most institutions were not ready to use ICT for E-learning and that the institutions authorities allocated minimal resources to the development of ICT (Kashorda, Waema, Omosa and Kyalo, 2007). Kashorda et al. also noted that these institutions were characterized by inadequate bandwidth, low access to networked personal computers by staff and students, low quality of campus network infrastructure and limited campus access to library resources.

In another survey of ICT and education in Africa: Kenya country report, very few secondary schools had sufficient ICT tools for teachers and students and even in schools that had computers, the student-computer ratio was 150:1 (Farrell, 2007). In addition, a study by Wabuyele (2003) indicated that while ICT has penetrated many sectors including banking, transportation, communications, and medical services, the Kenyan educational system seems to lag behind. The study found that computer use in Kenyan classrooms is still in its early phases, and concluded that the perceptions and experiences of teachers and administrators do

play an important role in the use of computers in Kenyan classrooms. Kenya School Net (2003) also found out that although schools were aware of benefits of computers, few had them and only one school had a website.

Farrell (2007) observes that the education sector in Kenya lacks adequate connectivity and network infrastructure although a small number of schools have direct access to high speed connectivity through Internet service providers. These notwithstanding, there is light at the end of the tunnel as noted by Check Point (2008) who points out that Kenya has become the third African country to launch E-learning facilities in secondary schools after South Africa and Nigeria. In its article, Check point states that the program sponsored by Intel, aims at equipping schools to use computers and wireless connectivity for all types of class work. The new program aims to replace the blackboard with touch screen and students to send their work to teachers through wireless connectivity. However rolling of this program may not be effective in rural areas since they lack the basic infrastructure to enhance this type of learning.

3. Research Methodology

Research Design

The study employed a descriptive survey design. Head teachers, teachers and students of public secondary schools were targeted. Systematic sampling technique was used to select ten (10) schools while simple random sampling was used to select 24 students and five (5) teachers from each school. Questionnaires and an observation schedule were used to collect data. Descriptive statistics such as frequencies and percentage were used to analyze the data quantitatively. Qualitative data obtained from the open-ended questions was analyzed according to themes based on the study objectives and the research questions and thereafter, inferences and conclusions were drawn

4. Study Findings

Demographic Information of the Respondents

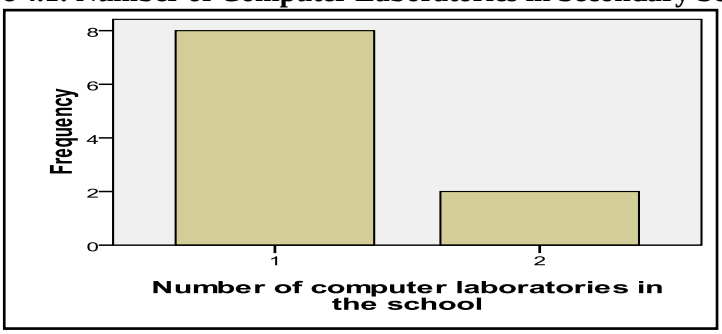
The study involved a survey of public secondary schools in Nakuru Municipality, Nakuru County. The schools types included 1 (10%) boys; 1(10%) girls and 8 (80%) mixed schools while the schools categories included 2 (20%) National; 4 (40%) Provincial and 4 (40%) District schools. This shows that all types and categories of schools were represented in the study.

The respondents included 10 (50%) head teachers who were found to be 8 (80%) males and 2 (20%) females; 50 (10.7%) teachers who were found to be 28 (56%) males and 22 (44%) females; and 240 (10%) students who were found to be 134 (55.8%) males and 106 (44.2%) females. All the head teachers and teachers involved in the study were found to be professionally trained educators suited for secondary schools teaching.

Availability of E-learning Infrastructure

The first objective sought to assess the availability of E-learning infrastructure like computer laboratories, computer hardware and software programs for E-learning in the schools. Data obtained from the 10 sampled public secondary schools in Nakuru Municipality revealed that 8 (80%) of the schools had one computer laboratory each while 2 (20%) had two computer laboratories each as depicted in Figure 4.1.

