

AN INVESTIGATION INTO INFRASTRUCTURAL AND TEACHER PREPAREDNESS TOWARDS IMPLEMENTATION OF DIGITAL LITERACY PROGRAMME IN PRIMARY SCHOOLS IN TRANS-NZOIA WEST SUB-COUNTY, KENYA

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Abstract: The government of Kenya is pushing for digital instruction content delivery in primary through full implementation of the Digital Literacy Programme. A trial phase for this programme was conducted in May, 2016. A major problem which arose was that most of the primary schools in Kenya were having various inadequacies to be addressed before full implementation of the Digital Literacy programme. Some of the schools were not having relevant and adequate ICT physical and technical infrastructure. Others were not having adequate teachers who had been adequately trained in ICT. Others were not having security measures to safeguard ICT physical infrastructure from thieves. Lastly the attitude of teachers, learners and the parents was not clear towards supporting the programme implementation. This Study's major objective therefore was to find out if the public primary schools had relevant and adequate requirements necessary for implementing the Digital Literacy Programme in Waitaluk division, Trans-Nzoia west sub-county, Kenya. The Study was conducted using the descriptive survey research design approach. This research design was considered appropriate because the major aim of the investigation was to study the extent of schools' preparedness towards implementation of the Digital Literacy Programme and report on the same without influencing the respondents in any way. This research was conducted in Waitaluk division found in Trans-Nzoia west sub-county. Waitaluk division has a total of 17 public primary schools, many pupils and 295 teachers. Therefore, the target population included teachers and pupils drawn from public primary schools from Waitaluk division. Six schools were selected using simple random sampling. From the six schools, teachers sample size was selected using simple random sampling while pupils were selected using purposive sampling to proportionately represent a total of 100 teachers and 12 pupils. Information was collected using questionnaires for the primary teachers and learners in public primary schools. In addition observations were used to collect data for ICT physical infrastructure. The validity of the data collection instruments was assured through co-operation with university academic advisors and by the researcher ensuring that the instruments met all the objectives. The significance of the reliability coefficient was tested using the t-test which gave 0.85 confidence level. Data was organized and analyzed using descriptive statistics through the help of

SPSS statistical package (version 16). The findings from the study revealed that most of the primary schools did not have adequate requirements for implementing the Digital Literacy programme. The findings indicated that the teachers, learners and the society at large were much interested in implementing the programme. The findings from the study will benefit the government for purpose of policy making through the ministry of planning and the ministry of education in making a policy plan for effective full implementation of the Digital Literacy Programme. Secondly the KICD will benefit in the development of future digital content to be used for implementation of the Digital Literacy Programme and for ICT integration curriculum development in basic education sector. Other stakeholders who will benefit include teachers, learners, and authors of books among others.

Keywords: ICT Physical Infrastructure, ICT Technical Infrastructure, Security services and Trained ICT Teachers.

I. INTRODUCTION

Background:

Every country is pushing for ICT integration in schools. In developed countries like the United States of America as many as 95% of schools are connected to the Internet; even at the level of the individual classroom (CEO Forum, 2000). Despite of this nearly ubiquitous access to computer technology, there is a significant gap between the presence of technology and its usage in the classroom. While some type of technology is present in nearly every classroom in the country, it is rarely used to its fullest potential (Royer, 2002). Part of this discrepancy is due to lack of comfort with using technology for teaching and learning. Even teachers who are using technology and report a high degree of comfort with technology tend to use it in fairly rigid ways, such as searching for activities to use with students, communicating with other teachers, and word processing (Price, Cates, & Bodzin, 2002).

For schools to use digital content appropriately they need to be fully prepared (CEO Forum, 2000). One area that makes a school to be prepared is the availability of enough teachers who are compliant in ICT. Every educator has professional development needs. From refresher courses on content areas to intensive training in new technology tools, hence professional development is a critical component of teaching and learning. It is also an essential component of any school change effort, but it is particularly useful in the implementation of educational technology and the creation of digital learning environments (CEO Forum, 2000). Many teachers (particularly those who did their teacher training many years ago) did not receive instruction on teaching with technology tools (Staples, Pugach, & Himes, 2005). When designing professional development activities for technology implementation, it is critical that efforts be made in two ways. First, teachers need basic technical knowledge about how to use ICT tools. Secondly, they also require knowledge about how to integrate the tools into their existing curriculum (CEO Forum, 2000). In order to achieve full-scale change, schools need to ensure that strong professional development programs are in place and that teachers have a variety of opportunities for learning and growth (CEO Forum, 2000; Price et al., 2002; Royer, 2002; Staples et al., 2005).

In Africa, the use of ICT is still a challenge. For example In Rwanda, ICT is a key driving force for economic development and there is a strong political will and commitment in this area under the leadership of H.E. President Paul Kagame, who champions ICT initiatives. Currently a national communication fibre optic network with cross border connection to submarine cable has been laid across the country so as to bring connectivity to all 30 districts. There are also sustained efforts to develop electricity coverage and to reduce access costs through import tax exemption on ICT devices.

Several guiding documents set out objectives for ICT development in Rwanda, the most comprehensive one being the National Information and Communication Infrastructure (NICI) plan Phase 2 (2006-2010) in which education represents one of the core pillars for its development. Within this framework and in consultation with key partners, an ICT in Education Policy has been developed and will be accompanied by a strategic implementation plan. President Paul Kagame launched the One Laptop per Child initiative Education Sector Strategic Plan 2010-2015.

In spite of this favorable political context, many challenges still need to be overcome in order to disseminate the use of ICT throughout the nation and more specifically in education. With limited national electricity coverage and Information Technology (IT) infrastructure, access to ICT in the education system is extremely low, with the exception of Higher Learning Institutions (HLIs). In addition there is a lack of clear understanding of linkages between ICT and expected

education outcomes. Even when ICT in education initiatives are taken up, the limited availability of digital learning material, lack of expertise and project management skills, capacity gaps among teachers to integrate ICT, lack of technical support and inadequate coordination of initiatives frequently hinder their success.

According to Hennessy, Onguko, Harrison, Ong'ondi, Namalefe, Naseem, & Wamakote (2010), the most significant ICT investment in the educational sector in Uganda is the Education Management Information System (EMIS) which aims at providing quality education statistics in a timely, cost-effective and sustainable manner. This is done through data capture on school facilities and pupil details which is coordinated at the district level and uploaded to the system for national compilation and processing. In Tanzania there has been an effort to develop digital instructional content for basic education level although its use has not been fully realized (Hennessy et al, 2010). In Burundi, no ICT infrastructural investment by the government has been realized.

