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Development of Digital Literacy Skills among Learners in Public Primary Schools in Homabay County, Kenya

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Digital literacy direct learners towards innovative, creative and transformational learning in the 21st century. It is one of the core competency in the Competency Based Curriculum. The objective of this study was to assess the availability of ICT infrastructure in public primary schools to develop learners' digital skills. Constructivist learning theory guided the study. Concurrent embedded mixed method was used. A population of 5713 was targeted for study where a sample of 571 respondents composed of 8 head teachers, 78 teachers and 485 grade six learners were selected. Stratified random, simple random and purposive sampling procedures were used to select the study sample. Data collection instruments included interviews, questionnaires, focused group discussion and observation schedule. Descriptive statistics were used to analyse quantitative and qualitative data. Some of the key findings of the study were majority of public primary schools in Kasipul lack internet connectivity and only 32.1% have computer labs. The results further indicated that teachers have basic knowledge and skills in digital literacy. However, only 23.2% of teachers have been trained in digital literacy. The study recommends that Ministry of education in collaboration with Ministry of Information and Communication Technology enhance internet connectivity in all primary schools to support implementation of digital literacy to develop learners' digital skills.

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INTRODUCTION

This paper is based on the provisions of sessional paper No. 1 of 2019, which guides educational reforms in Kenya. It provides for acquisition of ICT infrastructure, capacity building, security and management of ICTs and adaptation of digital content for learners and trainees with special needs. According to Atmojo, Ardiansyah, and Wulandari (2022), digital literacy is a 21st century skill linked to teachers' core competencies in teaching. It is a tool used by teachers to make teaching and learning more realistic and interesting. Hence developing learners' digital skills in the classroom. Development of learners digital skills require utilisation of digital devices such computers, mobile phones, tablets, internet and social media in the classroom in addition to teacher's digital competencies in teaching. However, Zubaidah, Angraini and Susanto (2023) point out that previous studies have shown that most learners lack digital skills, thus failing to utilise technology in the learning process for academic improvement. This study sought to find out development of digital literacy skills among learners in grade six in public primary school, Kasipul Sub-County, Homabay County, Kenya.

Education sector is undergoing transformation and improvement in the recent past with adoption of technology. Digital literacy in education has been informed by links of technological and innovative programs in teaching and learning process. According to Cherotich and Waweru (2022), traditional boundaries of learning are being replaced and erased by technological programmes to ensure improvement of the scholarly environment. Thus, for young adults to fit in the global economy, they must have work skills of the 21st century according to Sustainable Development Goal 4. Digital literacy in education is viewed as a new concept in the developing countries. Digital literacy programme in schools has been propelled by adoption of technological-based programs. Therefore, Digital Literacy skills

development is important for working, learning and living in the 21st century. The study by Churchill (2020) indicated that the use of mobile technologies has influence on development of learners' digital literacy skills. In addition, digital learning devices and content improves learning performance among learners especially at their early stages, for example, learner's exposure to digital tools and resources has influence on learner's numeracy skills development at their early stages of learning (Karpati, 2011). In addition, the learner is able to get information whenever they want to access online materials, share and give feedback of information searched online with the peers and teachers, Churchill (2020). The elements of digital literacy include information usage, technical skills, creation and communication (Johnston, 2020).

Digital literacy is a 21st century skill linked to teachers' core competencies in teaching, Atmojo, Ardiansyah and Wulandari (2022). It is a tool used by teachers to make teaching and learning more realistic and interesting. Hence developing learners' digital skills in the classroom. Learners' digital skills are developed when digital technology is integrated in teaching and learning process. It encourages active learning in classroom activities among learners. However, previous studies have shown that most learners lack digital skills to navigate the fourth industrial revolution in the 21st Century, thus failing to utilise technology in the learning process for academic improvement Zubaidah, Angraini, and Susanto (2023).

When learners are exposed to digital resource and pedagogy, it influence growth of their scientific literacy. Learners will frequently value, understand and use ICT to control and adjust their new environment (Zubaidah, Angraini, & Susanto, 2023). Therefore, development of learners digital skills require utilisation of digital devices such computers, mobile phones, tablets, internet and social media in the classroom. In

addition, teacher's digital competencies in teaching such as ability to solve problems, providing learners access to technology in the classroom and improving pedagogy through technology enhance development of learners' digital skills in learning process.

