School Administrators' Support for Teachers' Training and Maintenance of Digital Literacy Devices, in the Implementation of Digital Literacy Programme in Public Primary Schools in Kitui County-Kenya

School Administrators' Support for Teachers' Training and Maintenance of Digital Literacy Devices, in the Implementation of Digital Literacy Programme in Public Primary Schools in Kitui County-Kenya

1*Esther Wambua, 2Prof. Florence Kisirkoi, 3Prof Paul Maithya

1*Post Graduate Student; School of Education

1,2,3Maasai Mara University-Kenya

https://orcid.org/0009-0002-3685-0288

ABSTRACT

Purpose: This study sought to assess the school administrators' support to implementation of digital literacy program in public primary schools in Kitui County. The study sought to find out whether school administrators had facilitated teachers for digital literacy trainings and to examine whether school administrators had provided for maintenance of the digital literacy devices.

Methodology: Descriptive survey research design was used. The target population comprised of 3280 school administrators, who comprised of both head teachers and deputy head teachers and 328 classroom teachers making a total of 3608 respondents. A sample of 10% of the total population was taken making a sample size of 361 respondents, comprising of 328 school administrators and 33 classroom teachers. Self-administered questionnaires were used for data collection. A test- retest was carried out in four public primary schools to establish the reliability of the research instrument. Data collected were analyzed descriptively with help of Statistical Packages of Social Sciences (SPSS) version 28.

Findings: The findings revealed that a large number of teachers were supported by their school administrators to attend digital literacy training sessions. It was further noted that very few administrators always facilitated for repair of the broken parts of the computers 16(9.8%).

Unique Contribution to Theory, Policy and Practice: The findings of the study will guide the leadership in effective delivery of flagship programs like the digital literacy program through multi-agency approaches.

Keywords: *Digital literacy, Digital Literacy Pro*

Introduction

1.1 Background of the Study

Kenya's Vision 2030 program recognizes the value of Information Communication Technology (ICT) in its growth to its rapidly industrialized economy by the year 2030.One of the vision 2030 flagship projects for education and training was to establish a computer supply program that was to equip learners with modern IT skills and competencies for the 21st century. Implementation of the digital literacy into teaching and learning was very key in education system in Kenya. Digital literacy which simply refers to the ability to access, understand, manage, communicate, integrate, evaluate and create information appropriately and safely using digital technology was to be integrated in the education systems. With this in mind, the government of Kenya launched the Digital Literacy Program (DLP) for all its public primary schools. The DLP was borne of the government of Kenya's vision 2030 to make sure every pupil was prepared for today's digital world and to transform learning in Kenya into a 21st century education system. Fast development and variances in technology in the 21st century has ushered in remarkable changes in daily life as well as the education system. This has necessitated the need to teach students the skills they require in this century. Learning institutions have been challenged to restructure their curriculum so as to close the digital divide gap in teaching and learning. Education is one of the most important tools for poverty alleviation and economic growth in developing countries (UNDP 2005; UNESCO 2005). The use of Information and Communication Technologies (ICT) for dissemination of education is believed to have huge potential for governments struggling to meet a growing demand for education while facing an escalating shortage of teachers equipped with the required digital skills and competencies.

Implementation of ICT in public primary schools in Kenya is a modern occurrence. Nevertheless, it has been commonly recognized that application of technology in schools has advanced in a closely similar manner, ranging from developing policies, achieving elementary computer expertise, teaching from computer, exchanging information and enquiry, to application in each subject. The GOK acknowledges that if technology is integrated in public primary schools, then knowledge will be constructed, information will be shared and communicated across school communities. This opinion originates from claims in several studies on the significance of technology in schools (Manduku, Kosgey, & Sang, 2012). The GOK through sessional study no.1 of 2005 observed that technology has a straight forward part to play in schools and if put into proper use, it can advantage schools as well as communities. It also observed that technology will offer novel innovations for learning by enabling communities, and collaboration between teachers and learners.(GOK, 2005)Since then, the GOK developed a nationwide policy on technology in education in the year 2006 whose vision was "A prosperous ICT- driven Kenya society' and whose mission was "To improve the livelihood of Kenyans by ensuring the availability of efficient, accessible, reliable and affordable ICT services''(GOK, 2007).highlights in the policy were that

the GOK will inspire schools to integrate and apply technology so as to enhance the quality of learning.

The government of Kenya initiated a digital learning program in public primary schools known as the Digital Literacy Project (DLP) and provided funds for ICT infrastructure to be put in place which included building of computer labs, distributing fiber optic cables, training of teachers in digital learning and connecting remote areas to the grid and internet. The policy's mission was to be a" prosperous ICT based society of Kenya" with ICT being the core of national development (Kashorda & Waema,2014). This policy was intended to encourage the use of ICT technologies to promote the development and implementation of digital learning at all levels of education in Kenya, with the main objective of promoting digital literacy teaching and learning in public primary schools. (Fruth&Naecsu,2015).

According to Kenya's Vision 2030, if schools provided access to digital technologies, the quality of education would improve and high performance will be enhanced, (MOEST,2003). With the current implementation of the Competency Based Curriculum (CBC) which recognizes digital Literacy as a core competency, a comprehensive assessment of administration support implementation of Digital literacy program (DLP) is very key. However, most schools in the remote areas of Kenya and more so Kitui County did not have access to internet due to poor connectivity while others lacked internet access due to poor terrains. This caused a big digital divide and a curve in the digital literacy implementation process. This study therefore sought to assess school administrators' support for implementation of digital literacy program in public primary schools in Kitui County, Kenya.

1.2 Statement of the Problem

The Government of Kenya has used a lot of funds in purchasing and distributing digital literacy learning gadgets to public primary schools. If the devices were well utilized for the intended purpose, the desired results which include improved performance in the use of digital tools and technologies in schools would be realized. However, before these digital gadgets were purchased and delivered to schools, school administrators and teachers were supposed to have been taken for trainings for them to be equipped with the requisite skills and competencies to handle the digital literacy gadgets well in public primary schools. However, in Kitui County, the digital literacy program was rolled out in the schools before the administrators and teachers were trained. Then after the roll out, trainings started, and there has been strong feeling that it has not been done effectively. This gap occasioned this study to assess the school administrator's support for teachers' training and maintenance of digital literacy devices, in the implementation of digital literacy programme in public primary schools in Kitui county- Kenya.

1.3 Purpose of the Study

The purpose of this study was to assess the school administrators' support for teachers' training and maintenance of digital literacy devices, in the implementation of digital literacy programme in public primary schools in Kitui county- Kenya

1.4 Objectives of the Study

The study was guided by the following specific objectives

(i) To find out whether the school administrators had facilitated teachers to receive digital literacy training in public primary schools in Kitui County.
(ii) To examine whether the school administrators had facilitated for maintenance of digital literacy learning devices in public primary schools in Kitui County.

1.5 Research Questions

(i) In what ways do the school administrators facilitate teachers for digital literacy trainings in Kitui County?
(ii) In what ways do the school administrators ensure maintenance of the Digital Literacy Learning Devices in Kitui County?

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter presents the reviewed literature conducted on school administrator's support for implementation of digital literacy program in public primary schools. Popularity of digital learning was attributed to the benefits it offers to the school administrators, teachers and learners in schools. According to Sun and Baris (2011), constant access to the digital knowledge relevant any time promotes improved digital literacy learning. Sun Tsai, Funger & Chena (2008) argued that the use of digital technologies in learning, reduced learning time, gives consistency in service delivery and produces expert knowledge for administrators on the same point.

