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Assessing the Availability of Digital Learning Infrastructures in NGO-Sponsored and Non-Sponsored Public Primary Schools in Buuri and Isiolo Sub-Counties

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Abstract

Purpose: To assess the availability of digital learning infrastructures in NGO-sponsored and non-sponsored public primary schools in Buuri and Isiolo sub-counties.

Methodology: The study used deductive reasoning and adopted the descriptive survey research design. The study targeted 79 public primary schools in the 2 sub-counties, 79 headteachers, 79 ICT teachers, 2,192 Grade 6 learners, and their 79 Grade 6 class teachers. The researcher selected a 20% sample to get 16 schools, 16 headteachers, 16 ICT teachers, and 16 class teachers. Purposive sampling techniques were used to select 11 schools with NGO sponsorship while simple random sampling was used to select 5 schools without sponsorship for the comparative sample. Systematic random sampling was used to get a 15% sample from the learners – 329 Grade 6 learners. Data was collected using questionnaires, interview schedules, and observation checklists. Descriptive data was analyzed using percentages, mean, and standard deviation scores, while data from interviews was organized into themes and reported using quotes and narration and reported alongside the findings from descriptive data.

Results: The results of the questionnaire revealed that 79.9% of learners in sponsored schools strongly agreed that their classrooms were built with robust materials compared to only 62.0% in non-sponsored schools. 70.0% of teachers in sponsored schools confirmed these findings strongly agreeing that their classrooms were built of concrete stones with metal doors and windows, compared to 60.0% in non-sponsored schools. This indicates a significant difference in infrastructure quality, with sponsored schools showing better construction (97.4% vs. 70.5%). Simple regression analysis showed that NGO-sponsored schools had lower p-values ($p \leq 0.01$ for power availability and digital hardware, $p = 0.05$ for adequate gadgets) compared to non-sponsored schools ($p = 0.05$, 0.05, and 0.10 respectively). These results indicate significant differences in infrastructure availability, supporting the rejection of the null hypothesis.

Conclusion: The conclusion made was that NGO-sponsored schools possess significantly superior digital learning infrastructures compared to their non-sponsored counterparts. The robust construction of classrooms, reliable electricity supply, and the availability of essential wiring and power sockets collectively create an environment that is highly conducive to effective digital literacy programs. This enhanced infrastructure provides a stable foundation for the integration and use of digital technologies in the school. The study recommends that efforts be made to increase NGO sponsorship in public primary schools to increase the chances

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of learners attending the schools getting access to essential digital skills. This could involve intentional efforts by the Ministry of Education to reach out to NGOs and pursue partnership opportunities in this direction.

Keywords: *Digital learning infrastructures, NGO-sponsored, non-sponsored public primary schools, Buuri and Isiolo sub-counties*

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1.0 Introduction

The continued developments in technology have influenced all spheres of life, and education is no exception. Educational institutions and governments consider the use of computers and modern technology in teaching as ideal for learning in the 21st century (Srivastava & Dey, 2018). According to Explorance (2023), digital literacy is important because it enhances: access to information and resources; connects the classroom experience to the real world; prepares learners for the modern workplace; supports different types of learning styles; enhances global awareness and cultural exchange; teaches students how to be responsible of the internet; and makes learning fun. Murray et al. (2010) affirms this but highlight that access to equipment and quality resources is a prerequisite to the application of digital literacy and argue that in many countries, enhancing this access calls for public-private partnerships as many governments may not be able to meet this need alone.

According to Vlies (2015), European countries have largely incorporated digital literacy in their education system and this has brought many social and economic benefits to the industrialized countries. UNESCO (2013) affirms this and adds that education systems that have embraced technology enjoy benefits such as a multimodal interactive platform for learners and a wide variety of rich content for teachers.

In Namibia, a consultative process led to successful integration of digital literacy in their education system and significantly boosted the digital literacy of Namibians, while translating into a change in their digital economy (Murray et al., 2010). The use of digital literacy in teaching and learning improves teaching abilities and content comprehension, in addition to increasing instructional efficiency and communication (Wairumbi, 2021).