In China, schools in rural and urban areas are influenced by ICT infrastructure application in teaching and learning to develop learners' digital skills Lu, Tsai, and Wu (2015). Computers, laptops, internet access, digital cameras, projectors and school phones are digital infrastructure that support teaching and learning in schools for development of digital skills.

In Nepal, the education system shifted to e-education during COVID 19 to ensure that schools ran their activities despite the closure. Teaching and learning using online materials, digital devices, ICT application is a new approach to all educators and learners in Nepali education system and across the globe Rasmitadila et al. (2020). Learners benefit on online education because it create awareness on current opportunities and also improves quality of education. According to Paudel (2021), online education promotes learners and teachers skills on online search, connection between learners, teachers and global community, access to variety and authentic learning materials. However, reliable internet remains a major challenge for teachers and learners.

In Russia, education sector as one of the areas of social development, is influenced by the introduction of digital platforms to promote economic competitiveness in the global market. Similarly, the Russian government has seen the need to incorporate digital literacy in education platforms to meet the needs of the government, business, learners and society. Furthermore, according to Salakhova et al. (2021), educational entities cannot independently utilise digital technologies but can use the functioning digital ecosystem which is required to provide variety of new technologies in education sector for development of learners' digital skills.

According to Erwin and Mohammed (2022), digital natives are today's learners, because of their growth with technology and accessibility to technology. However, learners still lack necessary skills required to use the technology productively. The learner's ability to create, evaluate and apply the digital literacy skills is important in the real world of work. However, in Nigeria, learners still have challenges of accessing the computers and other digital learning materials and equipment in the schools Imhanyehor (2021).

Integrating digital literacy in teaching and learning is a response to advanced technology in the 21st Century. The reform has allowed learners and teachers access educational materials, personal learning, acquisition of digital literacy skills, and promotion of communication and collaboration, Republic of Kenya (2023). In Kenya, implementation of Competency Based Curriculum started in 2017, with digital literacy being one of its core competencies. Digital Literacy in CBC seems to become a new normal in teaching and learning process. This was evident during the Covid-19 period when education was disrupted, leading to the use of technology to provide access and use of educational services in the education sector. However, according to Ministry of Education (2021), despite the government effort to address ICT infrastructure, learners and teachers still have challenge in development of digital skills.

According to Murithi and Yoo (2021), 87.7 percent of public primary schools in Kenya have challenges of internet connectivity and lack projectors in the school to promote digital literacy integration. Therefore, with inadequate digital learning devices in the schools, teachers have difficulty in integrating digital literacy in learning and teaching. In addition, inadequate teaching and learning materials and digital infrastructure are challenges experienced in Kenyan schools, Republic of Kenya (2023). Similarly, Omoto (2021) alluded that primary schools have laptops and electricity connectivity however, they lack ICT infrastructure for storage. Further, Njeru and Itegi (2018) opined that primary schools have space, especially the classrooms however,

integration of digital literacy is still a challenge due to lack of proper infrastructure and learning materials for learners and teachers.

According to Owuor (2022), private primary schools have access to teaching and learning resources compared to public primary schools in the implementation of Competency-based Curriculum. This hinders development of learners' skills as envisioned in Basic Education Curriculum Framework. According to Nyamwange (2020), CBC focuses on developing skills and acquiring knowledge by applying the competencies learnt in class to real life situations. The competencies are developed regardless of the time taken in the classroom. Additionally, with regard to skills development in the process of teaching and learning, technology is used to meet the learner's specific needs which leads to increment in productivity in terms of performance. However, Nyamwange (2020), alluded that inappropriate infrastructure such as modern classroom, ICT rooms, science laboratories and smart boards' poses challenges to the implementation of CBC in Makueni County. In Homabay County, only 8.7% of schools are supplied with digital literacy programme devices for teaching and learning Omito (2021).