2.2 Theoretical Framework

The study was guided by the connectivism theory advanced by George Siemens (2004). The theory was termed as a learning theory for the digital Age. Connectivism is a theoretical framework for understanding learning in the digital age. The theory emphasizes how digital internet technologies such as web browsers, search engines, online discussions and meeting, virtual learning and social networks contributed to new avenues of learning. Siemens (2004) emphasized the idea that knowledge is a series of interrelated webs from not only social interactions, but experiences, digital observation (commercial, websites), or even organizations' the end, the interconnectedness of all of the knowledge leads to learning.

www.carijournals.org

The increasing use of technology as an educational tool has changed the learning landscape. With it came gaps in traditional ideas of teaching and the need for new methods to keep up. The theory of connectivism seeks to be the modern-day solution to those gaps. The connectivism theory gives teachers additional strategies to create a learning environment that sets students for digital success since it is a digital age connecting theory. In a connectivism view point, the new learning responsibilities shift from the teacher to the learner. Unlike traditional teaching methods and other theories like constructivism or cognitivism, the educator' job is to guide students to become effective agents for their own learning and personal development. Connectivism on the other hand relies heavily on technology, so the first step to creating a connectivism classroom is to introduce more opportunities for digital learning such as online courses, webinars, social networks and blogs.

Stravredes (2011) asserted that in connectivism, knowledge was distributed across networks where connections through online meetings and online courses were evident. School administrators did online meetings with their staff, boards of management and this made the framework very relevant to the study. Heavily grounded on technology, connectivism is a digital learning theory based on the acquisition of acknowledge focused on the future and not the past Siemens (2012). This theory was relevant to the study because it was a learning theory of the digital age which emphasized on how digital and internet technologies contributed to new avenues for the digital literacy programs. Through connectivism, students and teachers are empowered as the theory shifts the responsibilities from the teachers to the learners thus making learning more enjoyable as it is learner centered. Connectivism supports individual perspectives and diversity of opinions, theoretically providing for no hierarchy in the value of knowledge.

2.3 School Administrator's Support for Teachers' Trainings in Implementation of

Digital Literacy

Studies conducted on administrative support to digital literacy trainings is significant to its implementation in schools (Kincaid& Filder, 2002). Research indicated that school administrators should play a critical role in the successful integration of technology in their schools. (Ziegler, 2006). Literature suggests that one of the major challenges is infusion of technology into curriculum. Administrators who are able to implement technology in their schools must see themselves as technology leaders (Demoski, 2012).

In order to train a professional specialist in digital technologies, it is necessary to form, support and develop teacher' digital skills in education. The development of digital skills and competencies depends on the skills and experiences of technology usage acquired through digital trainings (Eynon and Geniets,2016). A person with digital skills knows how to use digital tools to search, process, analyse information, solve work tasks, communicate and perform other functions including classroom teaching as well as administrative purposes using digital tools. However, there is a limited understanding of methods and approaches to the formation of using these digital skills,

especially taking into account the dynamics of new digital technologies development (Matza and Sadowski 2012).

School administrators should take a lead in ensuring that they support their staff to attend digital trainings, for them to be equipped with the relevant digital skills and competencies. Teachers who attend digital trainings develop skills that exceed their academic expectations and enable pedagogical successes in their classrooms (Buckworth,2017). Teachers must transform educational paradigms to respond to the real learning needs of today's students and develop teaching skills that enable them to develop their students' competencies (Rusznyak,2008).

Education is an area where technology can enhance the overall experience for teachers and students, and society is embracing this idea (Flemmer,2007).In fact, one of the most powerful factors in increasing the use of technology in teaching, learning and learner achievement is societal pressure on administrators to use technology as an implementation tool(O'Dwyer, Russel & Bebell,2004).Because they have very little experience with new technology, however, very few school administrators claim to be technology experts, yet in the 21st century technology is in every field of education, and teachers need to be supported to be digital literate.(Gosmire&Grady,2007).Dias (2001) believes that it is important for school administrators to understand what constitutes best practices in technology integration, and the need to support it. While school administrators may be willing to implement digital literacy, they need more custom professional development to help them to effectively implement the digital literacy programs in their schools (Papaioannou&Charalambous,2011).

As the instructional leaders of the institution, school administrators who do not understand how to use digital technologies cannot properly evaluate the use of it by teachers for digital literacy learning and students for improved performance. As technology evolves, school administrator's skills, attitudes and digital competencies must change to remain current (Jerald,2009)A consortium that consisted of educators and business leaders created asset of standards to help administrators and all educators across the country implement technology effectively (ISTE/NETS,2009).These technology standards for the 21st century were referred to as National Education Technology Standards for Administrators(NETS-A)and International Society for Technology in Education ISTE,2006) These standards for school administrators included the following components to ensure proper implementation: effective planning, consistent support and a clear vision. The standards pertaining to planning ensures proper implementation by preparing the school members to utilize technology effectively. The support standard indicates the administrators support to teachers as they effectively implement the digital literacy curriculum. This included supporting teachers financially and morally to attend digital literacy trainings in order for them to be digitally equipped with their relevant skills and competencies. The vision standard is promoted by the school administrators and involves all stakeholders to achieve the goal of technology implementation in schools.

Technology and use of digital tools in teaching and learning can be affected by teachers, beliefs, confidence in using the digital technologies and their competence. How teachers are trained and even their professional development must be different for there to be a positive impact on student learning. Many teachers will lack proficiency in technology if not well trained (Thijiset al.,2014). Teachers should invest significantly in learning in order to shift gear from the traditional role of merely passing knowledge to providing learners with the relevant guidance on how to apply the information. To effectively use technology in instruction, professional development and training of teachers is paramount. Trained manpower is crucial for successful implementation of any technology (Tilya, 2007) Hennessey et al., (2010) found out that teachers were unreceptive towards application of e-learning mainly because of lack of relevant skills. Henderson (2003) agreed that resistance to change is as a result of the perception by teachers that e-learning materials were not secure hence lack of confidence in them. Kptalam (2010) did not agree teachers were incompetent. He noted that teachers and students were IT literate. An overloaded curriculum leading to lack of time was the major factor, according to Kozma, McGhee &Zalles (2004), as opposed to teacher competence.

Educator familiarity with teachers is also key when it comes to putting in place effective learning initiatives because some teachers lack familiarity with digital technologies while others may have received extensive training in the same. Therefore, the success of any digital learning initiative can be increased by training and providing help that teachers need (Greaves, Hayes, Wilson, & Peterson, 2010) According to UNESCO (2014), it is easy to integrate technology in all levels of education when a champion exists. If adequately trained and supported, digital learning initiatives can be championed by the school administrators. Schools that integrate technology into teaching ensure that school heads are trained in the best practices and that there is teacher buy-in (Greaves et al., 2010). When the school administrators are trained, they come up with or adopt strategies that require all teachers to use digital technologies when at work. They also create time for all the teachers to learn and incorporate technology in teaching (UNESCO,2004; Greaves et al.,2010). Teachers should be explained to how digital technologies can help them meet their curricular goals while at the same time providing specialized and pedagogical training practices that are best and related to any digital learning initiative on a continuous basis. Professional development is more useful when teachers are trained continuously throughout a teacher's career (UNESCO,2004).

2.4 Maintenance of Digital Literacy Learning Devices

The digitalization of maintenance allows shifting from breakdown and reactive maintenance to predictive and proactive maintenance policies, entailing financial, technical and social benefits (Mosyurch et al., 2017: Meqdadiet al 2020). According to Silvestri et al., (2020), big data can be lost when digital tools breakdown. There is therefore need to predict in advance the lifestyle of the machine, while augmented reality can guide failure diagnosis and inspection. Mourtizis and Vlachou (2018), suggested that Internet-of-Things and cloud computing enable efficient control

and monitoring of operating digital tools, reducing wastes and breakages and supporting more maintenance options. Several terms have been used to designate the digitalization of maintenance (Al-Njjir et al.,2018;Klathae and Ruangchoengchum,2019),Smart Maintenance (Rakyta et al.,2016;Cusano and Napoletano,2017;Boktrantz et al.,2020) and E-maintenance,(Lung et al,2009; Aboelmaged,2015).Although they may relate to similar aspects of digital maintenance, their concepts slightly differ, which can sow confusion among scholars and practitioners (Shaffer et al.,2016).To curb this issue, Bokrantz et al., carried out an empirical and theoretical analysis to conceptualize the term smart maintenance, which refers to managing maintenance in manufacturing environments supported by information and communication technologies. Another very important implication from the maintenance digital technologies concerns the policies and roles that may emerge to cope with the technological advances and innovative maintenance practices. (Silvestri et al., 2020).