Figure 4.1: Number of Computer Laboratories in Secondary Schools

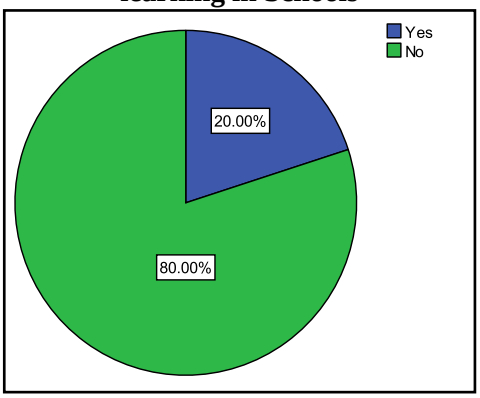


One of the schools that had two laboratories had in addition established a school cyber café where teachers and student frequented to access Internet. The data also revealed that the schools were equipped with an average of 80 personal computers that served both teachers and students.

The average student per computer ratio in the sampled secondary schools was noted to be fifteen students per computer which was considered to be poor for effective adoption of E-learning.

In terms of software, application programmes and digital content for teaching different subjects, the findings revealed that the secondary schools were ill equipped with only 2 (20%) of the schools affirming that they had acquired software suited for E-learning while 8 (80%) affirmed that they did not have any of the afore said resources for E-learning as depicted in Figure 4.2.

Figure 4.2: Availability of Software, Application Programmes and Digital Content Suited for E-learning in Schools



In addition, 8 (80%) of the schools sampled reported to allocate some financial resources for E-learning purposes while 2 (20%) reported that no financial resources were allocated for the same with a justification that there was no specific vote head set aside for such initiatives by the MoE.

Schools Connectivity to the Internet

The second objective sought to determine the school connectivity to the Internet. The findings of this study revealed that 80% of the sampled schools were connected to the Internet and most school administrators affirmed that Internet was affordable. This can be attributed to the concerted efforts undertaken by the government to bring down the cost of Internet connection by laying the undersea optical fiber and completion of the national optical fiber backbone in 2009.

However, despite the fact that most schools (80%) were found to be connected to the Internet, only 10% and 30% indicated that they were using the Internet for E-learning at a very great extent and great extent respectively as depicted in Table 4.1.

Table 4.1: The Extent at which Schools Use the Internet for E-learning (N=10)

Extent	Frequency	Percent
Very great extent	1	10.0
Great extent	3	30.0
Little extent	2	20.0
Very little extent	2	20.0
Not applicable	2	20.0

All the sampled schools reported to be using computer based mode of learning which entail the use of computer aided by CD ROMs and other accessories without hooking up to the Internet. No school was found to be using the other modes like online, synchronous or asynchronous learning. Additionally, only 30% of the schools reported to be having a school website where they only posted information relating to the school profile.

As pertains to accessibility to the Internet connected computers, 40% of the schools were found to have connected computers accessible to teachers and students to the Internet. The main uses of Internet here were reported to be search for supplementary academic materials and personal communication. This means that Internet as an E-learning resource was inadequate in the schools and the minimal that was there was underused and misdirected as far as E-learning is concerned.

Preparedness of Teachers and Students to use ICT Tools in Education

Objective three sought to establish the teachers and students preparedness in terms of skills and training for using ICT tools for teaching and learning respectively. From this study, only 34% of the sampled teachers said that they are using computers to enhance E-learning frequently and very frequently in their respective schools; only 16% said that they usually prepared electronic content for their students; only 32% reported to be using the Internet frequently and very frequently for E-learning purposes and only 2% said that they encouraged their students to submit their assignment online through e-mail. The low use of the ICT tools was mostly attributed to lack of skills on how to integrate them in the teaching and learning process. These results were startling considering that MoE through KESI has been conducting ICT in education integration courses that appear not to have benefited most of the teachers sampled.

As pertains to students' preparedness, most of them (90.4%) affirmed that they knew how to operate a computer, 87% said that they had knowledge on use of the Internet as a source of academic materials. This can be attributed to skills obtained at school because 88.3% of the students reported that their schools offered some ICT trainings to students through mainly computer studies subject. The students confided that the knowledge to use ICT tools in education makes their search for learning materials easy and fast in addition to making the learning process interesting to them.