Digital literacy, is one of the core competencies identified in Basic Education Curriculum Framework, serves as a pivotal component guiding the ongoing reform initiatives aimed at fostering competency-based learning. Through an innovative approach outlined in Sessional Paper No. 1 of 2019, the government has orchestrated a multifaceted strategy to bolster ICT integration in education. This comprehensive plan encompasses the expansion of ICT infrastructure across educational institutions, the cultivation of teacher proficiency in ICT integration, and the amplification of accessible digital learning resources at every educational tier. This concerted effort underscores the government's commitment to equipping learners with the requisite skills to navigate the digital landscape effectively, positioning digital literacy as a cornerstone in shaping the future trajectory of education in the digital age. Therefore, this study sought to find out

if public primary school, have acquired the digital infrastructure to facilitate development of digital skills among learners.

Study Objective

To assess the availability of ICT infrastructure in public primary schools for development of learners' digital skills.

METHODOLOGY

Concurrent embedded mixed method design was employed in this study. Both qualitative and quantitative data were collected using concurrent embedded mixed method design. Qualitative and quantitative data are collected at the same interval as planned, and either quantitative or qualitative data is embedded within one method Terrel (2012). More emphasis can be put on either qualitative and quantitative data or both in the concurrent mixed method Creswell and Creswell (2018). In this study, the researcher utilised quantitative data which was supported with qualitative data. Likert scale was used to measure the variables of the study such as digital devices, internet connectivity and ICT room. A population of 5713 was targeted for study where a sample of 571 respondents composed of 8 head teachers, 78 teachers and 485 grade six learners were selected in public primary schools in Kasipul Sub-County, Homabay County. The researcher use stratified, simple random and purposive procedures to select schools, head teachers and teachers and grade six learners. Stratified sampling is a method whereby the population of the study is divided into different category or smaller units known as the strata based on the members characteristics, thereafter in each stratum, random sample is used in a number proportional to the stratum's size Sharma (2017).

According to Bhardwaj (2019), stratified random sampling is the division of similar population into subgroups or strata and selection of members randomly to make a true representation of a sample. The researcher divided public primary schools in Kasipul into wards, (West Kamagak ward, East Kamagak ward, West Kasipul ward, Central Kasipul ward and South Kasipul ward)

and then randomly sampled the schools. Purposive sampling is technique used according to the purpose of the research; it is done by a researcher who is experienced (Bhardwaj, 2019). Simple random sampling procedures is where the study population is randomly selected by chance and every member has the equal chance to be selected as a sample, (Bhardwaj, 2019). A sample of 10% was used according to Gay, Millsand Airasian (2010).

The research instruments used include interview schedule for the head teachers, questionnaires for teachers and observation schedule. To ensure validity, each objective was evaluated differently by checking the clarity and simplicity of the language used. The items were deleted depending on the measurability of the variables. Statistical Package for Social Scientist (SSPS) version 24 was used to analyse the actual data from two schools under the study and Cronbach’s Alpha was used to ensure reliability of the study where Cronbach’s Alpha Coefficient of 0.8 was achieved to show that the items were measuring the same dimension. Bujang, Omar and Baharum

(2018) alluded that above 0.6 is a justification of items that measure the same variable while zero or a number close to zero is an indication that the same dimension is not measuring all items.

The analysis of qualitative data involved the extraction of themes, and then organised and presented thematically. Descriptive statistics were employed to analyse quantitative data. The researcher used of various statistical methods and tools such as diagrams and figures, means, standard deviations and Statistical Package for Social Sciences (SPSS) version 24.0. Descriptive statistical methods were used to analyse both quantitative and qualitative data.

FINDINGS AND DISCUSSION

The following section presents the descriptive statistics on the responses of teachers, head teachers and grade six learners’ results.

