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CHALLENGES FACING UTILIZATION OF ICT IN PUBLIC SECONDARY SCHOOLS IN KAJIADO NORTH SUB-COUNTY, KENYA

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Abstract: *This study assessed the challenges facing utilization of ICT tools in teaching and learning in public secondary schools in Kajiado North Sub County. The research was prompted by the need to awaken learners and teachers to utilize the available ICT tools so as to promote more innovative, creative, independent and collaborative teaching and learning. The research designs used were phenomenology and cross-sectional. Ten public secondary schools were randomly sampled. Ten principals were sampled purposively. Simple random sampling technique was used to choose 104 teachers whereas stratified and simple random sampling was used to choose 150 students. Data was collected through questionnaires and interview guides. Each Quantitative and qualitative data was analyzed singly and results converged in interpretation. Quantitative data was analyzed and interpreted through statistical Package for Social Sciences (SPSS) software package version 20.0 and was summarized and presented by means that of percentages, means, tables and pie charts. Qualitative data was analyzed and presented using narrative description. The findings revealed that lack of electricity or generators, inadequate tools and resources, in-adequate knowledge on teaching and learning through ICT, personal perceptions and lack of internet connection were the main impediments to learning and teaching through ICT. Based on the findings, the study recommended that education stakeholders, that is; the government, parents, teachers, local community and students should be involved in planning, training and appropriation of ICT tools and resources in schools.*

Key words: *challenges, utilization of ICT, public secondary schools*

1.1 Study Background

ICTs have impacted positively on various life sectors including education. When used appropriately, different ICTs facilitate access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by helping to make teaching and learning into an engaging, active process connected to real life (Tinio, 2002). The use of ICT in education is critical in promoting teaching and learning by facilitating skills like creativity and independent learning which are crucial in the 21st century. Learning and teaching should become a process of developing rather than transferring knowledge. In this respect it becomes highly vital to sketch architectures for interest-based learning communities for learners (UNESCO, 2004). ICT must therefore become an integral part of an education system. Education systems that ignore information technology will fail to produce a technically literate population and hinder a country's ability to compete in the global economy (World Bank, 2004).

The rationale for integrating ICTs in education was substantiated in a report issued by the Organization for Economic Co-operation and Development on the impact of ICT in schools (OECD, 2001). Schools must place learning through ICT as a matter of urgency to provide relevant education and respond to the needs of our time. Contemporary settings are now favoring curricula which promote competency and performance. Curricula is starting to emphasis capabilities and to be concerned more with how the information will be used than with what the information is (Sharma, 2011).

Despite huge efforts to position computer technology as a central tenet of secondary school education, the fact that many students and teachers make only limited formal academic use of ICT during their teaching and learning is less discussed by educational technologists. Yuen, Law and Wong (2003) conducted case studies on ICT integration in teaching and learning in 18 schools in Hong Kong. They found out that ICT innovation adopted by the schools was affected by schools' objectives, their perception of ICT's role in education, as well as their understanding of teaching and learning and the part played by teachers and students. The leadership role of individual schools played an important part in shaping the responses to ICT innovation.

Boakye and Banini (2008) measured teacher' readiness for use of ICT in schools in Benin, Cameroon, Ghana and Mali with the objective of determining if the teachers were involved in the process of integrating ICT into education in these countries. Teachers were asked about their skills with regard to ICT and use of ICT in their pedagogical practices. Of the teachers questioned, 71% had never used the computer in class, 10% used it for classroom activities. About 44% had never used the computer in preparing lesson notes while 49% did. Despite the fact that some teachers did not use ICT at all, they agreed generally that the computer had changed the way students learn.

Kenya promulgated a National ICT Policy in January 2006 that aimed to enhance the livelihoods of Kenyans by guaranteeing convenience of accessible, efficient, reliable and cheap ICT services. The Ministry of Education, science and technology was tasked with the event of curriculum content to be used on the digital platform, identification of beneficiary primary schools, capability building and training for teachers and different relevant education

stakeholders (ICT Authority, 2015). Teachers' personal theories and perceptions about teaching and learning processes and their level of competence with ICT play a major role in how they implement ICT and how they motivate themselves to use ICT tools in the classroom. Ayere, Odera and Ogak (2010), conducted a study on e-learning; a case of NEPAD e-schools in Kenya. They found out that e-learning produces significantly better results in teaching and learning outcomes in secondary schools. They study also found out that pupils' attainment improves when using ICT because they spend more time working at or practicing the skills being studied. Furthermore, computers enhance increased practice at particular tasks which promote learning like creativity and innovation. The study recommended that every school that had ICT programme be connected to the internet and acquire e-content relevant to the curriculum taught.

Mingaine (2012), studied leadership challenges in implementing ICT in public secondary schools in Meru county. She found out that leaders supported implementation of ICT in their schools and they had put some effort to acquire ICT infrastructure. However, very few teachers, if any, use them in meaningful way due to lack of essential visions and knowledge to lead implementation of ICT in their schools. School leaders were afraid that ICT infrastructure would be damaged by teachers and student in the process of teaching and learning. This had curtailed innovative use of the facilities by the school community.

The reviewed literature on implementation, integration, and use of ICT in teaching and learning, show that there were at least few ICT tools in most schools. These tools promote better learning by making learners more innovative, independent, participative and enhance student centered learning. The literature seldom tackled the challenges which individual teachers face in utilization of these tools in teaching and learning. The perceptions and attitudes among teachers and learners to education through ICT were not exhaustively tackled. This study therefore assessed the obstacles which hinder effective usage of ICT in teaching and learning in public secondary schools in Kajiado North sub-county.