In Kenya, the Digital Literacy Programme started its first implementation phase in 2016. The Digital Literacy Programme was one of the main promises of Jubilee government during its campaign in 2013. The project falls under the first key pillar of Jubilee manifesto, unity (Umoja), where the government promised to raise education standards and the Ministry of Education Science and Technology (MoEST) planned to roll out the programme in three years. The programme was initially faced with many hurdles which saw it not kicking off including Tender Awarding processes and lack of infrastructure in many primary schools. Initially the tendering process had various problems. The bid which was awarded to India's Olive Telecommunications was stopped by the Public Procurement Administrative Review Board (PPARB) in 2014, prompting Olive to take the matter to court. The board also said that the MoEST officials had inflated the price by 1.4 billion Kenyan shillings. This led the project to take a different face, where there was change to digital tablets which led to establishment of computer laboratories in schools (Malakata, 2015).

In March 2015 the government through the MoEST announced that it would instead adopt an education model used in Brazil in order to establish computer laboratories in schools (Malakata, 2015). The government branded the lab project as Digital Literacy Programme or Digital Learning Programme (DLP) or simply Digi School. This project is spearheaded by the Ministry of ICT. Digi School carries various components of the Digital Literacy Programme including provision of devices for learners and teachers as well as establishment of local assembly for digital devices and related accessories. DLP is based on four critical pillars which are the development of digital content, supply of power to schools, preparing teachers technologically and accessibility of digital content on multiple platforms. According to Wainaina (2015), the Kenyan government availed a plan to buy 1.2 million tablets instead of the earlier laptops. The tablets were to cost Ksh 17 billion which is lower than the initial budget of Ksh 24 billion. The project was awarded Ksh 17.58 billion during the annual budget reading, read in June 2015, and 13.8 billion during annual budget reading, read in June 2016. It was also awarded 13.4 billion during annual budget read in March 2017.

The government further asked interested public institutions who have the capacity to create local assembly lines to apply for participation into the programme. The companies were to receive tax incentives for engaging in the project. Due to this, Moi, Kenyatta and Jomo Kenyatta Universities expressed interest and they were working in creating assembly lines. University of Nairobi was to act as the digital learning hub thus empowering digital research. Strathmore University through iLab Africa was to provide technical knowledge on cloud computing for the programme (Wainaina, 2015). The tenders were finally awarded to Jomo Kenyatta University of Agriculture and Technology and Moi universities in 2016 (Ndunda, 2016).

Trials for the Digital Literacy Programme were carried out in three selected schools in every county in May, 2016 (Ndunda, 2016). More than 12,000 digital devices for the programme were distributed to 150 primary schools. The devices were luminous green tablet for pupils, sky blue laptop for teachers, a sky blue laptop for special learners, a braille embosser for special learners, a projector, a digital content server and a wireless router. Around 66,000 teachers had been trained for the programme by the time of trial phase. Although the trial phase was completed, some schools were not prepared for implementing the programme (Igunza, 2016). Some schools lacked adequate ICT physical infrastructure, adequately trained ICT teachers, adequate security services, ICT technicians and coordinators among other requirements (Igunza, 2016). Before carrying out this study, the attitude of teachers, learners and society at large was not clear.

Therefore, this study's major objective was to find out if public primary schools in Kenya and specifically in Waitaluk division were ready for implementing the Digital Literacy Programme. The study was carried out in Waitaluk division found in Trans-Nzoia west sub -county in Kenya.

Statement of the Problem:

Since 2013, the government of Kenya has been undertaking to integrate Information Communication Technology (ICT) in primary schools through the Digital Literacy Programme. The Kenya Institute of Curriculum Development (KICD) developed digital instruction materials for class one and two in May 2016. In addition KICD has also developed an online orientation system to train and conduct orientation for teachers. This was to implement ICT integration in primary sector in line with Vision 2030.

In spite of these, the Digital Literacy Programme has not been fully implemented in public primary schools in Kenya. The problem of this study therefore was that most primary schools in Kenya were not having the basic requirements for implementing the Digital Literacy programme. Some of the schools were not having adequate ICT physical infrastructure in terms of uninterrupted power supply, well equipped computer rooms or laboratories, ICT technicians and coordinators among others. Others lacked adequately trained teaching staff to implement the Digital Literacy Programme. Some schools lacked adequate security services for safeguarding the ICT physical infrastructure. The attitude of the teachers, learners and the society at large towards implementation of the programme was not clear before this study was carried out. Because of the above problem, this research sought to investigate the extent of preparedness of primary schools in Waitaluk division towards implementation of the Digital Literacy Programme. The preparedness of primary schools was very important for full implementation of the Digital Literacy Programme to be realized within the division and perhaps across the whole country. This problem was to be urgently addressed, or else some schools will lag behind in implementation of the Digital Literacy Programme, and as a result, there may be a serious imbalance in standards of teaching and learning across the division and perhaps across the country.

Purpose of the Study:

This study was to find out the extent of preparedness of public primary schools within Waitaluk division, Trans-Nzoia west sub-county in implementing the Digital Literacy Programme. This investigation was important because implementation of the project required that a school be well prepared. With respect to Digital Literacy Programme, schools needed to have relevant infrastructure both physical and technical, adequate ICT compliant teachers, and adequate security for safeguarding physical infrastructure among other factors. This study was carried out with a view to bring to light the reality of what was on the ground in terms of the schools being prepared in the requirements above in order to recommend for appropriate strategies to be adopted by policy makers, educationists and learners to improve the situation in public primary schools.

Research Objectives:**General Objective:**

The main objective of this study was to find out if the public primary schools had relevant and adequate requirements necessary for implementing the Digital Literacy Programme in Waitaluk division, Trans-Nzoia west sub-county, Kenya.