While this finding could be encouraging, students in public secondary schools might not derive the full benefits of E-learning due to the inadequacy of E-learning infrastructure and the low school connectivity to the Internet. Only a few (26.7%) reported to access Internet from their schools while the rest said that they rely on cyber cafés and private sources which might not be well monitored and might also not offer conducive environment for quality learning process to take place. These concerns are also shared by Farrell (2007) who observed that the education sector in Kenya lacks adequate connectivity and network infrastructure although a small number of schools have direct access to high speed connectivity through Internet service providers.

Strategies to Hasten E-learning Implementation in Public Secondary Schools

The fourth objective sought to determine the strategies that can be applied to hasten E-learning implementation in public secondary schools in Kenya. To begin with, a study by Kashorda et al. (2007) had found out that most institutions authorities in Kenya allocated minimal resources to the development of ICTs

and E-learning. The current study therefore investigated from the head teachers how funding to E-learning in public secondary schools could be improved so as to raise the allocation to the same. 50% suggested that the Ministry of Education should allocate specific funds for E-learning and services in schools. Most of them felt that the tuition fee allocated by MoE went mostly to the purchase of basic tuition resources like books and stationeries and hence was not adequate to fund E-learning initiatives in schools. 40% suggested that the private sector and donors should be encouraged to finance E-learning in public secondary schools while 10% suggested that parents should be sensitized on the use and appropriateness of E-learning so that they can also participate in financing of E-learning in their respective schools. The issue of E-learning funding notwithstanding, caution should be taken because other studies (Ford, 2007 and Kessy et al., 2006) have found out that there are many unsustainable ICT programs where schools have computers that do not work as resources that are often redirected and misused.

On their part, a higher percentage of teachers (38%) suggested enhanced capacity building of teachers to induct them on ICT integration in education. This is a good strategy that can hasten E-learning implementation in public secondary schools because despite all the teachers having said that they had acquired some basic computer skills and also all the sampled schools having at least one equipped computer laboratory as shown in figure 4.1, only 20% of the teachers reported to be using E-learning as a mode of delivery at a considerable extent. This puts to question their skills to integrate ICT tools in education. Other studies (Wabuyele, 2003; Mutula, 2003 and Jain, 2006) had also noted that equipping teachers with requisite skills on how to integrate technologies in education was a sure way of speeding the implementation of E-learning in Kenya and in Africa as whole.

5. Conclusion and Recommendations

Conclusion

From the findings of the study, it can be concluded that

1. Public secondary schools in Nakuru Municipality lack adequately equipped facilities in terms of computer laboratories and cyber cafes required for successful E-learning implementation. The average student per computer ratio of 15:1 is very high for effective E-learning to take place. In addition, the lack of standardized E-learning software, application programmes and digital content makes the implementation of E-learning difficult in public secondary schools.
2. The schools connectivity to the Internet is inadequate even though the cost of the Internet has come down considerably as acknowledged by the schools principals. This prevents the government and schools from reaping the benefits of on-line and distance learning that can enhance access to education by groups that have traditionally been excluded by the face to face mode of teaching and learning.
3. Despite the policy emphasis by the MoE that all schools should adopt E-learning so as to increase access to education, improve the quality of education and lower the cost, only a handful of public secondary schools in the Municipality are using E-learning mode of delivery at a very small extent through mainly computer based training.
4. Very few teachers have acquired the requisite skills and training on ICT in education integration that can enhance effective E-learning implementation. The ICT in education integration courses organized by the Ministry of Education through KESI appear strange to most teachers and there are no clear modalities on how schools should sponsor their staff to benefit from such initiatives.

Recommendations

Based on the findings from this study, the researcher makes the following recommendations:

1. Education stakeholders in the country should finance provision of ICT facilities and digital equipments in public secondary schools. This will enhance access to ICT facilities by students and teachers, improve the

current student computer ratio and ensure that teachers get the necessary equipments to enhance E-learning in their respective schools. In addition, MoE should provide standardized E-learning software, application programmes and digital content to all schools in the country to enable them adopt E-learning delivery systems with ease.