1.2 Statement of the Problem

According to the Ministry of education in Kenya, there is limited capability for effective use and maintenance of ICT infrastructure in educational institutions. Most schools use less than 40% of the available ICT infrastructure and therefore there is need to ensure optimum use of ICT resources by students, teachers and administrators in order to exploit the educational potential of technology. Furthermore, very few schools were using ICT as an alternative method for the delivery of the education curriculum (MoEST, 2006). Evaluation reports from school principals on the implementation and usage and shows that not many teachers adequately used ICT in teaching and learning (Karanja, personal communication, January, 2017). Tanui, (2013) studied principals' role in integrating ICT in learning and found out that though there were ICT software available in most schools, there was no requirement in the roles of principals which expected them to effectively implement utilization of the available ICT resources. Mbaluko, (2009) discussed the challenges facing teachers in integration and use of ICT in teaching and learning. He found out that most ICT teachers were illiterate or had little knowledge on teaching through ICT. Majority of schools had computers and printers to type and print examinations and official documents (Wahome, 2011). Kessy, Kaemba, and Gachoka, (2006) also discussed several reasons for under-use of ICT in education in the African context. They found out that the cost of adopting ICT including, acquiring hardware and software, setting up telecommunication

networks, and the maintenance and repair of facilities is often prohibitive for developing nations.

From the literature reviewed, it was evident that there were a myriad of challenges hindering effective utilization of ICT in teaching and learning in most schools. These challenges ranged from personal (individual attitudes and perceptions), inadequacy of these tools, and lack of training to administrative issues. It was necessary therefore to carry out a study on these obstacles hindering innovative learning through ICT in Kajiado North Sub-County.

1.3 Research Questions

a) What are the available ICT tools in public secondary schools in Kajiado North Sub-County?
b) What are the challenges to teaching and learning through ICT?
c) What are the mitigating strategies of the obstacles to teaching and learning through ICT?

1.4 Review of related literature

Theoretical Framework

This study was guided by the Diffusion of Innovation theory. Diffusion of innovations theory seeks to elucidate how, why, and at what rate new concepts and technology unfold through cultures. Everett Rogers, a professor of communication studies, popularized the idea in his book Diffusion of Innovations. Rogers argued that diffusion is the process by which an innovation is communicated through sure channels over time among the participants during a social structure. The origins of the diffusion of innovations theory are varied and span multiple disciplines. Rogers proposed that four main parts influence the spread of a brand new idea: the innovation itself, communication channels, time, and a social structure. This method depends heavily on human capital. The innovation should be more adopted so as to self-sustain. Among the rate of adoption, there's some extent at that an innovation reaches crucial mass (Rogers, 2010).

Diffusion scholars believe any population or social network can be broken down into five segments, for any given innovation: Innovators, Early adopters, early majority, late majority and laggards Innovation process begins with a tiny number of visionary, imaginative innovators. They often lavish great time, energy and creativity on developing new ideas and gadgets. The group of early adopters is always on the lookout for a strategic leap forward in their lives or businesses and is quick to make connections between clever innovations and their personal needs. Early majorities are pragmatists, comfortable with moderately progressive ideas, but will not act without solid proof of benefits. The late majority are conservative pragmatists who hate risk and are uncomfortable with new idea. Lastly, laggards hold out to the bitter end. They are people who see a high risk in adopting a particular product or behavior (Robbinson, 2009).

Pro- innovation theory is in tandem with the global call of digitization. ICT responds to this urge of becoming a global village of networking, researching and innovating. The government of Kenya supports this through e-Government Strategy, which was adopted in 2004, emphasizes transformation of Government services from manual to digital-based operations. The Government's specific objectives embrace improved coordination of state agencies to reduce duplication of efforts and to boost efficiency in utilization of resources, to enhance the competitive position of the country through provision of timely information and delivery of services. Other objectives are to cut back transaction costs, and to interact citizens and also the

non-public sector through digital and on-line service provision (MoEST, 2006). Innovation theory supports the fact that agents of communication (teachers in this case) play an enormous role in implementing the use of new technologies in learning. They belong to the category of early adopters who accept new innovations for their personal use and pass it to the learners. Teachers see ICT as kindling students' interest and learning in the subject

Diffusion is troublesome to quantify as a result of humans and human networks being complicated. It's very tough to measure what precisely causes adoption of an innovation. Diffusion theories will never account for all variables like the perceptions and attitudes which hinder utilization of ICT and so may miss vital predictors of adoption. Pro-innovation bias implies that all members of a social system should adopt innovations and adoption should happen more quickly. It does not take into account the fact that diffusion and adoption may fail because it was a bad idea to begin with and it focuses on the individual adopter and thereby ignoring social structures (Botha & Atkins, 2005). The study mitigates the pro-innovation bias of this theory by going beyond the stages of innovation to various social and individual perceptions on utilization of technology. The social perceptions include; the view that technology is a bad influence to character development of children and it is expensive to apply technology in learning. This is not the case as there are many benefits of learning through technology as discussed in this study. The individual attitudes to the use of ICTs in education range from incompetence on teaching through ICTs to viewing ICTs as added workload.

This study was guided by this theory because implementation of anything new largely depends on powerful communication agents; a role which is largely entrusted to teachers. The stages of adoption provide a procedural approach to teacher initiative in integration of ICTs in education. The knowledge and persuasion stages can be interpreted to the level where teachers get to acquire some of the ICT tools like a computer and learn how to use them in instruction. Knowledge on how to type, print, tabulate marks by use of excel, use internet for research and engaging other learning communities is acquired.