Rapid advances in technology, data and analytics have helped maintenance services to evolve from mere reactive process to a fully digital solution. Digital maintenance services exhibit a variety of functionalities to every adopting institution, with monitoring, diagnosing, trouble shooting, predicting and optimizing being the common influencer. The presence of digital maintenance is slowly growing in the asset-intensive industries; however, the early adopters have been benefiting the most. The number or digital devices in operation in this world is enormously countless, as every learner is supposed to have a learning digital device to match the 21st century digital era. With the growing number of digital technologies, one key area of evolution is maintaining the digital devices. Maintenance of the digital technologies must have been around since the inception of the first digital machines. However, it has evolved tremendously over the past six decades (Gulati, 2012; Jain, Bhatt & Singh, 2014).

Maintenance helps in retaining values of tools, achieving desired operating condition. Maintenance helps in retaining values of tools, achieving desired performances, influencing production quality and quantity, ensuring reliability and safety, reducing production costs, improving learner's satisfaction and many more (Starr et al.,2010; Al-Turki et al.,2014; Jain et al.,2014; Roy et al.,2016; Chen, Zhang&Di,2018; Chon et al.,2019). Every digital tool has a different operational lifetime and thus requires different level of continuous maintenance services. Roy et al., (2016) mentioned that digital tools with longer length of life requires a higher level of continuous maintenance and vice versa. The variabilities enforced the evolution of maintenance services through years and generations. Many kinds of maintained services were brought up and studied in the past, indicating continuous and consistent progress in the development and evolution of maintenance services. (Roy et al., 2016).

Maintenance services have transformed from mere asset repair and fixing actions to strategic, economic and management functions contributing to overall business performance (Ali Marttila 2013). maintained function has a role to ensure on promoting sustainability, reducing negative

impacts and integrating sustainability aspects to guarantee a set of performance, availability and quality with limited resources and energy consumption. (Lambiese & Miranda 2017). Installed technology needs ongoing maintenance and support or it will not remain functional for long. As technology has embedded in the school setting, schools had to come up with systems to support it, and have had to create support roles and find people to fill them. In the early stages of digital literacy implementation in schools, the need for maintenance was often unanticipated. Volunteers were pressed into service, or teachers with an interest in digital technologies were assigned support roles in addition to their other obligations and teaching roles. Such systems and roles were very difficult to sustain. It is a hallmark of the institutionalization of technology that more formal systems for maintenance and support have been established. Current trends in maintenance of digital devices includes the establishment of more formal support structures such as sources of digital technical help and outsourcing to non-school persons or entities, either on a volunteer or more formal contract basis. It is worthy emphasizing that in the latter situation as with any other situation in which work products depend on persons not under the control of the organization, proper documentation is an essential requirement and should be made explicit of the outsourcing contract agreement.

Maintenance means those preventive, diagnostic, updating, replacement and repair procedures that a school has in place for digital tools. Maintenance can be provided either by persons who are part of the school system or through outsourced experts and technicians It includes documenting trends and patterns in the use of applications or equipment. Specific maintenance items include: periodic replacement of parts and renewable of consumable supplies, repair or replacement of faulty components, periodic inspection and repair of equipment, updating or upgrading hardware and software, including installing new operating system versions, adding or deleting users from a system, or modifying user rights and properties, periodic backup of stored files on a school network, monitoring the condition and function ability of networks and equipment, including testing web site accesses and links; and installing and removing equipment and appliances.

Installed technology needs ongoing maintenance, or it will not remain functional for long. As technology has become embedded in the school setting, schools have had to come up with systems to support digital tools maintenance and facilitate for them. (NCES, 2013). Maintenance referred to all the activities carried out on a digital device in terms of proper installation, good servicing, routine checks, repairs and replacement of facility parts in order for the device to operate at its maximum outputs. Maintenance, in general, refers to maintaining any product to a reliable state and operable to its full productive capacity by repairing any occurring faults, controlling and stabilizing the environment that the product operates in, and eliminating any possible safety hazards or risks (Ali-Marttila,2013; Gulati 2012; pintelon&Parodi-herz,2008). Maintenance services keeps the digital devices operating at its highest potential throughout its lifetime. According to BS EN 133062017), Digital maintenance service is a combination of product

lifecycle actions such as technical, administrative, managerial together with intending to restore the product in a state to perform any required function as desired. Different maintenance differs for different digital devices depending on their technical, administrative, or managerial actions. Every digital Device has a different operational lifetime and thus requires a different level of continuous maintenance service. Digital maintenance now holds the capability to make use of data advanced analytics to predict, prevent, diagnose and fix equipment failures, and be a sustainable and strategic element to accomplish several business objectives including profit-making (Karki&Porras,2021).

Digital maintenance incorporates traditional maintenance functionalities with newer digital tools and methods to best serve the maintenance purpose. Major functionalities of digital maintenance can be categorized into a few brands such as monitoring, predicting, diagnosing, troubleshooting, optimizing, reporting, commissioning and modernizing (Karki&Porras,2021). School administrators can ensure that the digital devices are maintained well through preventive maintenance which is the practice or engagement whereby a piece of the digital tool is regularly checked and cleaned according to the manufacturer's specifications or effective performance. This maintenance method is normally carried out at a specified time of the year and in case the digital device and working system is shutdown. Another maintenance method is the corrective method which is applied on digital devices that has failed and thus broken down due to either improper operations, a defective part or mishandling. School administrators should ensure that they engage qualified personnel who have a good understanding of the faulty system of the digital device.

Financial resources are cited in many studies as a barrier to effective implementation and maintenance of ICT tools to support teaching and learning. Fredickson (2009) and Goldwin (2011) concluded that as far as sustainability is concerned, the budgetary consequences of introducing digital technologies in schools, the maintenance of the existing digital infrastructure, and upgrading both software and hardware have to be highly absorbed.

Maintenance of digital electronic devices is necessary so as to keep electrical appliances under good working condition to avoid operational downtime. Electronic components sometimes do not wear, but in most cases, discrete analogue component parameters tend to change overtime which can cause problems in electronic device that incorporate such sensitive components or designs in a digital device, for instance, Integrated Circuits (ICs) can undergo electronic-migrations that can cause high current densities in thin-film conductors which can result to failure of the device. In addition, resistors and capacitors can suddenly fail to operate as expected due to external factors such as temperature, pressure and other environmental factors or effects in form of corrosion and vibration. Electrostatic Discharge (ESD), lightning and excessive heat can also cause failure that may require immediate attention of effective maintenance of the electronic circuit of the device. Electronic devices should be kept safe and Emissions of Electromagnetic Interference (EMI) must be limited as well as the system's susceptibility to it. Digital cables also need to be carefully

supported and strapped down to avoid wear connector failure is often a very common cause of electronic system failure and attention should be paid to their placement and repair. Electronic troubleshooting and repair are another aspect of digital maintenance. It is a special category of problem-solving process in which attempts are made to identify faults in dysfunctional systems or components and fixing or replacing them.

In a school setting, literacy devices need simple cleaning for the help in maintaining the status of the digital devices. According to Enterprise Digital Signage (2005), simple cleaning routine of tools includes washing, wiping, dusting, removing stubborn stains and spots, and use of compressed air to remove loose dirt and dust. Digital software also requires periodic software maintenance and repairs, so as to serve longer. Hardware maintenance and repair is also very critical. In selecting the right digital hardware, to maintain, it's important to note that some devices come with hardware trade-in programs that allow easy upgrading when they become outdated or out of order. The school administrator should facilitate for the maintenance and ensure that the digital content is regularly updated (Digital Signage Solution).

In the midst of digital revolution, it's no surprise to see schools taking advantage of technology's offerings. With developments like digital literacy learning and online courses becoming more common, it seems digital learning is the way to go. It is very critical then to keep physical storage safe, especially the electronic items. At the very most basic level, having storage cabinets in classrooms, gives students a space to store their items such as bags, books and any other personal electronic equipment. Of course, proper storage is also needed to hold student's work in the classroom overnight as it is still physical. Physical storage also keeps the school electronic devices safer and ensures that they don't go missing.