Specific Objectives:

The specific objectives of the study were:

- I. To establish the availability of physical ICT infrastructure in terms of uninterrupted power supply, computer rooms, digitized content, ICT devices, and internet connectivity found in public primary schools in Waitaluk division, Trans-Nzoia west sub-county for implementing Digital Literacy Programme.
- II. To examine the technical ICT infrastructure (technicians and coordinators) available for implementation of the Digital Literacy Programme in public primary schools in Waitaluk division, Trans-Nzoia west sub-county.
- III. To establish the influence of ICT training on teachers in public primary schools in Waitaluk division, Trans-Nzoia west sub-county towards implementing the Digital Literacy Programme.
- IV. To investigate the availability of adequate security services in public primary schools in Waitaluk division, Trans-Nzoia west sub-county for safeguarding the physical ICT infrastructure.
- V. To determine the attitude of teachers and learners towards implementation of Digital Literacy Programme in Waitaluk division, Trans-Nzoia west sub-county.

Research Questions:

- I. What type of physical ICT infrastructure in terms of uninterrupted power supply, computer rooms, digitized content, ICT devices, and internet connectivity is available in public primary schools in Waitaluk division, Trans-Nzoia west sub-county for implementing Digital Literacy Programme?
- II. How many public primary schools in Waitaluk division, Trans-Nzoia west sub-county have ICT technicians and coordinators for implementing the Digital Literacy Programme?
- III. What influence does ICT training have on teachers in public primary schools in Waitaluk division, Trans-Nzoia sub-county towards implementation of the Digital Literacy programme?
- IV. Do public primary schools within Waitaluk division, Trans-Nzoia west sub county have adequate security services for safeguarding physical ICT infrastructure?
- V. What is the attitude of teachers and learners towards the implementation of the Digital Literacy Programme in Waitaluk division, Trans-Nzoia west sub county?

Assumptions of the Study:

One of the assumptions of the study was that all public primary schools in Waitaluk division, Trans- Nzoia west sub-county were prepared in some ways for implementing the Digital Literacy Programme. Secondly, all teachers in public primary schools in Waitaluk division, Trans-Nzoia west sub-county had adequate ICT skills for implementing the Digital Literacy Programme.

Significance of the study:

This study aimed at getting findings which was to be utilized by various stakeholders in primary education sector as discussed below. First, the government for the purpose of policy making through the ministry of planning and the ministry of education in making a policy plan for effective implementation of the Digital Literacy Programme. Secondly the KICD were to benefit in the development of future digital content to be used for implementation of the Digital Literacy Programme and for ICT integration curriculum development in basic education sector.

To add to these, authors and publishers of primary education books were to benefit immensely by knowing the areas which hinder use of digital content for all subjects. Also, National Examination Council was to benefit by using the findings in standardization of primary education examination. The donors were to benefit in knowing the teaching and learning resources they can donate to primary schools. Lastly other researchers on Digital Literacy Programme in Kenya and the rest of Africa may also benefit from the findings of this study.

Scope of the Study:

The study was to investigate the extent of schools' preparedness for the implementation of Digital Literacy Programme in public primary schools in Waitaluk division, Trans – Nzoia west sub- county. The respondents were drawn from primary school teachers and pupils of public primary schools in Waitaluk division, Trans –Nzoia west sub-county.

Limitations of the study:

First the sample size which was used for this study cannot be generalized to all primary schools in Kenya because Waitaluk division within Trans –Nzoia west sub county is just one of many divisions in Kenya. Secondly, the interior roads interfered with the accessibility to some schools especially after the heavy rains. Lastly some of the teachers and pupils were unable to give useful information due to inadequate information on the Digital Literacy Programme.

Conceptual Framework:

A conceptual framework is a representation of independent and dependent variables showing how they are related in a Study. The conceptual framework for this research was built around independent variables in education which contributed to a school being prepared for implementation of Digital Literacy Programme. These variables are discussed below.

First for any school to be prepared for ICT integration, it had to have access to ICT physical infrastructure which is the first step to having ICT technology available to a school (Hennessy et al, 2010). Physical infrastructure include computer

rooms or computer laboratories, digitized content, ICT devices, uninterrupted electricity power and internet connectivity. Secondly, primary schools were required to have teachers who are adequately trained with ICT skills for implementing the programme. This is because two of the most important supports for ICT integration into teaching and learning are effective Initial Teacher Education (ITE) and Continuing Professional Development (CPD) (Venezky, 2004). Both ITE and CPD have great impact on the beliefs and practice of teachers, and yet professional development time in particular is often not budgeted for (Venezky, 2004)..

Another independent variable was the technicians and coordinators who were to assist greatly in implementing the programme. Teacher and learner attitude was to determine the welcome to any change. According to Mumtaz (2000), teachers' beliefs about teaching and learning with ICT are central to its integration. To be successful in computer use and integration in learning, teachers needed to be engaged in conceptual change regarding their beliefs about the nature of learning, the role of the student, and their role as teacher (Niederhauser, Salem, & Fields, 1999). Lastly adequate security for safeguarding the physical infrastructure was also very important for any school to implement the Digital Literacy Programme.

The factors outlined above were to lead to preparedness of schools in implementing the Digital Literacy Programme which was the dependent variable. Implementation of this programme was to lead to various benefits including Computer Based Instruction, Collaborative Learning, Research among teachers and Learners and Development of problem solving skills as outlined by Hennessy, Harrison, & Wamakote (2010). These factors can be seen in Figure 1.