Availability of ICT Infrastructure in Public Primary Schools for Development Of Learners’ Digital Skills

Table 1: Teachers’ responses on ICT infrastructure in public primary schools for development of learner’s digital skills

| Item | Teachers | | Chi-square(X ²) | df | Sig. |
|------------------------|-----------|---------------|-----------------------------|----|------|
| | Available | Not Available | | | |
| Interactive whiteboard | 3 (3.8%) | 53 (96.2%) | 89.393 | 2 | .000 |
| Overhead projector | 36(64.3%) | 20(35.7%) | 4.571 | 1 | .033 |
| Learner’s tablets | 51(91.1%) | 5(8.9%) | 37.79 | 1 | .000 |
| Computer lab(s) | 18(32.1) | 38 (67.9) | 7.143 | 1 | .008 |
| Teacher’s Laptop | 42(75.0%) | 14(25.0) | 14.00 | 1 | .000 |
| Mobile phones | 38(67.9%) | 18(32.1%) | 7.14 | 1 | .008 |
| E-readers | 11(19.6%) | 45(80.4%) | 54.25 | 2 | .000 |
| wireless routers | 21(37.5%) | 35(62.5%) | 29.61 | 2 | .000 |
| Printers | 5(8.9%) | 51(91.1%) | 79.321 | 2 | .000 |
| Photocopiers | 6(10.7%) | 50 (89.3%) | 74.61 | 2 | .000 |
| Film projector(s) | 1(1.8%) | 55(98.2%) | 100.32 | 2 | .000 |
| Digital camera | 9(16.1%) | 47(83.9) | 61.75 | 2 | .000 |
| Television | 10(17.9%) | 46(82.1%) | 23.14 | 1 | .000 |
| Radio | 10(17.9%) | 46(82.1%) | 23.14 | 1 | .000 |
| DVD | 1(1.8%) | 55(98.2%) | 100.32 | 2 | .000 |

Table 1 indicates the responses of teachers on the availability of the digital infrastructure for development of learners’ digital skills in public primary schools in Kasipul. It shows that there is no significant difference on teachers responses on

digital infrastructure for development of learners’ digital skills in public primary schools in Kasipul. According to the responses, 3.8% of teachers indicated that interactive whiteboards were available while 96.2% responded that they were

not available in the school. This indicates that most of the selected schools in the constituency still use the traditional chalkboard to teach in the classroom, limiting learners' classroom engagement, interaction and motivation to develop their digital skills. Whiteboards are used for visual display of information projected through digital devices. This enhances engagement and motivation of the learner to enjoy learning through digital resources thereby developing their digital skills. This assertion is supported by Mwendwa (2017) who posits that primary schools in Kitui County have inadequate desk computers, whiteboards, and CD-ROMs to provide a learning environment that encourages independent thought, teamwork and problem-solving among students.

Regarding the overhead projectors in the selected schools in Kasipul, 64.3% of teachers indicated that they were available while 35.7% responded not available in their schools. This indicate that most schools that participated in the study have overhead projectors for class presentation The findings implies that most schools are in position to expose learners to new ideas especially on pictures, audio clips, videos and Power point slides during various lessons. This is supported by Munawar et al. (2021) who argue that computers, laptops, school cell phones, internet access, projectors and the cameras are some of the available digital infrastructure in the school that aid in integration of digital literacy. In addition, 98.2% of teachers reported that film projectors were unavailable, with only 1.8% indicating they were available in their schools. This may be due to the fact that film projectors are more expensive than the overhead projectors.

Regarding availability of learners' tablets in the school, 91.1% of the teachers indicated that they were available while 8.9% revealed that they were not available in their schools. On teachers' laptops, 75.0% of teachers responded that they were available while 25.0% revealed that teachers' laptops were not in the school. This signifies that most schools in the constituency have received learners' tablets and teachers' laptops to ensure digital literacy implementation

in public primary schools in Kasipul. These findings resonate with Okello, George and Mbotela (2020) who posit that primary schools digital instruction content delivery has been one of the government's strategic plans to ensure learners are competent and competitive through Digital Literacy Programme implementation.

Regarding availability of mobile phones, 67.9% of teachers indicated that they were available while 32.1% reported that mobile phones were not in the school. This indicates that most teachers have and use smart phones to access online materials to facilitate learning in the classroom. The findings are supported by Kerkhoff and Makubuya (2022) who assert that primary school teachers in Trans Nzoia County, group learners in their classes to share smartphone during the lesson to develop learners' creativity and literacies. Qualitative data from grade six learners affirmed that teachers are using their smart phones to expose learners to online content such as You Tube videos and online learning materials during their lessons. For instance, one learner commented:

In our class, we use tablets and smart phones to learn English activities. We watch videos, we also listen to radio especially during mathematics lessons to understand better.