Many strategists have alluded to the power of digital literacy in addressing joblessness in Africa. Martin (2006) as cited in Tang & Chaw (2016) explains that digital literacy is acquired in levels and that access to the technology is the first level. In its social pillar, Kenya's development blueprint articulates the place of technology in boosting the country's industrialization and innovation. The government has for the last 10 years focused on investing in education and technology as this is believed to be a key roadmap to achieving most of the mid-term goals towards Kenya Vision 2030. This is even evident in the financial commitments of the country as KSH. 14.4 billion in the 2016/2017 national budget was allocated to digital literacy in public primary schools (Kenya's Treasury, 2017). Guided by the National Laptop Policy, the government of Kenya then distributed digital hardware equipped with digital content and trained teachers in public primary schools using this allocation (Mariga et al., 2017).

Kenya's current Basic Education Curriculum Framework (KICD, 2019) recognizes digital literacy as one of the key core competencies that every learner is expected to acquire. Others are Communication and Collaboration, Self-efficacy, Critical Thinking and Problem-Solving, Creativity and Imagination, Citizenship, and Learning to Learn (KICD, 2019). Concerted efforts are needed to make it possible for all learners to access digital learning because the

government alone may not be able to equip all schools, especially with CBC in place. For that reason, corporates (such as commercial banks), churches, school alumni, and NGOs among other groups are on board. NGOs are helping mobilize resources from developed countries (including the G20 countries charged with the responsibility of supporting developing countries to reduce the digital literacy gap (Lyons et al., 2019).

1.1 Problem Statement

The United Nations International Children's Education Fund (UNICEF) acknowledges that African governments must prioritize digital literacy in schools to secure the future of African children in a fast-growing competitive yet digital world. Numerous policy guidelines, followed by the mainstreaming of digital literacy into the day's education system along with the financial investment made by Kenya's government and other partners towards producing a more digitally literate population should translate into public primary schools that have access to adequate and functional digital devices, present technical support, functional and regular teacher capacity building programs, and updated digital content for optimal utilization of the digital gadgets. The Competency-Based Curriculum is designed to ride on digital literacy as the main vehicle for the attainment of all seven core competencies, and the content currently in the curriculum design heavily draws from online sources, especially YouTube. The expectation is that the modern-day teacher and learner, irrespective of their economic, social, religious, geographical, or cultural backgrounds, must have access to resources to enhance digital literacy.

However, this is not yet the case as access is still limited. The August 2023 report on the implementation of CBC by the Presidential Working Party reveals that the Digital Literacy Competency was among the poorly attained competencies, with an average of 47.6% (Government of Kenya, 2023b). Inadequate access to digital literacy and the capacity of users were identified in the report as the major challenges in schools as the country rolls out a new education system. The specific access indicators are confirmed by (Wairumbi, 2021) and include insufficient competencies of the teachers, inadequate digital infrastructure, insufficient administrative and technical assistance, and poor learner involvement. The gadgets donated by the government are believed to have been put to little use in most of the schools. Also, the gadgets were donated only once to one group, pointing out the possibilities of inadequacy hence limited access. These statistics are indicative of the existing challenge in attaining digital literacy and help point out the differences that exist among various groups in society. The purpose of this study was to assess the availability of digital learning infrastructures in NGO-sponsored and non-sponsored public primary schools in Buuri and Isiolo sub-counties.

1.2 Research Hypothesis

H_0: There is no significant difference in digital learning infrastructure between public primary schools with NGO sponsorship and those without sponsorship.

2.0 Literature Review

2.1 Theoretical Review

The study used Jan Van Dijk's Theory of Digital Technology Access and Social Impacts (Hacker & van Dijk, 2000) to guide data collection, analysis, and interpretation of the findings. This theory was found relevant to this study because it explains the digital literacy gap mainly from an access perspective and explains that access is the main aspect that brings about digital literacy gaps globally. Hacker and Van Dijk (2000) explain that the concept of the digital

literacy gaps is multifaceted and describes the following types of digital access that bring about inequalities among individuals and groups in society:

Psychological access: This is due to individuals showing no interest in technology or being afraid of digital technology.