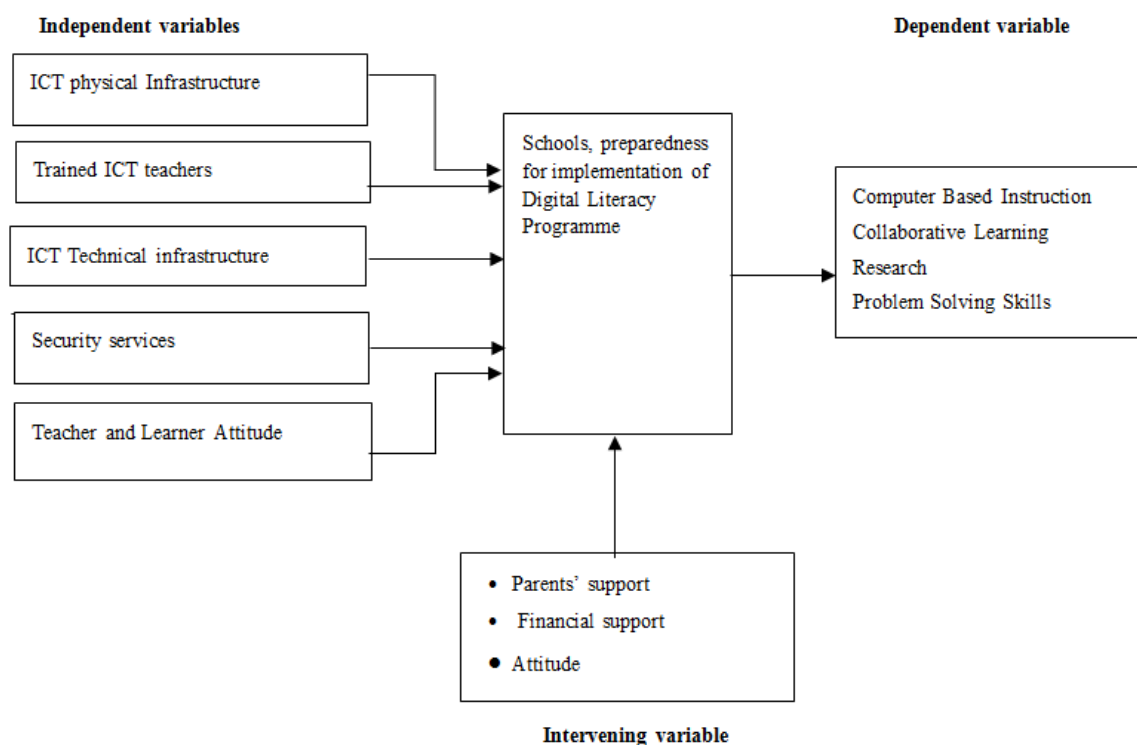


Figure 1: Conceptual framework showing interaction of variables

Operational Definition of Terms:

Digitized content: This is curriculum developed by the KICD to be installed on the laptops. This content is to be used to implement the Digital Literacy Programme.

ICT teachers: These are primary school teachers who have been adequately trained for the implementation of the Digital Literacy Programme.

ICT physical infrastructure: These include the computer hardware, computer software and the computer rooms (can either be a computer laboratory or a class room which has been renovated for the Digital Literacy Programme). Computer hardware are physical equipment while software are programs and data stored on the machines.

ICT Technical infrastructure: These are technicians who will support general functioning of the computer devices and coordinators who will assist in the implementation of the Digital Literacy Programme.

Security services: These are services which will ensure the ICT physical infrastructure for implementing the Digital Literacy Programme is well safeguarded.

Computer Based Instruction: This is learning in which students interact with a computer as a key element of the learning process. The teacher is always present in the classroom to organize and monitor learning activities of pupils.

Collaborative learning: This is a learning environment where by two or more learners carry out learning activities together. Learners capitalize on one another's resources and skills.

Cloud computing: It is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data rather than using a local server or a personal computer

2. LITERATURE REVIEW

Introduction:

In this chapter the literature on schools' for ICT integration in relation to Kenya's Digital Literacy Programme was reviewed. The literature included the following: ICT infrastructure, trained ICT teachers, security services, attitude of teachers and learners, parents' support and knowledge gap

Information Communication Technology Infrastructure:

ICT Physical infrastructure

Physical infrastructure of ICT is a fundamental condition for implementing changes to use ICT in education (Lim, Chai & Churchill, 2010). Setting up the infrastructure requires consideration of availability of physical infrastructure (e.g. rooms for servers, computer rooms, placing of cables and network points, electricity supply points), and general ICT hardware.

Lim, Chai & Churchill (2010) proposed a guide for teacher education institutions to set up infrastructure and hardware that is also applicable to primary schools. Their guide includes description of some key components of schools' ICT infrastructure and hardware including networks, Internet access, computer rooms, open access rooms, staff computers, computers for students, and digital media production facilities. For meaningful learning, ICT should not be considered only in terms of ease or efficiency when technology is advocated (Schacter & Fagnano, 1999). Both hardware and software need to be designed according to appropriate learning theories and pedagogical practices. Since different forms of ICT serve and augment different teaching and learning experiences, practitioners need to make informed judgments about which hardware or software is best suited to enhance student learning, achievement and the general ICT environment for the school.

ICT technical infrastructure:

These are human resources used to set up and maintain the ICT physical infrastructure and support every day running (Lim, Chai & Churchill, 2010). Given sufficient ICT physical infrastructure for both teachers and students, learners also need to have technical assistants and coordinators to maintain systems and ensure that the infrastructure remains compatible with developments in software (Divaharan & Lim, 2010). While technical assistants help to maintain ICT equipment and ensure everything works, ICT coordinators help to keep up-to-date with new innovations in the ICT field, decide the direction of ICT use for their schools, and organize in-school training for teachers. Through planning, allocating resources and budget, and giving technical and curriculum support, such coordinators lead the community of teachers in the integration of ICT-based teaching (Divaharan & Lim, 2010).

Digitized content:

The software installed on computers is very important for implementing educational ICT based programmes. Software needs to be chosen or developed after considering the instructional strategy involved. For example, CD-ROM and DVD-ROM are well-suited to individualized instruction, but not necessarily for other types of pedagogy. Classrooms which undergo the transition stage from being traditional to being ICT-facilitated may face many pedagogical problems, such as lack of appropriate example materials, insufficient in-class practice, overloaded curriculum content, and disordered

learning sequences (Hennessy et al, 2010). Well-developed software that is motivating, organized, and interactive can help structure ICT-facilitated learning activities, and also allow students to learn individually outside of class. Broadley (2015) suggested that schools consider their hardware needs before implementing any ICT-based learning activities among students or teachers. The reason is that even when schools have sufficient resources to purchase different software products for teaching, their hardware is not necessarily adequate. Hardware is not limited to the efficiency of computers. Many ICT-based teaching and learning materials can only be best used within an environment with sufficient and appropriate hardware, which involves physical spaces, computer devices, audio/video appliances, and other equipment for example, special sensor devices for scientific experiments.

When rapid changes are brought about by ICT integration in the whole curriculum, teachers need to be encouraged and supported (Divaharan & Lim, 2010). One potential problem in the process is that a proposed national ICT curriculum can become inconsistent with the one implemented at the school level. Vanderlinde & van Braak (2011) suggest that schools should pay attention to a few key issues to avoid this problem. These include planning of ICT curriculum across the school, the strategies to redirect education practices, access to courseware for ICT integration within the curriculum and opportunities for professional development of teachers and staff.