ICT Tools and their Usage

The use of ICT in learning and in particular computer and networking communication to support teaching and learning include a wide range of applications, for example using a word processor to enable redrafting of an essay, running a simulation to test a prediction in science, developing cross-cultural understanding through computer conferencing and others. Learning through ICT is used to describe situations where ICT facility becomes the whole learning environment by providing learning materials and acting as assessor and tutor (UNESCO/IFIP, 2000 in Webb, 2002**).** There are various technologies employed in education through ICTs. The most common one is the use of computer in learning. Through the use of the different software applications, computers are necessary tools which facilitate learning. According to Rallis (2000), facilitators/ learners can use computers in teaching in the following ways; Instead of writing on the board, instructor or a student takes notes on the computer and projects this onto the screen so the whole class can see this. The notes can then be saved as a record of class (summary of class discussion or group work) then e-mailed to the whole class or posted on the course web page. Computers can be used for PowerPoint presentation, internet, online discussion forums among others uses.

Other mobile devises are used in education through ICTs. This is famously referred to as m-

learning which is an element of eLearning. This can be achieved by the use of mobile and portable devices such as PDA, cell phones, portable computers and Tablet PC. They must have the ability to connect to other computer devices, to present educational information and to realize bilateral information exchange between the students and the teacher. The main types of mobile devices used in the education process as noted by Georgiev, Georgieva, and Smrikarov (2004) are: Note-Book computers which are small sizes computers and support wireless communications. Tablet PC; they have full range of abilities as personal computers. Some of them don't have a keyboard but have software to recognize handwritten text. Personal Digital Assistant (PDA); they have small sizes and significant processor power. Cellular phones; the low class devices mainly can be used for voice communication and sending and receiving of text messages (SMS). Some of their disadvantages are low memory capacity and low data transfer rate. The cellular phones from the higher class can be used to Internet access through WAP or GPRS technologies. Smart Phones; they are hybrid devices which combine the abilities of cellular phones and PDA. They have smaller sizes than PDA and bigger than cellular phones.

Wastiau et.al (2013) did a survey on ICT in education in schools in Europe. They found out that; Laptop and tablet computers and mobile phones are increasingly seen as useful in education offering portability and choice as to when and where to use them. In order for a specific device to be used optimally, certain technical and organizational conditions must be fulfilled. A tablet was found to be best used together with a wireless network and a wireless data projector which enabled it to be moved around between pupils in class, something which is difficult to organize with laptops that are physically connected to an interactive whiteboard (IWB) for example. There is also a growing body of evidence on the impact of IWBs on learning. This survey was done on a totally different context from the foregoing study, the European level of digitalization is far beyond the Kenyan context. Therefore a study needed to be carried out to assess the utilization of ICT in education in Kajiado North Sub-County.

Tools used to support e-learning cover a wide range of different applications. They include discussion forums, chat, file sharing, video conferences, shared whiteboards, e-portfolios, weblogs and wikis. Such tools can be used to support different activities involved in the learning process. The question of organizing e-learning tools involves the problem of integration versus separation. On the one hand, it is possible to integrate different tools in a single stand-alone system, a learning management system, also called virtual learning environments or e-learning systems (such systems include Blackboard, WebCT, Moodle) (O'Neil et al, 2004). In a comparative study, Dabbagh and NannaRitland (2005) examined the differences between traditional and online learning environments. They found out that, traditional learning environments are bound by location and presence of instructor and student, presented in real time, controlled by an instructor and are linear in teaching methods. Using evolving information and communication technologies, asynchronous communication and real-time information, online teaching and learning environments are unbound and dynamic. Through technology, interaction and collaboration are now attainable in either asynchronous or synchronous learning networks. The emergence of social software that enables a group of individuals to collaborate through the Internet has added a new dimension to online learning. The versatility of social software and other collaboration tools available today support constructivist environments that seek to motivate, cultivate, and meet the needs of the 21st-century learner (Beldarrain,2006).

Tondeur, Krug, Bill, Smulders, and Zhu (2015), conducted a research on integration of ICT in Kenyan schools. They found out that the involvement of all stakeholders was crucial for the ownership of ICT integration in education. Consequently, the process of effective technology incorporation should not be facilitated as a stand-alone event. Rather, professional development programmes should be part of a cycle of inquiry that supports teachers' learning, to try out and receive feedback. Teachers will need opportunities to share their successes and failures, face challenges and make new discoveries. Tanui (2013), conducted a study on ICT use in public secondary schools in Wareng sub county, Kenya. He used a mixed methods design; cross-sectional and phenomenology. He found out that majority of the school principals hardly use computers making them a bad example to other teachers. There is low IT literacy among teachers and learners, weak ICT policies in curriculum ICT implementation, technophobia and inadequate computer studies. The study did not however look at the extent to which the available tools are used in learning and the attitudes accompanying the low level of utilization. This study will fill this gap by employing convergent parallel mixed methods design which will analyze qualitative and quantitative data concurrently to find a convergence between attitude and level of utilization.

A summary of reviewed studies analyze how various ICT tools can be used in learning and teaching. Web is mainly seen as a medium for the students to retrieve information. Discussion forums, chat, file sharing, video conferences, shared whiteboards, e-portfolios, weblogs and wikis. Such tools can be used to support different activities involved in the learning process (Rallis, 2000, Gonzalez, 2010). The reviewed literature however does not bring out how individual teachers utilize these tools in learning and teaching to improve learning. This study will fill this gap by assessing the utilization of these tools in public secondary schools in Kajiado North sub-county.

Challenges to Teaching and Learning through ICT

Tezci (2009), conducted a quantitative study on teacher's effect on ICT use in education in Turkey. He found out that the most common uses of ICT are the Internet, e-mail, word processing and educational CDs, though rarely used. The study also revealed that ICT use in classroom is limited, a finding which is attributed to the level of experience; and the most commonly used ICT types were determined as the Internet, e-mail, word processing, and educational CDs. According to the results of the study, most teachers know how to use the Internet, email, word processing, graphics and presentation software. The low levels of knowledge on ICT might result from the fact that these. There is a significant correlation between the levels of knowledge about ICT and the use of ICT in education. This study however has a methodological gap; a purely quantitative design neglects the personal, social-cultural and social economic factors that support or hinder education through ICT. The current study uses a mixed method design to assess all these factors.