From the excerpt by the learner, it is clear that learners are using tablets and smartphones during lessons to watch videos and access online materials. This help learners in retaining information learnt during the lessons, improves learners' understanding of concepts taught by the teacher, and supports developing learners digital literacy skills. This is supported by Insorio and Macandog (2022) who postulate that teachers in public schools in Philippines create and upload mathematic videos lessons to teach, deliver mathematical content and make learning process understandable to learners.

Regarding computer laboratories, teachers who indicated they were available in their schools were 32.1% and those who responded not available were 67.9%. This indicates that most schools lack

computer labs to develop learners' digital skills. Development of digital literacy skills is in tandem with the current curriculum which requires utilisation of computer labs. In addition, computer labs provide learners with space and time to develop research, communication, creativity and innovative skills which are part of classroom curriculum. Therefore, from the findings it is evident that learners only access minimal literacy skills and also miss the part of production of materials. The findings point to Bariu (2020) who argues that computer hardware, software and other peripherals are expensive, resulting in most schools making little investment in their ICT infrastructure such as computer labs. Qualitative data from head teachers support the findings by indicating that public primary schools lack computer labs to support learners' digital skills development. One of the head teachers affirmed:

There is no computer lab in the school. In the evening of every Thursday, teachers are given the opportunity to select the class to help to ensure learners have access to tablets and laptops. This is the time that teachers have access to digital devices. Our teachers use staffroom to access the laptops and tablets for practical.

As expressed in the above statement, public primary schools in Kasipul constituency lack computer labs to support learners' digital skills development. In addition, teachers and learners still have difficulty in accessing tablets and laptops due to inadequate digital learning devices in public primary schools in Kasipul to develop digital literacy skills. The findings seem to be in agreement with that of Omito (2021) who posits that only 8.7% of schools were distributed with Digital Literacy Programme devices in Rachuonyo Sub-County.

In the case of E-readers, 19.6 % of teachers indicated that they were available while 80.4% responded that they were not available in the school. This is evidence that majority of sampled schools have not been provided with E-readers to support development of digital skills. Learners' access to E-readers would help them develop

digital skills because the device enables them to access vast library, digital books and journals. The device is also convenient because it is portable, has adjustable font and text settings and built-in lighting that enable the learner to read in various lighting conditions. Regarding availability of wireless routers, 37.5% of teachers' responded that they were not available while 62.5% indicated that they were available in their schools. Wireless routers are key in the connection to internet, through which teachers and learners are able to access content from website including Kenya Education Cloud. This implies that most of the schools in the study area had wireless routers to support internet connectivity. However, 37.5% of schools did not have wireless routers, thereby missing digital content uploaded on Kenya Education Cloud. Further, qualitative data obtained from head teachers revealed that public primary schools in Kasipul constituency, have available wireless routers but have not yet installed them, and in other schools they are kept in head teacher's office. Therefore, teachers are using their smart phones to access the online materials. One of the head teachers commented.

There is digital wireless router in our school and has never been used since. Some teachers use their mobile phones to hotspot learners to facilitate learning in classes.

The head teacher's comment is an indicator that public primary schools in Kasipul have received wireless routers to improve educational outcomes. However, the routers are not being used in the schools for internet connectivity. This might be caused by the schools' lack of funds to purchase internet bundles or the fact that some of the schools are situated in geographical locations with no internet coverage. The situation forces teachers to use their smart phones to hotspot learners' tablets to access online materials in the classroom. Omondi, Were and Kamaku (2019) support this view by asserting that internet and laptops help to improve learners' educational outcomes; nevertheless, factors such as insufficient internet access, laptops or tablets, and electricity impede development of digital skills.

The *Table 2* displays the head teachers' responses on availability of internet connectivity in public primary schools in Kasipul constituency.