Integration of ICT in the classroom involves development of ICT-based assessment across the school curriculum. The practice of assessment and its effect on learning outcomes are influenced by the roles of ICT as defined by the school's ICT policy. That is whether ICT is considered as a set of skills, a vehicle for teaching and learning, or an agent for delivering other changes.

Effective use of ICT-based assessment may play a positive role in enhancing general practices of ICT integration. In this regard, both teachers' and students' experiences matter. A good way for implementing ICT can be based on the use of computer-based assessment tools under a specific assessment framework agreed and practiced by teachers. The reason is that if formal assessment is carried out via computer, teachers will need to incorporate some elements of similar tasks in their teaching to prepare students adequately; students may also be asked to practice these computer-based tasks (Hsu, 2011). Moreover, when students are stimulated to think about their learning process while using the assessment tool, ICT becomes learning-oriented and it is possible to examine students' action and thinking process. Therefore the ICT-based assessment tool becomes a support to student learning by directing them to useful resources, rephrasing important questions, and providing additional information and answers to their questions (Miller, 2009).

ICT-based self-assessment can also be used to help identify students' learning potential and their thinking strategies (Peltenburg, van den Heuvel-Panhuizen and Doig, 2009). Successful application of ICT-based assessment may facilitate students' positive attitude towards learning with ICT. According to Lugosi (2010), internet-based assessment used in group work contributes to students' positive attitudes towards ICT.

Learners prefer computerized assessment over traditional methods because it is more credible, objective, fair, interesting, fun, fast, and less stressful (Hsu, 2011). However, when ICT tools become more complex, the frequency of teacher and then student usage will decrease (Hsu, 2011). Therefore, the ease of use is crucial to a widely acceptable computer based assessment tool. A challenge in Kenya is that most of the above arguments are invisible in primary schools.

Trained Information and Communication Technology Teachers:

Use of computer technology for teaching has been hindered by lack of expertise. Most of the teachers at primary level were not adequately trained to use computers in their teaching profession. Due to this they use the other methods they acquired with which they are familiar and competent (Muingai, 2011). Training for Computer Based Instruction is also expensive in Kenya. There is limitation of lecturers at Kenya teachers training colleges who are qualified to train computer teachers. Teachers are inadequately trained in computer based teaching. Great emphasis is still placed on traditional didactic teacher training where verbalism and use of chalkboard and printed materials are mainly utilized. A lot or many teachers come off teacher training institutions with little competence in the use of computers and other ICT tools and facilities (Muingai, 2011). Computers use in primary schools indicates that some primary school teachers use computers primarily for administrative and preparatory tasks and not for instructional activities with students, causing computer use to be less frequent and effective than it could be in instruction (Becker, (2000); Cuban, (2001); NCES, (2000, 2005)). Lack of teacher preparation is cited as one of the factors that hinder computer use by primary school teachers (Broadley, 2015). The teacher preparation focusing on integrating technology into curriculum and instruction does, in fact,

matter significantly. These teachers will use technology for instruction more frequently and in more diverse ways than the majority of those who are unprepared. Teachers who feel better prepared to use technology are more likely to assign learners to use it than those teachers who feel unprepared. If technology integration into curriculum at the primary school level is desired, teachers must know how to integrate curriculum and technology. The National Educational Technology Standards; International Society for Technology in Education (2000, 2002) provides sound guidelines for teacher preparation.

For a successful integration of ICT into the primary school curriculum, it is essential to have knowledge of the existing software that is used by teachers. For primary schools to be prepared for the Digital Literacy Programme teachers have to be prepared for various tasks which include evaluating ICT tools, assessing ICT competencies of pupils, setting clear expectations, negotiating objectives with learners, preparing student for lessons by adopting various scaffolding strategies, and so on (Lim, 2007). Teaching with ICT in primary education requires teachers to act as if they were learners themselves in the computer-enhanced environment (Toit, 2015).

The Internet is one major aspect of ICT, but the Internet is fraught with misleading and inappropriate information that may harm young primary pupils. According to Anastasiades & Vitalaki (2011), teachers who are competent and professional in ICT tend to have high sensitivity and be effective in providing pedagogical guidance, promoting Internet safety, teaching students moral behaviors when navigating the Internet for educational, recreational, and interpersonal purposes. In addition, if teachers are concerned about management of websites and possible risks on the Internet, they will be better skilled in engaging students in meaningful online interaction and be more comfortable to use the Internet as a teaching tool. Therefore, teachers play the role of considering all the information available about the dangers related to Internet use, and what is effective training to protect students, and thus guide their students on the issue of Internet safety.

As primary pupils are limited in their capacity for self-directed learning, the value of ICT is to a large extent dependent on teachers' strategies. Hudson's (1997) Study, conducted in a relatively early stage of ICT implementation, found that teachers are important for fostering peer interaction among students in multimedia-based activities. Teachers play the cyclical role of observation, reflection, recording, discussion and feedback. Teachers not only monitor the interaction in group learning, but also use direct intervention (e.g., asking questions to stimulate discussion) to facilitate students' thinking, understanding, and then learning on the subject. Therefore, teachers play the role of directly or indirectly leading students through their learning activities, and intervening into students' learning activities where necessary so as to enhancing learning performance and achievement.

Teachers are also supposed to facilitate human interactions in ICT-enhanced learning activities. Postholm (2006) suggests that teachers act as advisers in the ICT classroom through dialogues with students. ICT can mediate interaction between teachers and students to facilitate learning, but in the end teachers are crucial to make such interaction happen through guidance (Uibu & Kikas, 2008). Human interaction cannot be replaced by ICT and teachers play a key role in supporting interactions between and among students, in any ICT-enhanced learning environment. They provide psychological supports to students. Hardy & Kirkwood (1994) propose a number of roles for teachers when using ICT in tertiary education, some of which are also applicable to primary education. First, develop the trust of students by affirming and supporting them to deal with their expressed doubts and insecurities when using ICT to learn. Secondly, enhance students' confidence by affirming students' ICT competence and valuing their acquired knowledge. Fourth, allow students to control their learning by letting them have significant control over the direction and pace on their own learning path. Fifthly, encourage reflection and sharing among students fortuning their critical thinking towards their own practices and justifying their perspectives. Lastly teachers are supposed to become an expert of Study materials in class. The introduction of ICT leads to a phenomenon that textbooks are less used in teaching than they used to be. Being less limited by such generalized teaching materials, teachers must deal with individualizing the learning process, taking each student's interests and abilities more into consideration (Uibu & Kikas, 2008). At the same time students rely more on teachers' instruction in the use of ICT. Teachers then become experts of Study materials and function as the "gateway" to information sources found using ICT. There will be a challenge for teachers because, without being able to refer to textbooks, teachers may be expected to present knowledge of subjects accurately and effectively. This role as experts (at least in students' eyes) takes extra time to fulfill because teachers need extra analytical and synthesizing abilities. The use of ICT in teaching and learning also leads to changes in the roles of teachers in non-ICT based teaching. According to (Hernnessy et al, 2010), the use of ICT may increase student autonomy in learning, and at the same time decrease teacher's control and authority. Therefore, teachers need to develop new strategies to monitor students' learning activities to make sure that learning objectives were met.