Technology has not yet fully established itself well in the school setting as it has in many business sectors. When the network goes down in a school or a coverage area, the school administrators, teachers and students just wait until it comes back. Any information may be lost and not restored back. School administrators should liaise with the ICT experts for installation of back up programmes in the digital gadgets to avoid loss of vital information meant for digital learning. In the instructional setting, preparing for an outage may mean that teacher's file print outs as back up materials. This can be very expensive; lost instructional time has not been valued in the same way. Yet as schools rely more and more on the use of technology (both administratively and instructionally), the loss of time and information is increasingly understood to be very expensive and disruptive to the learning process. Maintenance and backup systems are therefore beginning to be recognized as important throughout the school setting (https://nces.ed.gov>techschools).

The school administrators were expected to liaise with the ministry of education, parents and other stake holders for provision of funds to put up strong maintenance workforce for the digital literacy tools. The maintenance team should have had adequate repair materials, adequate power and power strips to charge the digital tools. The school administrators should have ensured that the room

where the cabinet was located was completely sealed and constructed preferably using concrete to avoid breakage and stealing of the Digital Tools. The cabinets should be maintained well to avoid the digital tools from any form of damage. (DLP Management guidelines, September 2016, version 2)

2.5 Definition of Terms

School Administrator-   Refers to a person who is in charge of the school. He/she is

bestowed with duties and responsibilities involving: - teaching,

Helping, organizing and supervising the function of the

institution.

Administrators Support-   This is the support given by administrators to their staff either

Administrators moral or financial.

Digital Curriculum-   Refers to any form of information that is stored digitally and

Can be used through multiple choices including subscriptions,

Free online services and other digital devices which may

Include texts, graphics, videos, internet, Google meetings,

Video conferencing, cloud computing, digital application

and other technologies meant for digital learning.

E-learning-   Refers to any teaching and learning that is facilitated under

Computer mediated environment.

Instructional Media-   Refers to the approaches and tools used in teaching and

learning process.

Information Communication Technology- Refers to digital equipment that are used to

support digital learning and use of technologies.

Digital Literacy-   Refers to the ability of having the current skills and

competencies to handle and use technological devices. It

involves the ability to locate, organize, understand, evaluate,

and create information using digital technology.

Competency-   This refers to the ability one has to do something perfectly or

successfully.

Competency Based Curriculum (CBC) - This refers to a learner centered and adaptive

Curriculum that puts more emphasis on what learners are

Expected to do rather than focusing on what they know.

Digital Tools-   Refers to the tools that assist teaching and learning processes.

They are in other words online programs, applications or

technologies that help in digital literacy learning.

Support -   Refers to giving assistance to someone either morally,

spiritually or financially, for him /her to achieve a given

objective.

Digital learning resources - Refers to images, audio and video materials used for digital

Literacy teaching/learning.

Digital Technologies -   Electronic devices that process and store binary bits such

as personal computers, calculators, cellular phones and I-pads

Professional Development- Refers to a coordinated set of planned activities that are based

on research, are standard-based and are continuous.

Digital Literacy Program (DLP): A project set up by the government of Kenya with an aim

to integrate ICT into the teaching and learning processes and

management of education in primary schools.

ICT integration: This refers to the incorporation of technology in teaching and

learning   to support learners in the teaching and learning tasks

in public primary schools.

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents research methods applied in carrying out the research study. The study is organized under the following sections: Research design, target population, sampling procedures and sample size, research instruments, validity and reliability of the research instrument, data collection procedures and data analysis.

3.2 Research Design

The study employed a descriptive survey research design which allowed description of the subjects without influencing them in anyway. Descriptive survey research design also called observational research was used for collecting data about people's attitudes and habits on educational or social issues thus made it very relevant to the study (shuttle worth, 2008).

The research employed the descriptive research approaches because the researcher's main objectives was to asses school administrator's support digital literacy in terms of digital training maintenance of digital tools, digital content, storage of digital, beliefs altitude and power connectivity for implementation of digital literacy programs in public primary schools in Kitui County, Kenya.The main respondents were the school administrators who were the headteachers in public primary schools. The school administrators were directly involved in the study since they were the ones targeted by the researcher. The deputy headteachers were taken as key informants. The two groups of respondents were used by the researcher for information about support offered to the teachers for implementation of digital literacy programs in public primary schools in Kitui County Kenya.

3.3 Target Population

Target population in this study comprised 1,640 public primary school head teachers who were the school administrators and their 1,640 deputy head teachers who are also teachers, and 328 classroom teachers. The research used the school administrators as the main respondents and the classroom teachers as the key informants.

The school administrators were targeted because they were the key decision makers and the deputy headteachers who were the key implementers of the digital literacy program. The target population of this study was 3280 respondents which comprised of 1640 administrators and 1640 deputy head teachers.

3.4 Sampling Procedure and Sample Size

From the target population of 3,280 respondents which comprised of 1640 school administrators and 1640 deputy headteachers, the researcher sampled 10% of the 1640 school administrators and 10% of the 1640 deputy headteachers. This gave a sample size of 328 respondents which was considered as being adequate for the study. The researcher used simple random sampling technique to sample 164 schools from the target population (10% of the total number of schools which is 1640). Simple random sampling technique was used to select the schools, because it gave each school an opportunity to be selected in the study. From each of the 164 schools, the administrators also known as the headteachers and the deputy head teachers who were teachers were sampled. This gave a total of 328 respondents, which comprised of 164 school administrators and 164 deputy headteachers respectfully.

3.5 Research Instruments

The research instrument for data collection in this study was questionnaires. Self-administered questionnaires were used in collecting data from the school administrators who were the main respondents. Mugenda (2003) argued that a self-administered questionnaire is one in which respondents complete the questionnaires themselves. Questionnaires were used because they were effective means of measuring behaviors, attitude, preferences and opinions of the respondents.

The researcher developed a questionnaire for both school administrators and classroom teachers. The questionnaires yielded both qualitative and quantitative data. A self-administered questionnaire was used to collect qualitative data from the headteachers as well as the deputy head teachers on administrators support to digital literacy programs in Kitui County- Kenya.

3.6 Validity of Research Instrument

Bryman (2007) defined validity as the degree to which a test measures or what it supports to measure. The three steps in establishing construct validity were applied as recommended by Bryman (2007). First the researcher identified variables from the research questions that had strong relationship with the assessed test. Second, the researcher established through pilot testing method the degree to which variables conveyed and finally the researcher interpreted the evidence about the validity of the particular variable of interest. Pilot testing of the questionnaires was conducted against prospective sample population. The researcher gave out sample questionnaires to the school administrators and classroom teachers and gave them a duration of two weeks to fill them. The researcher then collected them. The researcher gave out the research instrument and collected them again. The researcher then interpreted the validity of the research instrument.

3.7 Reliability of the Research Instrument

Ngechu (2004) asserted that reliability is the ability of a research instrument to yield consistent results or data after repeated trials. To establish the reliability of the research instrument, a pilot testing was carried out in four public primary schools in Kitui County. Cronbach's alpha was used to measure the internal consistency of participants. A threshold of 0.7 was accepted since it measured the consistency of participant's responses to one set of items. Any research item falling below 0.7 was eliminated to improve the reliability of the research instrument.

3.8 Data Analysis

Data collection was done with the use of self-administered questionnaires. The raw data was collected and coded. Data was analyzed using descriptive analysis methods which was presented in measures of frequencies, central tendencies and contingency tables. Measures of central tendencies were measured with the use of three averages, means, medians and modes. Measures of dispersion included ranges or standard deviations, while measures of position included

percentages. The data was analyzed with the help of statistical package of social sciences (SPSS) Version 28.

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This section presents data analysis, presentation and interpretation. The purpose of this study was to assess the school administrator's support for implementation of Digital Literacy Program in Public Primary Schools. In this chapter, the study presents the findings of the study and their discussions. This section also presents the general information of the respondents and analysis of the independent, dependent, and moderating variables.