Teo (2008) conducted a survey on pre-service teachers' attitudes towards computer use in Singapore. A sample of 139 pre-service teachers was assessed for their computer attitudes using questionnaire with four factors: affect (liking), perceived usefulness, perceived control, and behavioral intention to use the computer. He found that teachers were more positive about their attitude towards computers and intention to use computer than their perceptions of the usefulness of the computer and their control of the computer. Demici (2009) conducted a similar study on teachers' attitudes towards the use of Geographic Information systems (GIS) in Turkey. The

study revealed that though barriers such as lack of hardware and software existed, teachers positive attitudes towards GIS was an important determinant to the successful integration of GIS into geography lessons. The current study looked at the possible attitudes among teachers preventing them from appreciating the usefulness of computers and other ICT tools. Khan (2012), points out lack of good vision in educational institutions in implementation of ICTs in education in developing countries. He uses a case study of Bangladesh and describes it this way, "In Bangladesh most of the educational institutions are far away from implementing ICT into teaching and learning situations. Also, there are few educational institutions in big cities that have ICT facilities but cannot integrate it effectively due to lack of a proper vision and plan." (p.69). Yilmaz, (2011) in assessing the technology integration processes in the Turkish education system reported that in providing schools with hardware and internet connections, it is also crucial to provide the schools with technical support with regard to repair and maintenance for continued use of ICT in schools. Therefore, if there is no technical support for teachers, they become frustrated resulting in their unwillingness to use ICT.

Neyland (2011) conducted both quantitative and qualitative research on factors influencing the integration of online learning in high schools in Sydney. The study involved 26 computer coordinators. In an interview, one computer coordinator in a schools stated that increased workload of teachers was alarming: Asking them to take on board yet another task in an already overcrowded curriculum and extremely busy work day is pushing many teachers to the limit and in some cases beyond. The perception and attitude of teachers is a great hindrance to the implementation on ICTs in learning. Curriculum change theories have generally asserted that once a small cohort of innovators emerges, their adoption of the innovation cascades through their peer group of subject teachers. Yet it is clear this is not happening with respect to ICT in schools; the innovators have remained a minority of teachers. Teachers who do use computers in their classrooms tend to be those who can clearly relate the use of technology to their pedagogic strategy for their own subject (Watson, 2002).

In particular it is these teachers who recognize and enjoy the pedagogic potential of ICT because it relates to their own philosophical underpinnings about teaching and the nature of their subject. They are at home with CAL; they teach Geography or History or Biology with computers' rather than 'deliver ICT'. They recognize the way that ICT is actually changing the nature of the subject that they teach. But they are rare. So the success of this innovation, ICT use in schools, resides in the professional competencies and interests of only a few teachers. For them the focus is not a future 'information age', but the fact that it supports the nature of the learning. Their colleagues, however, even in the same subject express caution and articulate barriers which inhibit their involvement with IT. They find the micro politics of access too inhibiting, are not confident users of the hardware, and are not convinced of the value. They all state reasons that have become associated with failure of IT innovation; a lack of good software, or time to explore software, negative experiences in the classroom that had 'put them off', and that it is not worth the amount of extra effort required (Watson, 2002). In a qualitative multiple case-study research on primary school competence and confidence level regarding the use of ICT in teaching practice conducted in five European countries, Peralta & Costa (2007) found that technical competence influenced Italian teacher's use of ICT in teaching. However, the teachers cited pedagogical and didactic competences as significant factors if effective and efficient educational interventions are likely to be implemented.

Yildirim (2007) conducted a survey on factors that discourage teachers' use of computer technology in classrooms. He reported that the major use of technology by teachers was to prepare lesson notes and assessments instead of improving students' performances. The research also revealed that barriers to the use of technology include congested classes, insufficient training, inadequate technical and pedagogical support, rigid school syllabi, inadequate motivation, lack of strong leadership and inadequate cooperation among teachers. There is lack of optimum participation from lecturers on introducing in-service teachers to teaching through ICT. Chitiyo, and Harmon (2009), did an analysis on the integration of instructional technology in pre-service teacher education in Zimbabwe. He found out that, the absence of resources both hardware and software and the lecturers' own lack of preparedness to integrate technology, were given as the main reasons the lecturers were not using computers for instructional purposes. The lack of readiness was further confirmed by the lecturers' lack of confidence and their uncertainty in their ability to do some critical IT integration tasks.

Amutabi (2004), in his research on the use of ICTs in education, discusses a number of challenges facing Kenyan institutions in integrating the use of ICTs in education. The lack of trained and experienced technical personnel to manage control and maintain the increasingly large numbers of these resources means that their utility values, effectiveness and efficiency, cannot be ascertained. The lack of theoretical knowledge and practical management, control and maintenance skills of ICT staff leads to these units being managed, controlled and maintained virtually on trial and error basis. Some of the technicians are untrained or semi-trained in the real sense of ICT training. The lack of computer culture in public institutions impedes rapid diffusion of the new technologies. Ignorance is the biggest problem facing institutions with regard to ICT. Many school managers have never experienced an environment where ICT is at full throttle. This makes them less appreciative of ICT.