Security Services:

The fact that computers are still very expensive in Kenya, makes them a target for thieves who usually have ready markets to another party at a much less figure (Muingai, 2011). This will make many schools to incur extra expenses trying to burglar proof the computer rooms. Hiring of qualified security agents to safeguard ICT laboratories and digital content libraries was a great concern for most primary schools. Security of ICT physical infrastructure was one of the major factors to be put in place in all schools (Muingai, 2011).

The Attitude of Teachers and Pupils:

According to Wikipedia dictionary, attitude can be defined as an expression of favor or disfavor toward a person, place, thing, or event. There is still a strong perception especially by the older generation that computers require highly skilled personnel to operate them, while this may not be the case, some school administrators and parents also fear that their pupils will be exposed to adult sites and other undesired sites, through the use of the internet (Ertmer, 2005). Some also fear the infection of viruses to their computers leading to data loss, while this may be true to some extent, proper education on the safe use of computers and help alleviate some of these fears. This will have a negative attitude on learners. The teacher on the other hand may fear being rendered irrelevant by the introduction of computers in his/her class. The 'feel' that the teacher still remains an authority and a 'know it all' in class is something that most teachers cherish, and anything that makes them otherwise is deemed an enemy of the classroom. Teacher attitudes and beliefs play a major role in the amount of technology infusion in the classroom. Ertmer (2005) asserts that the decision to utilize the innovation basically lies in the fundamental beliefs teachers hold concerning technology and student achievement. If teachers do not see the relevance in the resource, they willingly chose not to implement its use. Lastly organization culture also influences the classroom teacher on how much and to what degree integration takes place. Teachers are unwilling to adopt a new technology when it is perceived to be incongruent with the total school philosophy (Hennessy, Ruthven, & Brindley, 2005). Teacher's perceptions is one of the barriers associated with technology use in the classroom including their confidence levels, types and levels of training received, and conjectures on the future of technology (Al-Bataineh, Anderson, Toledo & Wellinski (2008)). With standards and accountability come teacher stresses and pressures added to an already full set of daily responsibilities. Most teachers do not have enough time to implement technology.

Parents' support:

Any development in public schools is supported by parents or guardians of learners. If their attitude is positive they help in development of ICT physical infrastructure by donating devices finances (Malakata, 2016). If parents do not support the use of technology, they end up affecting the attitude of learners in the long run.

Knowledge Gap:

In their study, Hennessy, Ruthven, & Brindley (2005) revealed that teacher perceptions were barriers associated Earlier research on preparation for ICT integration in education did not cover all the areas that the Kenya's Digital Literacy Programme requires for a school to be prepared for its implementation. Lim Chai & Chiurchil (2010) gave out a guide line for teacher education institutions to set up infrastructure and hardware that is also applicable to primary schools. They did not consider the Kenya's Digital Literacy Programme and left out digitized content, devices and security services required to safeguard the ICT physical infrastructure for the programme. with technology use in the classroom but they left out learners' attitude in primary schools. Malakata (2016) revealed that parents help in putting up ICT physical infrastructure but left out their influence on the security of the infrastructure in the long run.

Another study by Anastasiades & Vitalaki (2011) shows that teachers who are competent and professional in ICT tend to have high sensitivity and be effective in providing pedagogical guidance, promoting Internet safety, teaching students moral behaviors when navigating the Internet for educational, recreational, and interpersonal purposes. However they did not consider primary school teachers in Kenya who have not yet implemented the Digital Literacy programme. Lastly Vanderlinde & van Braak (2011) looked at essential condition for ICT policy implementation in schools in general. They did not narrow down specifically to primary schools and especially the DLP in Kenya.

3. RESEARCH METHODOLOGY

Introduction

This chapter includes the methods which were used in carrying out this study, the description of the research design, area of study, target population, sample size and sampling techniques, study instruments, data collection procedures, data analysis and ethical considerations

Research Design:

The study was conducted using a descriptive survey research design. Gay (1981) defined descriptive research as a process of collecting data in order to answer questions concerning the current status of the subjects in the study. This study aimed at exploring the current preparedness of schools for implementation of the Digital Literacy Programme in primary schools in Waitaluk division, Trans-Nzoia west sub-county. The chosen research design was appropriate for the study because it described how primary schools were prepared for implementing the Digital Literacy Programme without affecting them in any way. Also the design was particularly suited for describing homogeneous populations like the primary schools' population in Waitaluk division. Lastly descriptive research design studies are conducted in communities to establish the extent of arrange of issues as outlined by Mugenda (2008). In this case the study established the requirements for public primary schools which were necessary for implementation of the Digital Literacy Programme.

Area of Study:

The research was carried out in Waitaluk division found in Trans - Nzoia west sub-county. This sub-county is found in Trans – Nzoia county within Kenya which is located between river Nzoia and Mount Elgon with its centre at Kitale town as it's capital and largest town of the county, 380 North West of Nairobi. The county borders Bungoma to the west, Uasin Gishu and Kakamega to the south, Elgeyo Marakwet to the east, West Pokot to the north and the republic of Uganda to the North west. Trans-Nzoia covers an area of 2495.5 square kilometers. Other sub counties in Trans-Nzoia are Endebess, Kwanza and Trans-Nzoia east.