4.2 Demographic Information

Figure 1 below on the gender distribution of the respondents 86 out of 164 were female which was86 (56.36%) while male respondents were 78 (43.64%).
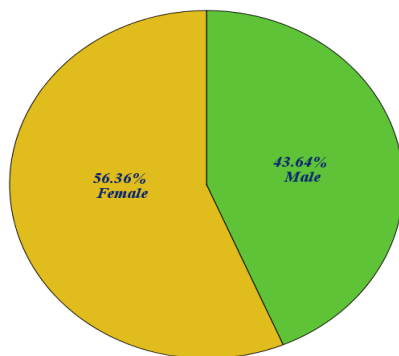

Figure 1. Demographic data in relation to gender

This showed that female teachers were more as compared to their male counterparts. This met the threshold of the current constitution of Kenya 2010 which stipulated that not more than two thirds of any public institution should be drawn from one gender. It also implied that regardless of the gender the respondents were able to give reliable information.

4.3 Demographic Data of the Respondents.

According to Figure 2 below, the respondents from the 20-29 years' age bracket were 3(1.82%) of the total respondents. This showed that, of the total respondents this age bracket got the lowest number of respondents, as shown in figure 2 below.
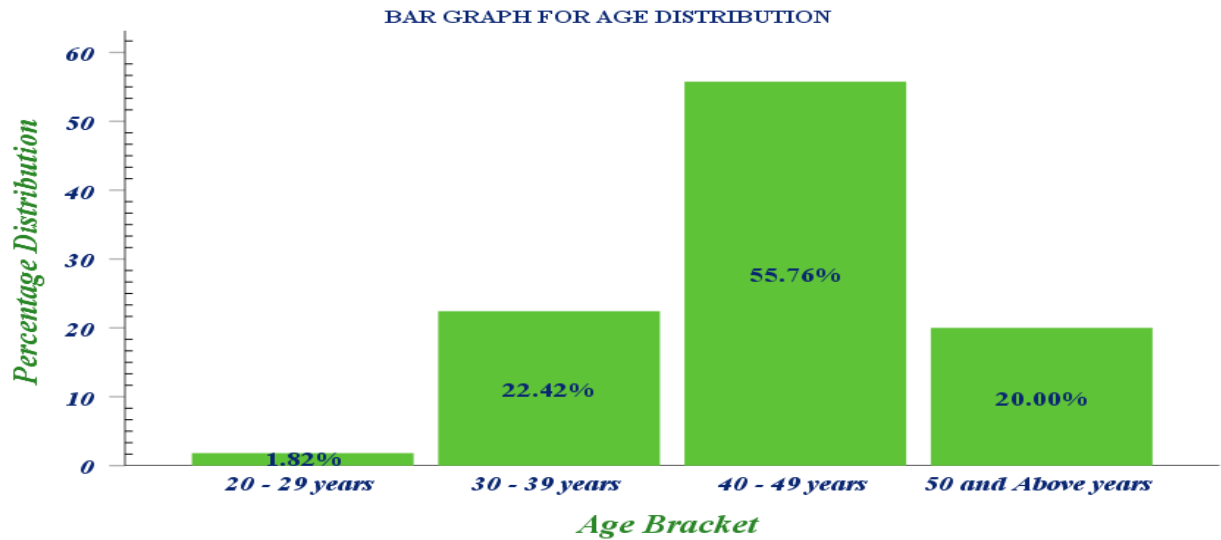
www.carijournals.org

Figure 2 Age Bracket

Those respondents from the age bracket of 30-39 years were 37 (22.42%) followed by those from the age bracket of 40-49 years which had 91 respondents the highest percentage of 91 (55.76%) of the total respondents. Lastly were those respondents from the age bracket of 50 years and above which had 33 (20.00%). This showed that most respondents were those in the age bracket of 40-49 years, hence most of them were interested in digital literacy content. This implied that the young respondents in terms of age were more interested in digital literacy compared to those in the age bracket of 50 years.

4.4 Level of Education

The results in figure 3 indicated that the school administrators who had bachelor's degrees were the majority with106 (64.74%) followed by those who had diplomas at 34 (20.61%) then those with master's degrees at 21 (12.73%), and those with Doctoral degrees were the least with 3 (2.42%). This showed that the school administrators had attained the minimum qualification of primary school teacher which is a certificate. Effective implementation of a digital literacy program requires a qualified teacher; this could assist them in successfully implement a digital literacy program.
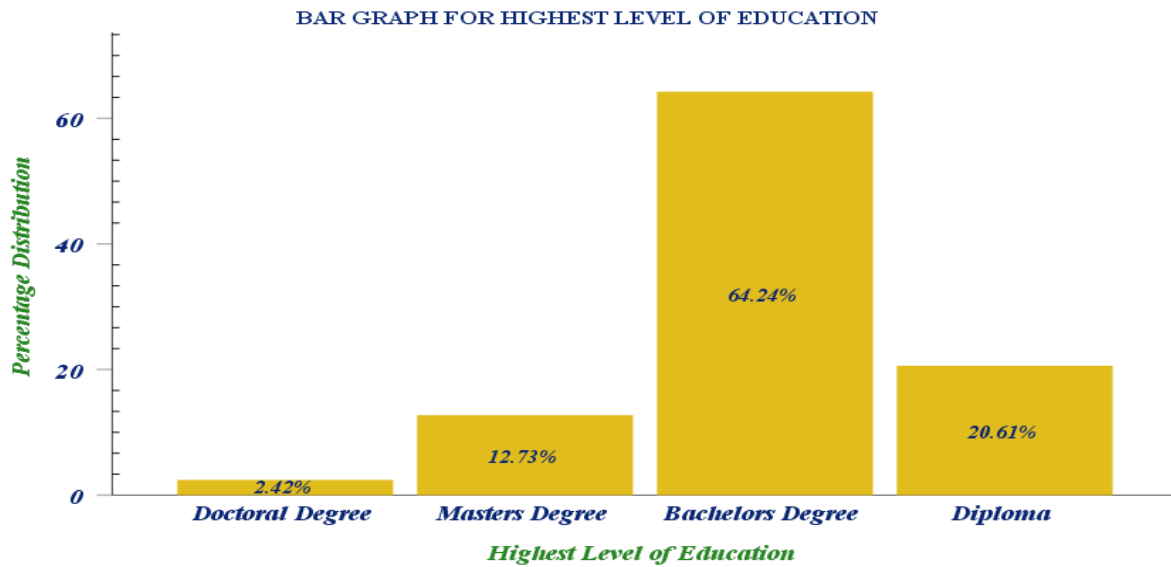
Figure 3 Highest level of Education

4.5 Respondents' Years of Service

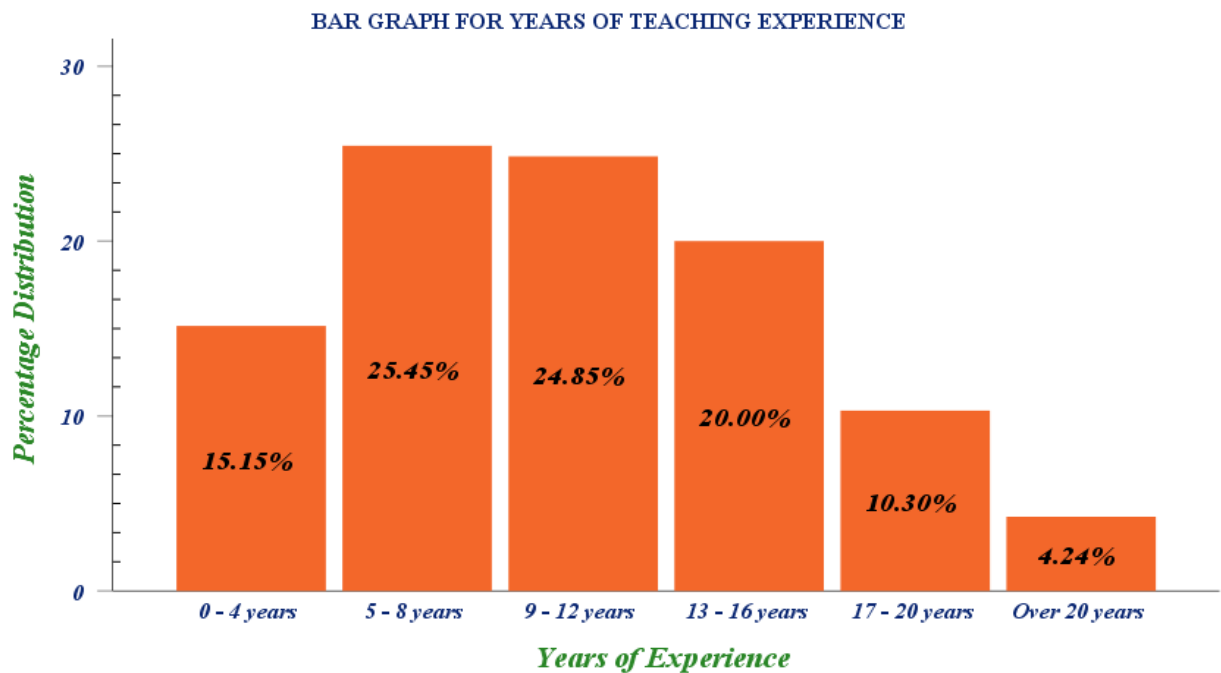Figure 4 below presents the years of service in school by the school administrators.