2. The government and the schools should invest in adequate, fast and reliable Internet connectivity that will enhance the schools uptake of the other E-learning modes like the online, synchronous and asynchronous learning that requires hooking to the Internet. These can increase access to education and educational resources to all students regardless of distance, time or physical barriers that militate against education access.
3. There is need to conduct training on ICT integration and strategic planning for ICT integration to public secondary school administrators. The administrators should also be educated on how to respond to the various opportunities created by the government, the private sector and donors that will enhance their schools E-learning uptake and use.
4. All the teachers should be trained on using ICTs in education, especially how to integrate the ICT tools in teaching. Courses like the one organized by KESI to induct teachers on ICT use in education should be mandatory to teachers and made affordable and reachable so as to fill the capacity building gaps among teachers in the country. Moreover, the teacher educators in teacher training institutions should be encouraged to integrate ICTs to instruction so as to serve as models to the pre-service teachers. In addition, computer studies subject should be made compulsory and examinable to all the students so that it is used as an avenue to equip students with E-learning skills.
5. The government through MoE should increase its allocation on tuition fees and encourage schools to have a specific vote head for E-learning so as to ensure reliable funding of E-learning initiatives by schools. However, measures should be put in place by MoE to ensure that school administrators use the funds efficiently and effectively to create sustainable E-learning programmes in their schools.

References

Borg, W.R. and Gall, M.D. (1989).Educational research: An introduction, (5th ed) New York: Longman.

Commission of the European Communities (2008).The use of ICT to support innovation and lifelong learning for all- A report on progress. http://ec.europa.eu/education/lifelong-learning-programme/doc/sec2629.pdf retrieved 12 November 2009.

Economic Intelligence Unit (2009).E-readiness rankings; the usage imperative. http://www.935.ibm.com/services/us/gbs/bus/pdf/e-rediness-rankings-june-2009-final- web.pdf retrieved 08 November 2009.

Elina (2008).New policy on ICT use in education.http://www.checkpoint.elearning.com/article/5168.html retrieved 20 October 2009.

Farrell, G. (2007). ICT in education in Kenya.http://www.ifodev.org/en/publication.409 html retrieved 20 October 2009.

Farrell, G. &Shafika, I. (2007). Survey of ICT and education in Africa: A summary report, based on 53 country surveys. http://www.infodev.org/en/publication.353 html retrieved 26 February 2010.

Gaible, E. (2008). Survey of ICT and education in the Caribbean: A summary report, based on 16 country surveys.http://www.infodev.org/en/publication.441.html retrieved 26 February 2010.

Infinedo (2005) Measuring Africa 's e-readiness in the Global networked economy. A nine country analysis.E/ international Journal of Education and development using ICT Vol.1 No. 1 (2005).http://ijedict.de.uwi.edu//viewarticle.php?=12&layout=html retrieved 21 October 2010.

Jain, P. (2006). Empowering Africa 's development using ICT in a knowledge management Approach.The electronic library, 24(1), 51-67.

Kashorda, M., Waema, T., Omosa, M. &Kyalo, V. (2007).E-readiness survey of higher institutions in Kenya.http//:www.kenet.or.ke/e-readinessretrieved 12 February 2010.

Kenya School Net (2003).Preparing a workforce for the evolving information economy.A survey of ICT access and use in secondary schools. Nairobi: Summit Strategies Ltd.

Lockesh, K. (1984). Methodology of educational research. New Delhi: Vikas publishing House PUT Ltd.

Mutula, S. (2003).The digital divide in Sub-Saharan Africa: Implications for revitalization and preservation of indigenous knowledge systems, paper presented at the SCECSAL-15 conference, 15-19 April 2002. Johannesburg.

Olaniyi, S.S. (2006). E-learning technology: The Nigeria Experience. http://www.fig.net/pub/fig2006/paper/ts84-03 retrieved 12 January 2010.

Republic of Kenya (2005a).ICT in education options paper. Ministry of Education, Science and Technology.Nairobi : Government printer

Republic of Kenya (2005b).Kenya education sector support programme. Nairobi: Government printer.

Republic of Kenya (2005c).Sessional paper No.1 of 2005 on A Policy Framework for Education, Training and Research. Nairobi: Government printer.

Republic of Kenya (2006).National ICT policy.Ministry of Information and Communication,Nairobi : Government printer.

Wabuyele, L. C. (2003). Understanding teachers' and administrators perceptions and experiences towards computer use in Kenyan classrooms: A case study of two schools. Athens: Ohio University.

World Bank, (2009). How do ICT in education initiatives contribute to the Millennium Development Goals? World Bank.http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTEDUCATIONretrieved 12 November 2009.