The county's arable land makes agriculture the top economic activity, where maize farming is widely practiced, and mostly at a commercial level. Tea, coffee, horticulture and commercial businesses are also very significant to the county's economy. Dairy farming and tourism are also undertaken. A number of companies such as Kenya seed company, Western Seed Company, Kenya Cooperative Creameries and various government institutions provide employment to many people living in the urban centers. Historically the County was inhabited by the Kalenjin and Bukusu communities. After independence many of the farms which were vacated by white settlers were bought by individuals from various communities in Kenya. According to the 2009 census it has a total population of 818,757. Trans Nzoia has a cool and temperate climate with average annual temperatures ranging between a minimum of 10°C to a maximum of 27°C. The county receives annual precipitation ranging between 1000 and 1200mm, with the wettest months being experienced between April and October.

Waitaluk division has a total of 17 public primary schools with a total of 295 teachers who are employed by the Teachers Service Commission. The area was chosen because it has public schools found in the rural, semi- urban and urban areas from which a sample was drawn easily.

Target Population

The target population included teachers and learners drawn from public primary schools in Waitaluk division, Trans-Nzoia west sub-county. The schools were sampled through simple random sampling technique.

Sample Size and Sampling Techniques:

The researcher used multistage sampling procedure with both probabilistic and non probabilistic characteristics. First the researcher used purposive sampling to obtain Waitaluk division from the four divisions found in Trans-Nzoia west sub-county. Simple random sampling technique was used to sample out six public primary schools out of the available schools in Waitaluk division. The actual sample for teachers was obtained through simple random sampling. Its size was decided upon using Kothari's (2004) suggestion that if the universe is homogeneous, a small sample can serve the purpose.

The researcher therefore selected 100 teachers from the six public primary schools using simple random sampling. The teachers were selected by assigning a number to each of the teachers from the six schools selected. These numbers were placed in an empty bucket which was thoroughly shaken. After this, any number was picked at random and the teacher who's Teachers Service Commission Number correspond to the number picked was included in the sample. The sample size for learners was obtained through the use of purposive sampling to select each head boy and head girl from the six public primary schools making a total of twelve pupils. Hence the total number of respondents was 112.

Study Instruments:

Questionnaires:

A questionnaire is a data collection instrument that comprises of questions which a respondent is expected to answer. Questionnaires are commonly used to obtain important information about a large sample. Each item in the questionnaire is developed to address a specific objective and research question of the study (Mugenda & Mugenda, 2003). An effective questionnaire should be simple to understand, have clear instructions, with focused questions, have no leading questions and ensure a balance of questions per topic. The questionnaire for this Study contained both closed and open ended questions. The questions addressed each of the objectives of the study. In the first section of the teachers' questionnaire, information on teachers training in ICT was solicited. The researcher got information on the competence of the teachers in implementing the DLP. The teachers also gave suggestions of the gap existing in their ICT training for them to have required skills needed for implementing the DLP.

The second section solicited information on the attitude of learners, the society and teachers towards implementation of the DLP in public primary schools in Waitaluk division. Information to improve on their attitude was also obtained. The Likert scale was employed in soliciting data on attitude. The scale included not interested, interested and very interested. The third section assisted in gathering information on the availability and adequacy of ICT physical and technical infrastructure in public primary schools in Waitaluk division. The Likert scale was from very inadequate to very adequate. The last section helped the researcher collect information on source and adequacy of security services for safeguarding ICT physical infrastructure. The questionnaire for learners solicited information on sensitization of DLP in primary schools. Information on learners' attitude and parental support for implementation of DLP was also gathered. All the two questionnaires had questions from the ordinal scale with answers like yes or no, positive or negative.

In order to make questionnaires effective, there was need to conduct a pilot study using a representative sample of similar subjects. However these subjects did not participate in the actual study. Problems which came out during the pilot study were sorted out before the actual study was carried out. Advantages of using questionnaires during data collection as outlined by Kombo & Delno (2006) are that questionnaires can cover a wide area and also there is no bias between the researcher and the respondents. This study used self – administered questionnaires where the questionnaires were delivered to the respondents by the researcher. The respondents completed them and handed them back to the researcher after 3 days.

Observation checklists:

It is a tool that provides information about actual behavior (Delno & Kombo, 2006). It is an instrument that helps the researcher to put behavior in context and therefore understand it better. Variants of the observation technique are as outlined below. First there is participant observation where the researcher becomes an active member of the group being studied. He/she participates fully in the behavior being studied. Secondly there is none – participant observation where the researcher becomes an onlooker. He or She does not participate in the behavior under investigation. The researcher only records descriptive accounts of what is happening. The researcher used this method to obtain information on available ICT physical infrastructure in schools. The classes prepared for the DLP were observed and extent of implementation was ascertained. To assist in the process of observation, the researcher used an observation checklist as a guide to observe ICT physical infrastructure (Delno & Kombo, 2006).

Validity of Instruments:

To ensure validity of the questionnaires the researcher ensured all the objectives of this study were captured in the items in the research instruments. Both closed ended questions and open ended questions were used so as to obtain relevant information. Before administering the questionnaires to the respondents, the researcher gave the instruments to her supervisors and fellow students for critique. They suggested adjustments and corrections to be made. Data obtained from piloting was also used to make adjustment and improvement on the research instruments.

Reliability:

The reliability of the questionnaires was done by trying the sample of the population. This was done by administering the questionnaires twice to two schools selected for pilot study with a time lapse of one week between the first test and the second test. The reliability was then obtained by calculating a Pearson's Product Momentum Correlation Coefficient from the scores obtained in the two tests. The reliability of the correlation coefficient was obtained using a t-test which was 0.85 confidence level. This was in agreement with Mugenda & Mugenda, (2003) suggestion that the reliability of the correlation coefficient should be 0.7 and above.

Data Collection Procedures

Before going to the field, the researcher obtained a research permit from National Council for Science Technology and Innovation (NACOSTI) after applying for the same through Kisii University. The instruments of the Study helped to collect data or factual items. The method selected for collecting primary data for this research was survey method and the instruments which were used in collecting data included self-administered survey questionnaires for teachers and pupils and observation checklists.

Data Analysis:

After collecting data the researcher organized and cleaned the data. The data was then coded. After coding, the researcher employed descriptive statistics to analyze the data. The purpose of descriptive statistics is to enable the researcher to meaningfully describe a distribution of scores or measurements using a few statistics (Mugenda & Mugenda, 2003). In this research the researcher employed means, standard deviations, frequencies and percentages through the aid of SPSS version 16.0 statistical package. A summary of data analysis is as shown in Table 1.