Another problem inhibiting the use of ICTs in learning is limited digital equipment at virtually all levels of education. While the average access rate is one computer to 15 students in most of the developed countries, the access rate in Kenya public schools is approximately one computer to 150 students. In addition, it is noted in the Education Policy Framework (EPF) that there are a number of challenges concerning access and use of ICT in Kenya. These include high levels of poverty that hinder access to ICT facilities, limited rural electrification and frequent power disruptions. Where there is electricity, hindrances to application of ICT include; high costs of Internet provision, costs associated with digital equipment, inadequate infrastructure and support. Another problem is limited penetration of the physical telecommunication infrastructure into rural and low-income areas. Specifically, the main challenge is limited access to dedicated phone lines and high-speed systems or connectivity to access e-mail and Internet resources (MoEST, 2006). Mbaluko, (2009) in discussing the challenges facing teachers in integration and use of ICT in teaching and learning found out that most IT illiterate or have little knowledge on teaching through ICT. Majority of schools have computers and printers to type and print examinations and official documents (Wahome, 2011). Inadequate hardware and software, slow internet connections, learners' procrastination, lack of technical expertise among the instructors, insufficient orientation for learners, and a lack of release time for instructors to develop and design their online courses have been cited also as barriers to faculty participation in developing and teaching online courses (Nkonge & Gueldenzoph, 2006).

Mitigating Obstacles to Effective Learning through ICT

To overcome impediments to education through ICT, some strategies should be put in place. These impediments are either technological (lack of enough ICT infrastructure) or personal (individual attitudes). To gain the knowledge necessary to implement online curriculum effectively, teachers must have the necessary training, mentoring, and support, preferably on the equipment they will use. Tasir et al (2012) conducted a research on the relationship between instructors' level of competency on the use of ICTs and the level confidence and efficiency in Malaysian schools. He found out that teacher's competency, teacher's confidence level, and teacher's satisfaction toward ICT training programmes is a very important factor that can increase the levels of the competency and confidence (Porter, 2004).

Soong (2001) in FitZpatrick (2012) points out some Key Success Factors for developing an online curriculum and getting good results from it; Human issues: The teacher needs to be skilled in motivating the students online and creating an enthusiastic online environment; Technical skills: Both the instructor and the student need to possess the necessary skills to work efficiently in an online setting; Technical support: Any form of technical difficultly needs to be address in order for the full utilization of the course to be had; Collaboration: there should be collaboration and networking with other institutions on the use of ICT; Attitude: The teacher and student need to have a positive approach towards learning online. Teachers need to be self-motivated, interested, and willing to integrate technology in their subjects. Technology provides opportunities to support student learning. However, to achieve the full benefits in education, technology requires strategic planning and integration of these tools into teaching that only a sense-making and skilled teacher can provide (Keengwe &Wachira, 2008).

Tondeur, Van Keer, Van Braak, and Valcke, (2008) did a study on ICT integration in classroom. The study was conducted in Ghent, Belgium. A stratified sample of 60 schools was involved in the study. Stratification variables were related to the type of educational network and the degree of urbanization (rural/urban). The study found out that teachers in schools with an explicit ICT school policy that stresses shared goals are using ICT more regularly in their classroom. This study filled this gap. Hodgson (2005) discussed some issues to consider in implementation and management of learning technologies, Students develop a strong dependence on their teachers during their primary and secondary schooling. To help students to develop from being dependent learners to independent learners, they need to be oriented towards the teacher's expectations and be given guidelines for online activities and their own roles in the online learning community.

There are areas to look at if there is to be any meaningful progress in the online curriculum development in education. First the vision of the school should reflect the new needs of education as innovative- something which is necessarily achievable through the use of technology. Administrative support structures, student services, technology support, and staff training and support needs are all areas that need to be analyzed and perhaps changed in order to successfully implement eLearning. By accepting a vision statement and its implications, those at the forefront of eLearning in the school acknowledge that physical, organizational, and programmatic changes will be occurring, with the inevitable shift of resources. Advanced planning and policy development are keys to a well-run distance learning program. This planning will allow money to be spent more efficiently such as buying one software package to serve

multiple purposes, rather than several packages over several years. Planning will also facilitate better use of existing resources and time, for example, developing technical training programs for all departments rather than having departments contacting technical support one at a time (Levy, 2003).

Wong and Li (2008) conducted a study on factors that influenced transformational integration of ICT in eight schools in Hong Kong and Singapore. The study revealed that leadership promotion of collaboration and experimentation and teachers dedication to student centered learning influenced effective ICT transformation. Similarly, Afshari et al. (2009) distributed questionnaires to 30 heads of second-cycle institutions in Tehran. Their results revealed a relationship between the head's level of computer competence and transformational leadership practices. They concluded that transformational leadership could help improve the integration of ICT into teaching and learning processes. This current study analyses the specific roles of schools principals in ensuring maximum utilization of ICT in teaching and learning. Yuen, Law and Chan (2003) conducted case study of 18 schools in Hong Kong. They found that in catalytic integration model schools, the school principal is the key change agent, exhibiting visionary leadership, staff development and involvement while in cultural innovation model schools, good leadership is exhibited where the school principal is not necessarily involved in ICT leadership, and teachers are free to implement new ideas in supportive and enhancing culture. Also studies have shown that various levels of leadership such as principal, administrative leadership and technology leadership influence successful use of ICT in schools.

Successful education through ICTs depends on the following factors; (a) Institutional: The appropriate infrastructure needs to be in place to complement the successful operation of the eLearning environment; (b) Management: Managing the content, the delivery, and the maintenance of the eLearning system; (c)Technological: The correct hardware and software is used; (d) Pedagogical: The method and process of teaching needs to be analyzed; (e) Ethical: An overview of social, political, cultural, geographical, and legal issues needs to be considered; (f) Interface: The actual site design and content navigation system must be easily accessible and usable; (g) Support: Both communication and resource support need to be in place; and (h)Evaluation: This includes the evaluation of the eLearning content development process, the evaluation of the eLearning program and the assessment of the students' learning (Levy, 2003). The fore going discussion presented various attitudes that can either promote or hinder learning and teaching through ICT. The teacher needs to be skilled in motivating the students online and creating an enthusiastic online environment. The attitude of facilitators towards online learning and its benefits will determine its effectiveness. Teachers need to be self-motivated, interested, and willing to integrate technology in their subjects. The reviewed literature failed to elucidate the various cultural, social and attitude issues among teachers and their causes. This study assesses the perceptions of teachers on learning and teaching through ICT and how these obstacles hinder maximum utilization of ICT in learning.