Figure 4: Years of Service

According to figure 4.4 those who had served in the service in the bracket of 0-4 years were 25 (15.15%) followed by those in the bracket of 5-8 years were 40 (24.45%), those in the bracket 41(9-12) years were 24.85%, those in the bracket of 13-16 year were 33 (20.00%), those in the bracket of 17-20 years were 18(11.30%), lastly those in the bracket of over 20 years were 7 (4.24%). This showed that the respondents had enough required experience to initiate and run the digital literacy program in the public primary school in the study area.

4.6 Support Provided by School Administrators for Digital Literacy

The first objective of the study sought to establish the extent to which school administrators had facilitated for teachers to attend digital literacy trainings. It was investigated and found that a large number of teachers had been supported by their administrators to attend digital literacy trainings 99(60.37%) compared to 65(39.63%) who had not been supported to attend such training courses by their respective school administrators. The findings revealed that most teachers in the sample were adequately trained in digital literacy supported by their administrators. This was supported by a report by Yuen Law & Chan (2003), in their case study in 18 schools in Hong Kong which revealed that in catalytic integration model schools, the school administrators were the key agents exhibiting visionary leadership, supporting staff development, trainings and involvement in digital literacy implementation. Good administration and positive support to teachers influenced successful use of ICT's and a smooth roll out of the digital literacy programs Anderson & Dexler (2005).

The school administrators therefore needed to provide adequate and frequent support to teachers to attend digital literacy training courses for them to be equipped with the relevant skills and competencies required in the implementation of the digital literacy programs. There should be regular follow ups of the untrained teachers and improve on the frequency of digital trainings, since most of the trained teachers were affected by transfers, promotions, retirement and natural attrition. According to a research study conducted by Liam et al (2011), one of the prerequisites for a school to begin implementing digital literacy programs is to provide support and teacher trainings.

The results in figure 5show that most teachers had been attending most training in digital literacy supported by their respective Administrators. Those who had attended the training were 99 (60.37%) compared to65 (39.63) who had not been attending such training supported by their Administrators in initiating and implementing the digital literacy program.
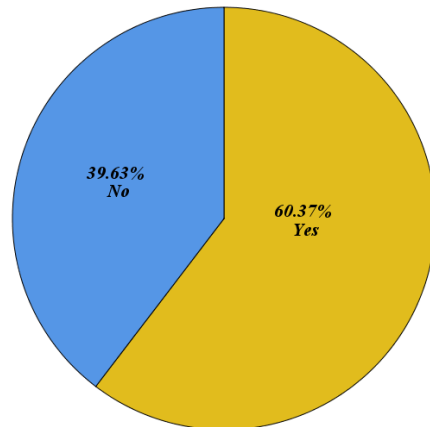
Figure 5 Training in Digital Literacy

The study findings on frequency of digital training, showed the frequency in which the Administrators supported their teachers on digital training, 42(25.5%) of the respondents always supported their teachers on digital training, 114(69.1%) sometimes supported their teachers, 8 (4.8%) rarely supported their teachers on this training, lastly, 0.6% never supported their teachers on these training. Findings on the frequency at which teachers used computers to teach and administer learning to pupils showed that 34 (20.6%) always used computers to teach, 98(60.0%) sometimes used computers to administer content to pupils in public primary schools, 29(17.6%) rarely used computers and lastly, 3(1.8%) never used computers to teach and maybe used other mechanisms to teach pupils. This implied that the use of computers was as a result of varying levels of digital literacy training.

4.7 Maintenance of Digital Literacy Learning Devices

The second objective of the study sought to establish the extent to which school administrators had provided maintenance for digital literacy programs. It was investigated and found out that very few administrators reported that they always facilitated for repair of the broken parts of the computers 16(9.8%). Table 1 presents the summary of the responses on storage facilities for the digital learning devices.

Table 1: Storage facilities for the digital learning devices

Secondary Storage Device Used	Yes				No			
	Number	Percentage %	95.0% Lower CL for Row N %	95.0% Upper CL for Row N %	Number	Percentage	95.0% Lower CL for Row N %	95.0% Upper CL for Row N %
Optical Disks	16	9.8%	5.9%	15.0%	148	90.2%	85.0%	94.1%
Flash Memory	52	31.7%	25.0%	39.1%	112	68.3%	60.9%	75.0%
Floppy Disks	27	16.5%	11.4%	22.7%	137	83.5%	77.3%	88.6%
Hard Disk	69	42.1%	34.7%	49.7%	95	57.9%	50.3%	65.3%

Results from table 1 show the percentage of the respondents who used secondary storage media for the digital literacy devices as being very low 16(9.8%), though, majority of the respondents reported that they used hard disks to store the digital content 69(42.1%). The results from Table 1 shows the preference of the respondents for the secondary storage media.16 (9.8%) of the respondents used optical disks to store the digital content, 52(31.7%) of the respondents used flash memory to store digital content, 27(16.5%) of the respondents used floppy disks to store the digital content, lastly, 69(42.1%) which were the majority used hard disk to store the digital content in the storage of digital content. The confidence level for Yes and No did not overlap all the secondary storage devices. This showed that the percentage proportion reported was significantly different for those who had secondary storage devices and those who didn't have storage devices. Table 2 presents the summary of responses on maintenance of digital learning devices in schools.

www.carijournals.org

Table 2. Maintenance of Digital learning devices

	Always		Sometimes		Rarely		Never	
	Number	Percentage %	Number	Percentage %	Number	Percentage %	Number	Percentage %
11. How often do you repair the broken parts of your computers?	16	9.8%	85	51.8%	47	28.7%	16	9.8%
12. How often do you clean the hard discs of the literacy devices	18	11.0%	84	51.2%	45	27.4%	17	10.4%
13. Do you ensure that the digital content is well installed?	32	19.5%	95	57.9%	28	17.1%	9	5.5%

Findings on the frequency of repair of broken parts of the computers showed that 16(9.8%) always facilitated repair of the broken parts of the computers, 85(51.8%) sometimes facilitated repair of the broken parts of the computers, 47(28.7%) rarely facilitated repair of the broken parts of the computers lastly 16(9.8%) of school administrators never facilitated repair of the broken parts of the computer.

Study findings on frequency of cleaning the hard discs of the literacy devices revealed that 18(11.0%) of the school administrators always facilitated the cleaning of the hard discs, 84(51.2%) sometimes facilitated cleaning of the hard discs on the literacy device, 45(27.4%) of the respondents rarely facilitated for cleaning of the hard discs on the digital literacy device lastly 17(10.4%) of the school administrators never facilitated cleaning of the hard disc of the digital

literacy devices. Findings on whether the respondents usually ensured that the digital content was well installed showed that 32(19.5%) always ensured that the digital content was well installed, 95(57.9%) sometimes ensured that the digital content was well installed in the devices, 28(17.1%) rarely ensured the digital content was well installed lastly 9(5.5%) never ensured that the digital content was well installed.