Table 1: A summary of data analysis

Objective	Data Analysis Method
Availability of ICT physical infrastructure for implementing DLP.	Frequencies, percentages
Availability of ICT technical infrastructure for Implementing DLP	Frequencies, percentages
Influence of ICT training on teachers towards implementation of DLP.	Standard deviations, percentages
Attitude of learners and teachers towards implementation of DLP.	Means, frequencies , percentages
Availability of adequate security services	Frequencies, percentages

Source: *Researcher's own creation*

Ethical Considerations:

Ethics can be understood as Study of one's perception of what is right or wrong in a given context or situation. It is an attitude of how one reacts or relates to a happening or stands that one takes in a society. During the research, the researcher upheld the code of conduct and avoided utterances or questions which could compromise harmony and peace amongst the teachers and pupils.

Questions directed to teachers were not supposed to discourage them in working hard towards implementing the DLP. Also, questions directed to learners were simple and clear for them to give required information. Lastly the researcher used only data collected from the respondents for analysis purposes for this Study.

4. RESEARCH FINDINGS AND DISCUSSIONS**Introduction:****The objectives of this study were:**

- 1) To establish the availability of physical ICT infrastructure in terms of uninterrupted power supply, computer rooms, digitized content, ICT devices, and internet connectivity found in public primary schools in Waitaluk division, Trans-Nzoia west sub-county for implementing Digital Literacy Programme.
- 2) To examine the technical ICT infrastructure (technicians and coordinators) available for implementation of the Digital Literacy Programme in public primary schools in Waitaluk division, Trans-Nzoia west sub-county.

- 3) To establish the influence of ICT training on teachers in public primary schools in Waitaluk division, Trans-Nzoia west sub-county towards implementing the Digital Literacy Programme.
- 4) To investigate the availability of adequate security services in public primary schools in Waitaluk division, Trans-Nzoia west sub county for safeguarding the physical ICT infrastructure.
- 5) To determine the attitude of teachers and learners towards implementation of Digital Literacy Programme in Waitaluk division, Trans-Nzoia west sub-county.

Descriptive statistics were adopted for analyzing the data collected during the study. SPSS statistical package version 16.0 was employed in analyzing data. Before analysis codebooks for both pupils' and teachers' questionnaires were prepared. Planning matrices for the same were also prepared. The information was presented using means, frequencies and percentages. Standard deviation was computed to find out the variability of training of teachers towards implementation of the DLP. Pearson product –moment correlations were calculated in order to determine the relationship between the training and attitude of teachers towards implementation of the DLP, parental and teacher support, and learner and teacher attitude. No correlations were obtained because one of the variables' responses was constant. Data was organized in frequency tables for easier interpretation.

Security services:

Data from table 2 revealed that 56% of the schools receive security services from the community around the school while no school received security from a security company. 44% of the respondents said they did not receive security services from any source.

Table 2: Source of security services

Source	Frequency	Percentage
From the community	56	56.0
From a security company	0	0.0
None of the above	44	44.0
Total	100	100.0

Source: Researcher's own creation

However, of those who received security services from the community, 36% indicated that the security services were very inadequate while 36% responded that the security services were inadequate (table 3). Only 19% of the respondents showed that the security services received in their schools were adequate to safeguard the ICT physical infrastructure for DLP. For safety to be guaranteed, a lot was required to be done before the devices were to be distributed to these schools. This agrees with Muingai (2011), who stated that security was one of the factors to be considered in schools before ICT implementation.

Table 3: Adequacy of security services

Response	Frequency	Percentage
Very Inadequate	36	36.0
Inadequate	36	36.0
Unsure	9	9.0
Adequate	19	19.0
Total	100	100.0

Source: researcher's own creation

5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction:

This study focused on investigating into infrastructural and teacher preparedness towards implementation of the Digital Literacy Programme in public primary schools located in Waitaluk division in Trans-nzoia west sub-county. Data for the study was collected using questionnaires for teachers and pupils and observation check lists. The data from the field was analyzed using descriptive statistical methods like frequency tables, percentages, means and standard deviations by the help on SPSS version 16.0 statistical software. Data was presented in tables for easy and quick way of interpreting it.

The findings from the study were: first it was revealed that primary schools from Waitaluk division were not prepared in terms of having adequate infrastructure and teachers to implement Digital Literacy programme; secondly, although the findings indicated that the teachers and the learners were very much interested towards full implementation of the programme, lack of adequate teacher training in ICT and general inadequacy of infrastructure was a stumbling block to be addressed by all stakeholders; thirdly, the attitude of the teachers, learners and the society was positive towards implementation of the DLP in public primary schools found in Waitaluk division. Most schools lacked technical infrastructure services. Lastly, the security services were not adequate and if these services were not beefed up the same society could be burglars to the digital devices due to their market prices being high.

Conclusions:

Based on the findings of this study, it is concluded that most public primary schools in Waitaluk division are not prepared in terms of having adequate infrastructure, teachers who have adequate training in ICT and adequate security services for implementing the Digital Literacy Programme. These can be shown by the findings obtained from the frequency tables used for this study's data analysis.

Lastly, the security services for safe guarding the physical ICT infrastructure were not adequate in many schools. As noted by Muingai(2011), ICT devices are generally expensive. This makes burglars interested in getting them for their own benefit. The security officers who were employed in most of the schools were drawn from the immediate community and had not received adequate training from security companies. This makes the schools vulnerable to experienced thieves. Making matters worse, some schools did not have even one security officer. This meant that the head teacher had to perform many duties at the same time which was tedious. It was concluded that without security, the administrators cannot be comfortable with setting up a well equipped computer room in their schools.

Recommendations:

Provision of adequate training for security officers in primary schools:

Most of the schools do not have adequately trained security officers. Other schools do not have even the untrained security officers. For safeguarding of ICT physical infrastructure, schools require adequate security services. This can only be got from well trained security officers. It is important that each school have at least two adequately trained security officers who should be well paid. Those security officers should be taken for training in one of the recognized security firms so as to be competent in carrying out their work. It is better that the training of security officers for the Digital Literacy Programme be fully implemented because they will support the technological change.

Recommendation for further research:

It was not possible to cover all primary schools in Kenya, further studies could be carried out on a number of primary schools to ascertain whether the findings from this study are common in different schools. Other research might be the impact of DLP on learners' academic performance. Also a research could be conducted on impact of DLP on contemporary society.

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