Table 2: Head teachers' responses on availability of internet connectivity in the school

| | Frequency | Percent |
|-------|-----------|---------|
| Yes | 2 | 25.0 |
| No | 6 | 75.0 |
| Total | 8 | 100.0 |

Table 2 depicts the head teachers' responses on internet connectivity availability in the sampled schools in Kasipul Constituency. The findings indicate that 25.0% of the sampled schools have internet connectivity while 75.0% are not connected. The results show that most public primary schools in Kasipul lack internet connectivity, indicating that most learners cannot access or download digital content uploaded on Kenya Education Cloud. The results is contrary to Maina et al. (2020), who asserted that government has distributed public primary schools with pre-loaded routers on digital literacy to develop learners' digital skills. Despite this assertion, the bundles loaded in the routers may have expired and the schools lack funds to purchase adequate bundles leading to lack of internet connectivity in the schools.

Regarding availability of printers, 91.1% of teachers indicated printers were not available while 8.9% of teachers revealed that they were available in their schools. Similarly, those who indicated that photocopiers were not available were 89.3% while those who responded they were available in their schools were 10.7%. Teachers' responses on printers and photocopiers in most public primary schools in Kasipul indicate that teachers rely mostly on textbooks and exercise books provided by the school for learning, and cannot print or photocopy the online learning materials. Further, 98.2% of teachers responded that DVD were not available while 1.8% indicated that DVD were in the school. As a result, most teachers are not utilising DVDs as an instructional resource for various subjects such as Music, performing Art and Dance to develop learners' digital skills. This finding may be because DVD are not compatible with the latest laptops and

computers, thereby making them not included in the digital accessories supplied to schools.

On digital camera, teachers who indicated that digital cameras are available were 16.1% while 83.9% revealed that digital cameras were not in their school. This is an indicator that majority of sampled schools in Kasipul constituency have not received digital cameras to be used in developing videos for learning. Regarding availability of television sets, teachers who responded that they were available were 17.9% while those who indicated that they were not available in their schools were 82.1%. This implies that most schools are not utilising Television lessons aired by KICD through EDU channel to support the learning process. Similarly, 17.9% of teachers revealed that radios were available, while 82.1% demonstrated that radios were not in the school. This is a pointer that majority of schools in the constituency are not utilising radio lessons aired by KICD through Kenya Broadcasting cooperation English Service. The findings are supported by Njeru and Itegi (2018), who opine that public primary schools in the country lack essential ICT infrastructure and equipment to integrate digital literacy, despite many classrooms having adequate space.

Qualitative data obtained from head teachers supported the findings by indicating that public primary schools in Kasipul constituency have inadequate ICT infrastructure to support learners' digital skills development. One head teacher commented:

In our school there is no computer lab, we have a structure without computers in it; the school has only 27 tablets for learners and 2 teachers' laptops, however, the equipment

available are not enough for our learners and teachers. Interactive whiteboard, school mobile phone, printers, photocopiers, film projectors, digital camera, television, radio and DVDs are not available in the school.

The head teacher's comment reveals that public primary schools in Kasipul have classrooms that learners can use to develop their digital skills. However, there is inadequate learners' tablets and teachers' laptops. The available devices were supplied during implementation of digital literacy programme. These are not adequate due to the growing learners' population caused by 100% transitions policy. Consequently, the situation contributes to limitations in development of digital skills among learners and teachers if all teaching staff and pupils were to use the digital learning devices in every lesson.

Therefore, inadequate digital learning devices, lack of computer labs, internet connectivity and lack of computer technicians remain major challenges in development of digital skills among learners in public primary schools in Kasipul. It should be noted that teachers' laptops and learners' tablets are the only available digital learning devices in most public primary schools in Kasipul, and they are not adequate for learners due to high school population.

CONCLUSION AND RECOMMENDATION

The study's objectives were to assess the availability of digital infrastructure to develop learners' digital skills in public primary schools. The result indicated that public primary schools in Kasipul have inadequate digital infrastructure for learners to develop their digital skills in the 21st Century. The result revealed that computer labs, internet and electricity connectivity in schools is still a major concern, however, most schools have connected electricity power grid. The study concludes that public primary schools in Kasipul Sub-County have difficulties integrating digital literacy among learners because of inadequate ICT infrastructure. Furthermore, the study recommends that:

- The Ministry of education in collaboration with the Ministry of Information Communication and Technology enhance internet connectivity in all primary schools to support implementation of Digital literacy to develop learners' digital skills.
- The government distributes all public primary schools with digital learning resources to support integration of digital literacy in schools.

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