Storage Facilities for The Digital Learning Devices

Study findings on whether the public primary schools had well maintained rooms for the implementation of digital literacy, showed that 137(83.64%) had room for the implementation of digital literacy while 27(16.36%) had no room maintained for the implementation of the program. This showed how most public primary schools were prepared for the implementation of the program that would be beneficial to the learners. Figure 6 shows the percentages of schools that had maintained rooms for implementation of digital leaning.
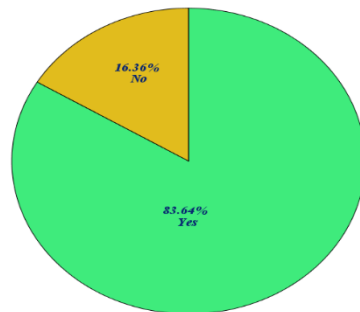

Figure 6 Maintained rooms for implementation of digital literacy

Study findings on whether the digital devices were stored in well maintained classes showed that 123(74.55%) of the respondents stored the devices in well maintained computer rooms while 41(25.45%) of the respondents did not store the devices in the computer rooms, this could have been due to poor security status for the devices.

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary of findings, conclusions, recommendations as well as suggestions for further studies based on the purpose and objectives of the study.

5.2 Summary of Findings

The purpose of this study was to assess the support provided by school administrators for the implementation of digital literacy program in public primary schools in Kitui County-Kenya. The research was guided by the following objectives; to establish the extent to which school administrators had facilitated digital literacy trainings, to establish the extent to which school

administrators had provided for maintenance and appropriate storage of digital literacy devices in public primary schools in Kitui County.

5.3 Support for Teachers to Attend Digital Literacy Trainings

Findings on sufficiency of digital trainings revealed that 99 (60.37%) of deputy head teachers had received adequate digital literacy trainings supported by their respective school administrators, (Table 1). The adequacy of the non-attending individuals was 65 (39.63%). This revealed that most teachers in the sample were adequately trained in digital literacy supported by their headteachers who were the school administrators. According to the researcher's observations, a large number of primary school teachers profited from the trainings and they were also supported by their school administrators. Lim et al (2011), one of the liquisite for a school to begin implementing a digital literacy program was to provide support for teacher's digital trainings.

5.4 Maintenance of Digital Literacy Learning Devices

Study findings in terms of maintenance of digital literacy devices, established that 16 (9.8%) responded that the school administrators facilitated for repair of the broken parts of the computers followed by 85 (51.8%) who said that they had sometimes facilitate for the repairs of the broken parts of the computers. Another 47 (28.7%) reported that the school administrators rarely facilitated for the repairs while 16 (9.8%) never facilitated the repairs of the broken parts of the computers. This was presented in table 4.2. On storage of the digital devices, very few respondents said they used secondary storage media. Most schools had rooms built or renovated for appropriate storage of digital devices while 27 (16.36%) had no rooms renovated for the storage of digital devices. This could have been due shortage of funds.

5.5 Conclusions

Based on the findings of this study, it was established that the majority of public primary schools teachers were uncertain regarding support provided by school Administrators and attending any Digital Literacy Training, the level of content available for learners in Public Primary Schools, and the type of maintenance and storage of digital devices in the Implementation of the Digital Literacy Program. This was shown by the results of the frequency tables utilized for data analysis in this research.

5.6 Recommendation

5.6.1 Supporting Teachers to Attend Digital Literacy Training

The government should employ ICT personnel with sufficient training. These ICT agents should have training from a reputable ICT agency so that they could assist the teachers. It was preferable to completely execute the digital literacy program trainings for teachers and deputy headteachers since they would support the technological evolution as they meet the targets of the 21st century digital Age. Teachers should be responsible for their own preparation via self-training. They

should also take advantage of the school based training possibilities supported by their school administrators through the Ministry of Education. Teachers should have been trained in technological assistance so that they continued teaching even if there was no technician present during their class delivery.

5.6.2 Maintenance of Digital Literacy Learning Devices

The government should have constructed and equipped computer laboratories in schools which would have been accessible to all public primary school teachers in order to aid in their implementation of the digital literacy program. School administrators should as well have liaised with the parents and stakeholders to renovate rooms for storage of the digital devices. The government should have ensured that the public primary schools had access to the best means of secondary storage in order to permanently archive digital content for future use. The hard disk was the best type of content storage because it was easier to access than other options and had a greater capacity for huge digital storage. The school administrators should always liase with the stakeholders for provision of secondary storage for digital literacy devices.

REFERENCES

Abik M Ajhoun, R &Ensias, L (2012) Impact of technological advancement on pedagogy. *Turkish online journal of distance Education, 13* (1). 224 – 237.

Agnew, D. W. (2011). Administrative Obstacles to technology use if West Virginia public schools. A survey of West Virginia Principals (unpublished doctoral dissertation). *West Virginia University, Morgantown. WV.*

Ashburn (Eds). Leadership for meaningful learning with technology. *New York: Teachers College Press.*

Barron, B., Cayton – Hodges, G., Bofferding, L. Copple, C., Darling – Hammond, L., & Levine, M. (2011). Take a giant step: A blue print for teaching young children in a digital age. *New York: the Joan Ganz Cooney Center at Sesame Workshop and Stanfold C. A. Stanford University.*

Brat, C. J (2010). Perception of two educational technology standards. A case study of an *Olio Urban K – 12 school District Dissertation Abstracts International Section A*: Humanities and social sciences, 7 (12 – A) 536.

Carr, T. (2011). An examination of leadership styles in implementing instructional technology: a case study to examine the elementary school administrator perspective (Doctoral dissertation) *North central university* (online institution).

Cates. W., Prince B., &Bodzin, A. M. (2003). *Implementing technology rich curricular materials*. Finding from the exploring life project. Computers in the school. 20 (1/2) 153 – 159.

Chapman, L., &Pedulla. J. (2010). Do digital divisions still persist in schools? Access to technology and technical skills of teachers in high needs schools in the *United States of America.* Journal of Education for Teaching. 36(2), 239 – 249.

Cheung, a. C. &Slavin; R. E. (2011). The effectiveness of education technology applications for enhancing mathematics achievement in K-12 classrooms. A meta-analysis *Baltomore: Center for Research and Reform in Education.*

Dean, V., & Martineau, J. (2012). A state perspective on enhancing assessment and accountability systems through systematic implementation of technology. In R. W. Lissit& H. Jogo (Eds.), computers and their impact on state assessments: recent history and predictions for the future (pp. 55 – 77) *Scttsdale, AZ. Information Age Publishing.*

Dzidovu (2010) The role of ICTs to achieving the millennium Development Goals in Education, Retrieved from *unpal/ Un.org/introdoc/groups/public documents/ dpadm/unpan039076.pdf*

Flore. A. (2017, August 17) How can a theory guide or inform practice? (Web log post) Retrieved December 21. 2018, from *http://annemarieflore.com/connectivism/:*

G.O.K (2006) The National Information and communication technology Policy.

Gray: L: Thomas, N., & Lewis L. (2010). Educational technology in U.S Public Schools: Fall 2008. *Washington DC. U.S Department of Education*. National Center for Education Statistics.

Kitui County Education Office (2021). Education Management Information System (EMIS), *Kitui County Education Office.*

Lebaron, J. (2001). Curriculum planning for technology rich instruction. In J. Lebaron& C. Collier (Eds). *Technology in its space: Successful infusion in schools* (pp. 17 – 29) San Francisco Jossey – Bass.

Lesisko, L., Wright, R., &O'ttem, B. (2010) February Technology integration. A best practice perspective [*resented at educational research; Savannah*. G. A.

Ministry of Education. Kenya (2012). ICT integration in Education; Ministry of Education. Nairobi, *Government Printers.*

Morrison, G. R., & Lowther, D. L (2010). Integration computer technology into the classroom (4th Edition). *Upper saddle river.* NJ. Pearson, Merrill Prentice Hall.