1.5 Methodology

The research used mixed method research design (cross-sectional and phenomenology). The study used also convergent parallel mixed method design. Convergent parallel design was used because the study aimed at finding a convergence between perception and other obstacles to ICT and under-utilization of ICT tools in teaching and learning (Creswell, 2014). According to

Babbie, (2010), target population is all members of a real or hypothetical set of peoples, events or objectives to which an investigator wishes to generalize results of the research study. Kajiado North sub-county had a population of 28 public secondary schools, 8420 students and 345 teachers. A sample is a selection of part of population with the aim of understanding some of the characteristics of the whole population (Ogula, 2005). The sample for this study consisted of 10 public secondary schools in the sub-county which is 35% of the total population of public secondary schools in Kajiado North sub-county. The sampling approach was guided by the proposal of Kombo and Tromp (2006) who says that a sample of 30% is large enough for big population. The sample size for teachers was 104 teachers out of 345 which translate to 30%. The number of teachers from each of the selected schools was chosen using simple random sampling in proportion to the total population of teachers. Simple random sampling gives equal opportunity for all members of the population being selected. Thus it removes the likelihood that the sample is biased by the individual selecting the sample. (Gay & Arasian, 2003).

The sample size for students was 150 of the 1500 students. They were selected using stratified random sampling for mixed schools and simple random sampling for single sex schools. Stratified sampling is the process of selecting a sample in such a way that guarantees desired representation of relevant sub-groups within the sample (Mugenda & Mugenda, 2008). Ten head teachers were selected purposively from the sampled schools because they had crucial information on the schools' vision in regard to ICT integration. Two education officials were also purposively sampled to participate in the study. The sampling matrix is represented in table

The research used questionnaires for teachers and students. The questionnaires were precluded by a brief introduction on the purpose of the study. The questionnaires included each open ended and closed ended queries. The study also used interview guides. An interview guide is a written down general guide or plan which is followed to orally ask questions and make comments. It helps in leading a respondent towards giving some information. Interview guides were employed to school principals and Ministry of education officials in the sub-county. The researcher sought the approval of the department of Post Graduate Studies in Education to collect data after fulfilling the research proposal requirements. Using the University data collection letter, the researcher went ahead and sought a research permit from the Ministry of Education, Science and Technology. The researcher then visited the education offices in Kajiado North sub-county in order to submit copies of the research permit. This was done in order to obtain clearance to visit schools.

Further clearance was sought from the principals in consideration to different school programmes so that the research does not become a distraction to learning. The researcher then met participating groups, did a self-introduction and finally introduced the topic and aim of the research. The respondents were taken through the ethical considerations guiding the research with specific emphasis on voluntariness, confidentiality and the prospective benefits of the research. The questionnaires were distributed and collected after the respondents were through filling them. Interviews were conducted on prior arrangement with the respondents in regard to their availability. The study used the concurrent triangulation; comparing the two sets of quantitative and qualitative data to determine convergence, difference or some combinations. To analyze quantitative data, the study used descriptive statistics. The information gathered was organized into different categories of respondents and coded to make data reduction possible. It

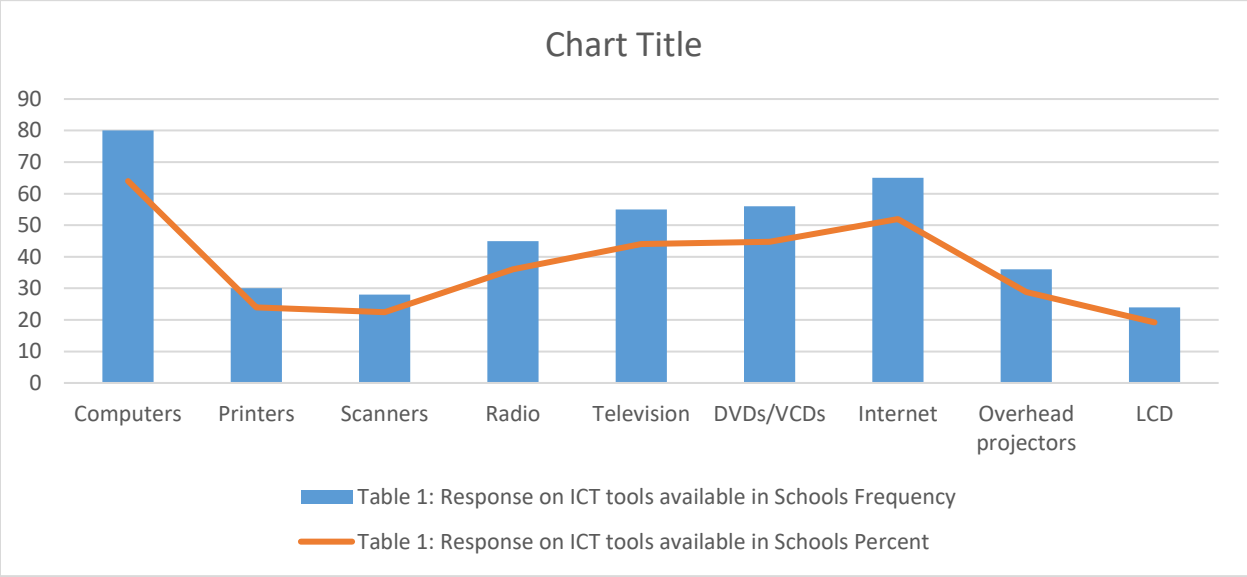
was then interpreted using SPSS and presented using tables, frequencies, percentages, graphs and charts. The procedure for analyzing qualitative data was; documentation of data, categorization of data into concepts and themes, connection of data to show how one concept may influence another and reporting the findings. Quantitative and qualitative data was mixed in interpretation and discussion section by presentation of quantitative statistical results followed by qualitative quotes supporting or disconfirming quantitative results (Creswell, 2014).