November A. (2010). Empowering students with technology (2nd edition). *Thousand Oaks CA. Corwin Press.*

Oulo I. O. (20130. Preparedness of the Head Teachers in the Use of Information Communication Technology in public Primary Schools in Bondo District. *Kenya Unpublished Research Report of the University of Nairobi.*

Stavreds. T. (2011). Effective online teaching. Foundations and Strategies for student success. *San Francisco, CA Jossey – Bass.*

Terpstra, M. (2010). Developing technological content knowledge. Pre – services teachers' persecutions of how they learn to use educational technology in their teaching. *Dissertation Abstracts international section A*, (70 (10) (UMINO AAT 33814010).

U. S. department of Education (2010). Transforming American Education. Learning powered by technology. A national educational technology plan 2010. *Washington DC: Office of Education Technology.*

N.Kurnia and S.I.Astuti (2017)."Map of the Digital Literacy movement in Indonesia' 'Studies on actors, various activities, target groups and partners conducted by Japaledi (In Bahasa) Informas vol 47.

Y.Eshet-Alkali(2004) "Digital Literacy; A conceptual Framework for survival skills in digital era''.Journal of educational multimedia and Hypermedia; 2004.

Samatha Shannon McCord (2015)" Digital Literacy in the classroom: Teachers' attitudes towards technology and the language curriculum. A research paper submitted in conformity with the requirements for the award of a degree of Master of Teaching, Department *of Curriculum Teaching and Learning. Ontario Institute* for Studies in Education of the University of Toronto.

Modem (2018) "Digital Literacy Perceptions of the students in the department of computer Technologies Teaching and Turkish Language Teaching' 'International Journal of Progressive Education.

H.A. Spires.C.Medlock Paul and S.N. Kirchhoff(2017) "Digital Literacy for the 21st Century'' Encyl. Int.Sc.technol-Fourth Ed.No.January (2017).
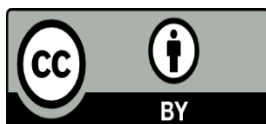
H. Cahyani and B.Y Cahyono (2012) Teacher attitudes and Technology use in Indonesian classrooms.

Alboelmaged.M.2015. "E-Maintenance research: A Multifaceted perspective' 'Journal of *manufacturing Technology Management.*

Al-Najjar,B.H.Algaboun and M.Jonsson (2018) "Maintenance 4.0 to fulfil the demands of industry 4.0 and factory of the future' -International journal of Engineering Research and Applications.

Boche and Bejamin(2014) "Muiltiiteracies in the classroom; Emerging *conceptions of first year teachers*''.J.Lang.Lit.Educ vol *10 pgs*114-135.

O.Alice(2012) "Challenges Facing Teachers and Students in the Use Of Instructional Technologies. A case study of selected secondary schools in *Kisii County' 'Master dissertation, Kenyatta university, Kenya.*

Alex Koohang, Liz Riley and Terry Smith (2009). E – learning and constructionist. From theory to application, *interdisciplinary journal of E – learning and learning objects.*

Amirian, S. (2007). *Digital backpacks facilitating faculty* implementation of technologies for teaching and learning computers in the school.

Anderson, R. E. Dexter, S. (2000). School technology leadership: *incidence and impact center for research on information technology and organization,* University of California.

Bakia, M. Mitchell. K…, & Yang… E. (2007). State strategies and practices educational technology. Volume 1 – Examining the enhancing education through technology program. Washington, DC; US. *Department of education*. Office of planning, evaluation and policy development.

Barron, A. E…., Ivers, K. S., Lilavois, N., & Wells, J, A (2006). Technology for Education. *A practical guide (5ᵗʰ Ed.).* west Port, CT: Libraries Limited.

Beach, R. H. & Lindahi, R. A (2000). *New Standards for the preparation of school administrators.* What conceptualization of educational planning do they portray? Planning and changing 31 (1-2), 35 - 52.

Binging. K. (2009). *Barriers to successful integration of ICT in teaching and learning environments.* A review of the literature. Eurasia journal of *Mathematics Science & Technology Education 5(3)* 235 – 245.

Bitter, G. G., & Lagacy, J. M (2008). *Using technology in the classroom (7ᵗʰ edition).* Boston Allyn & Bacon.

Brennan. M. U. S. Corporate and Government E-learning Forecast (2002 – 2007). *International data corporation, 2003.*

Buzhardt. J. Greenwood, C., Abbott, M., & Tapia Y. (2006). Research on scaling up evidence – based instructional practice. Developing a sensitive measure of the rate of implementation. Educational technology research & development 54 (5), 467 – 492.

Byrom, E., & Bingham, M. (2001). Factors influencing the effective use of technology for teaching and learning. Lessons learned from SEIRTEC Intensive site school (2nd ed.) Greensboro, NC: SERVE Center.

Collier, C. (2001). Staff development for technology integration in the classroom. Inj. Libaron & C. Collier (eds). Technology in its place. Successful technology infusion in school (pp. 61 – 72. San Francisco: Jossey Bass.

Crane, C. M (2005). Teacher perceived impact of technology on elementary classroom and teaching. (Doctoral Dissertation) University of Missouri, Columbia, MO.

Culp. K. Honey, M. & Mandinach. E. (2003). A retrospective on twenty years of educational technology policy. Washington, DC: U.S. Department of Education. Office of Educational Technology.

Dietinger, T: Aspects of E-learning environments; Dissertation, Graz University of Technology: Graz 2003.

Farrell, G & Isaacs, S (2007) Survey of ICT and Education in Africa. A Summary Report, Based on 53 Country Survey.

Siemens, G (2004). Connectivism: A learning theory for the digital age (html). Retrieved from *http://www.itdlorg/journal/ian.05/articleolhtml*

Flanagan, L. & Jacobsen, M (2003). Technology leadership for the twenty – first century principal. Journal of Educational Administration, 41(2), 124 – 142.

Frank, K. Zhao, Y., & Borman, K (2004). Social Capital and the Diffusion of Innovation; within organizations: the case of computer technology in schools. Sociology of education 77(2) 148 – 171.

Gooler, D., Kautzer. K., & Knuth, R. (2000). Teacher Competence in using technologies. The next big question. Honolulu. H/S Pacific Resources for Education and learning.

Haddad, W.D, and Draxler, A. (2005), The Dynamics of technologies for Education.

Kariuki, J. (2006). E-learning in Africa; Random reflection about e – learning in Kenyan Universities.

Komal, K. L. (2009) Understanding Teachers and Administrators' Perceptions and Computer Integration in Education.

Kothari, C. R. (2004), Research Methodology; Methods and technologies (2nd Revised).

Kazma, R. B. (2003). Technology, innovation and educational change. A global perspective. Eugene, OR international society for technology in education.

Krischner, P., & Davis, N. (2003). Pedagogical benchmarks for information and communication technology in teacher education. Technology pedagogy and education 12 (1), 125 – 147.

Oubre, A. (2008). Technological leadership proficiency among school administrators in the twenty – first century schools (21st C) initiative. Dissertation Abstracts Internation Section A. 68.

Peckham., V. (2001). Training. Brevard's Cornerstone of technology. Curriculum administrator 37 (1).

Ringstaff, C., & Kelley, L (2002). The learing return on our educational technology investment. A review of findings from research. San Francisco. West Ed.

Schofield. J. W., & Davidson, A L. (2002). Bringing the internet to school lessons from an urban district. San Francisco. Jessery – Bass.

Schrum, L. & Levin, B. B. (2009). Leading 21st century schools: harnessing technology for engagement and achievement. Thousands of Oaks, CA. Corwin press.

Smith, G. E., Throne, S., & International Society for Technology in education (2007). Differentiating instruction with technology in K-5 classroom. Eugene, OR International Society for technology in education.

Steelman, J. Vasu, E., & Foley, A. (2004). Evaluating technology integration, putting all the pieces together to meet the challenge of NCLB in R. Ferding et al. (Eds). Proceeding of the society for information technology & Teacher Education International Conference 2004 (pp. 1055 – 1060) chespeake, VA AAGE.

Zhao, Y., Frank, K. A., & Ellefson, N. C (2006). Fostering meaningful teaching and learning with technology: characteristics of affective professional development efforts. In R. Floden & E.