1.6 Presentation, interpretation and discussion of findings

ICT tools available in most Schools

The researcher wanted to know the most common ICT tools found in majority of the schools at the disposal of teachers. The results are as shown below showing both students and teachers' responses.

Figure 1: Response on ICT tools available in Schools



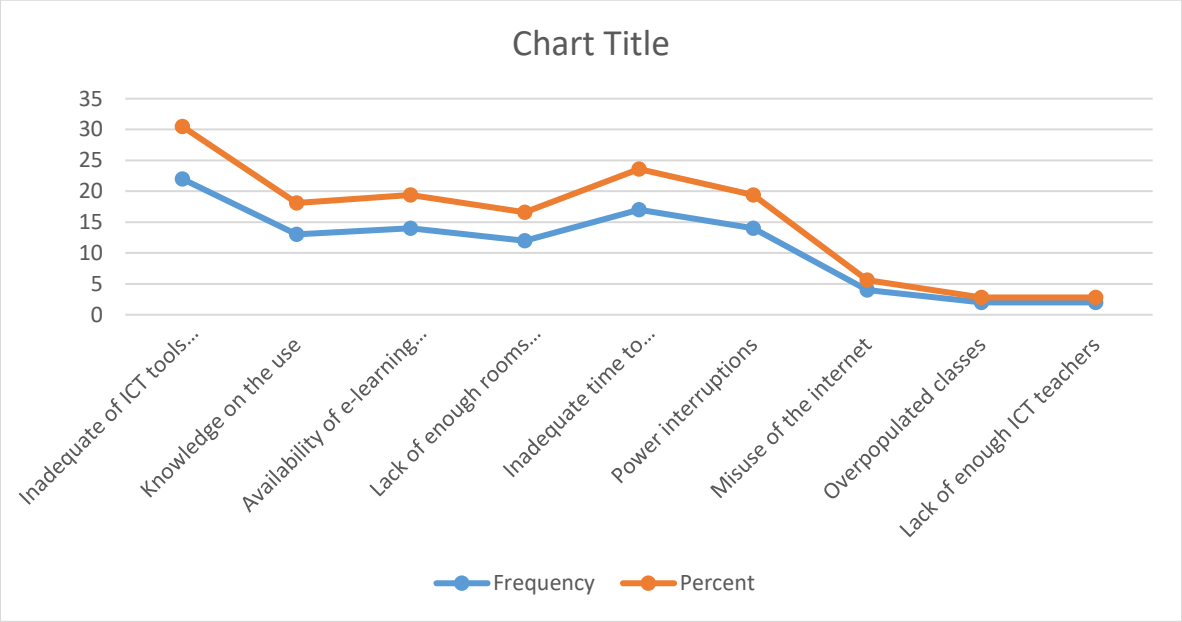
Source: Field data 2018

Majority of the students (64%) reported that they have computers in their schools while 52% reported to have internet in their schools. A small number of students (36%) reported to have Radio, Television (44%) and DVDs/VCDs (44.8%) in their schools. Few students reported the availability of printers (24%), scanners (22.4%), overhead projectors (28.8%) and LCD (19.2%) in their schools. These findings supported Wahome (2011), Wanjala (2013) and Mbaluko (2009) who found out the ICT tools available in most schools were computers and printers which were used in printing, typing and publishing examinations, DVD/VCD were used by English teachers to teach poetry and oral literature and also to watch set books.

Challenges of teaching and learning through ICT

The study wanted to find out the main challenges teachers and students face in teaching and learning through ICT and their impact in teaching and learning. This was important to the study because the level of usage depends on how well teachers are able to highlight what can hinder ICT in education and the possible remedies. Data was tabulated and the results were summarized in the following table.

Table 2: Challenges of teaching and learning through ICT



Source: Field data 2018

Lack of enough ICT tools and resources is the biggest challenge in teaching and learning through ICT (30.5%). Many teachers also reported inadequate time to prepare and deliver lessons using ICT (23.6%), unavailability of e-learning materials (19.4%), power interruptions, inadequate knowledge on the use of ICT (18.1%) and lack of enough rooms with proper power connections in schools as other challenges to education through ICT. Yildirim (2007 in a related study revealed that barriers to the use of technology include; insufficient training, inadequate technical and pedagogical support, rigid school syllabi, inadequate motivation, lack of strong leadership and inadequate cooperation among teachers. These findings agree with other reviewed studies. Alemneh and Hastings (2006) said that some of the barriers to effective learning through ICT include; inadequate funds and lack of progressive national programs because many African governments remain unconvinced of the importance of research and scientific innovation in creating economic growth and they pay little attention to the national need for higher education and ICT infra- structure.

Measures and Strategies to Effective Teaching and Learning through ICT

The study sought to know the extent to which the outlined strategies and ways that may promote

better learning through ICT. This aided the research to identify and recommend the focus areas if successful implementation, integration and utilization of ICT in learning was to be achieved.

Table 3: Strategies to Effective Teaching through ICT

	Very large extent	Large extent	Moderate	Small Extent	Very Small Extent
Training on ICT help in effective teaching and learning through ICT	45(62.5%)	17(23.6%)	5(6.9%)	2(2.8%)	0
Technical support help in effective teaching and learning through ICT	33(45.8%)	27(37.5%)	6(8.3%)	2(2.8%)	1(1.4%)
Collaboration with other schools on ICT in education help in effective teaching and learning through ICT	22(30.6%)	37(51.4%)	8(11.1%)	2(2.8%)	0
Change of attitude help in effective teaching and learning through ICT	31(43.1%)	31(43.1%)	4(5.6%)	3(4.2%)	0
Support from school administration help in effective teaching and learning through ICT	37(51.4%)	27(37.5%)	2(2.8%)	3(4.2%)	0
Good planning on ICT infrastructure and training help in effective teaching and learning through ICT	38(52.8%)	22(30.6%)	7(9.7%)	1(1.4%)	1(1.4%)
Government funding help in effective teaching and learning through ICT	36(50.0%)	20(27.8%)	10(13.9%)	0	2(2.8%)
Community participation on ICT infrastructural improvement help in effective teaching and learning through ICT	20(27.8%)	21(29.2%)	13(18.1%)	10(13.9%)	4(5.6%)

Source: Field data, 2018

The respondents (86.1%) said that training on ICT facilitate effective teaching and learning through ICT to a very large extent. They also said (83.3%) that technical support help in effective teaching and learning through ICT to a large extent. Majority of the teachers (82%) recommended collaboration with other schools on ICT in education to achieve effective teaching and learning through ICT to a very large extent. In addition, majority (86.2%) stated that change of attitude can help in effective teaching and learning through ICT. A high number (88.9%) recommended the support from school administration to facilitate effective teaching and learning through ICT. A large number (83.4%) also said good planning on ICT infrastructure and training help in effective teaching and learning through ICT. Most respondents (77.8%) on the other hand said that government funding help in effective teaching and learning through ICT to a very large extent. Lastly few respondents (57%) wanted the community to participate on ICT infrastructural improvement to achieve effective teaching and learning through ICT.

In a close study to the current, Wong and Li (2008) disclosed that leadership promotion of collaboration and experimentation, and teachers dedication to student centered learning influenced effective ICT transformation. In a related study, Tondeur, Krug, Bill, Smulders, and Zhu (2015), found out that the involvement of all stakeholders was crucial for the ownership of ICT integration in education. Consequently professional development programmes should be part of a cycle of inquiry that supports teachers' learning, to try out and receive feedback. These trained teachers will easily stimulate learners to learn using ICT. These findings were similar to studies done by Wanjala (2013) and Mbaluko (2009) on ICT in learning. They found out that, teacher needs to be skilled in motivating the students online and creating an enthusiastic online environment. Similarly, Afshari et al. (2009) found a relationship between the head's level of

computer competency and transformational leadership practices.

1.7 Conclusions and recommendations

Regarding the availability of ICT tools in public secondary schools in Kajiado North sub-county, the study established that majority of the schools had computers and printers. Few schools had scanners, Internet, Radio, Television and Overhead projectors. The study found a relationship between teachers' personal interest and teaching through ICT; teachers who do use computers in their classrooms tend to be those who can clearly relate the use of technology to their pedagogic strategy for their own subject. The findings also indicated that teachers used computers and printers for filling in marks, printing of exams and learning materials, administrative work, exam analysis software to compute results more easily and monitor students' progress, internet for research and downloading reading materials. The findings exposed limited utilization of ICT in real teaching and learning among students and teachers. Therefore continuous training, improvement of infrastructure, technical support and support from the administration should be emphasized to achieve more usage of ICT in learning.

The findings from this study identified lack of electricity or generators, inadequate ICT tools, inadequate time to prepare and deliver lessons using ICT, unavailability of e-learning materials, inadequate knowledge on the use of ICT and lack of enough rooms with proper power connections as the main impediments to teaching and learning through ICT. Other obstacles exposed in the findings included; lack of technical support in using the tools, poor maintenance of the tools, lack of support from the administration, lack of internet connection, poor funding from the government to ICT department in schools and personal perceptions and attitudes on learning and teaching through ICT. These tools and resources need to be provided in schools, more training enhanced and good maintenance strategies fostered. The results from the study also revealed that training on ICT, technical support, collaboration with other schools on ICT in education, change of attitude, support from school administration, good planning on ICT infrastructure, government funding, community participation on ICT infrastructural improvement were the main strategies to achieving effective teaching and learning through ICT.

Based on the results and findings of this study, the researcher makes a number of recommendations. First, education stakeholders, that is; the government, parents, teachers, local community and students should be involved in planning and appropriation of ICT tools and resources in schools. The purchase, usage and maintenance of the tools is to be taken as corporate responsibility of all the aforementioned stakeholders. Teachers should also use the available ICT tools effectively. Second, teachers need to continuously update their knowledge base on teaching and learning through ICT. The government and school administration also need to organize for workshops and seminars on integration and utilization of ICT in teaching and learning. Teaching through ICT is not a reserve for computer teachers but a requirement of all teachers of this age and time. The curriculum also needs to be re-aligned to accommodate e-learning. This proposal is in line with the reviewed literature on ICT in education: The Ministry of Education, science and technology, is tasked with the event of information content to be used on the digital platform, capability building and training for academics and other relevant education stakeholders (ICT Authority, 2015). Third, the government should put it as a priority to connect electricity in all schools. The schools administration should also mobilize funds to acquire back-up generators in case of power interruptions. An IT expert needs to be employed in

schools to offer technical support to teachers and learners on use of technology. It could be more beneficial for schools administrators to regularly benchmark with schools which have integrated these tools in learning and teaching. This recommendation is based on the findings on the challenges hampering effective teaching and learning through ICT. Lastly, it would be of benefit for the Ministry of education to revisit the ICT policy of 2005 to schools. The policy left the responsibility of integration ICT in learning to school administrators. No clear framework has so far been rolled out on e-curriculum development, assessment and evaluation of teaching through ICT (MoEST, 2006). Teachers need to be involved in e-curriculum development. Assessment on teaching through ICT in real classroom setting would be done regularly by peer teachers and feedback acted upon for improvement. A test on the extent to which intended learning outcomes are achieved when ICT is used in teaching needs to be done in schools to make appropriate recommendations.

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