Material access: This is where individuals exhibit digital gaps because they have no access to actual digital gadgets. According to Hacker and van Dijk, (2000), this is what public opinion and public policy consider to be 'digital literacy'. Many people and institutions do not care to find out what else it takes to achieve digital literacy beyond the provision of gadgets (Muriira, n.d.).

Skills access: Van describes this as an access gap brought about by insufficient training, hence making individuals incapable of being digitally literate.

Usage gap: The theory attributes this gap to a lack of opportunities and platforms for individuals to utilize technology to gain more confidence and access to information.

2.2 Empirical Review

Globally, in a study conducted to establish the barriers perceived by teachers in the implementation of ICT in the classroom by teachers in Manarashtra India (Singhavi et al., 2019), insufficient digital literacy hardware was identified as one of the major barriers. The study recommends that schools should consider the PPP option to support an increase in access to the required infrastructure. With these partnerships, public schools can increase access to key facilities to support learning as the government alone cannot finance education fully. Many countries have adopted the cost-sharing policy of financing education, and this is very common and effective in this century.

Regionally, to determine the capacity of African countries to support learners during the COVID-19 school closures, Krönke (2020) explored the digital capacity of 34 African countries. The findings indicate that on average, only 19% of the households have both a computer and a smartphone that can access the internet while 25% of the households have access to a smartphone that can access the internet. Further, the study indicated that the digital literacy gap is more pronounced in rural areas than in urban areas while 32% of the households in urban areas have access to both a smartphone and a computer, while only 9% of rural households have the same privilege.

Locally, In Kenya, the study showed that 17% of the households had both a computer and a smartphone, 26% had either a computer or a smartphone, 40% owned a phone but with no access to the internet and had no computer, and 17% had neither a computer nor a smartphone (Krönke, 2020).

Kenya's implementation of the OLPC program was well aligned with the then National ICT Master Plan of 2012-2017 that sought to guide the country into quick ICT investment and innovation, with a special focus on developing digital literacy skills among young learners in primary schools. This was also aligned with Vision 2030 and was quickly taken up by the Jubilee government as one of their campaign manifestos, and deliverables when they were elected to office in 2013.

3.0 Methodology

The study used deductive reasoning and adopted the descriptive survey research design. The study targeted 79 public primary schools in the 2 sub-counties, 79 headteachers, 79 ICT teachers, 2,192 Grade 6 learners, and their 79 Grade 6 class teachers. The researcher selected

a 20% sample to get 16 schools, 16 headteachers, 16 ICT teachers, and 16 class teachers. Purposive sampling techniques were used to select 11 schools with NGO sponsorship while simple random sampling was used to select 5 schools without sponsorship for the comparative sample. Systematic random sampling was used to get a 15% sample from the learners 329 Grade 6 learners. A pre-test was conducted in Laikipia North Sub-County. Data was collected using questionnaires, interview schedules, and observation checklists. Face and content validities were examined and Cronbach coefficient was used to measure reliability. Descriptive data was analyzed using percentages, mean, and standard deviation scores, while data from interviews was organized into themes and reported using quotes and narration and reported alongside the findings from descriptive data.

4.0 Results and Discussion

4.1 Response Rate

The study sampled 16 headteachers, 16 ICT teachers,16 class teachers, and 329 Grade 6 learners. Data was collected using questionnaires, interview schedules, and observation checklists. The results of their response rates are shown in Table 1.

Table 1: Response Rate

Respondent	Frequency			Percentage of Response Rate
	Received Responses	Missing Responses	Total	
Headteachers	16	0	16	100%
ICT teachers	16	0	16	100%
Class teachers	16	0	16	100%
Learners	275	54	329	83.6%
Total	323	54	377	85.7%

The results depicted in Table 1 reveal that 16 responses were expected from the head teachers, ICT teachers, and class teachers respectively. These 3 groups delivered a 100% response rate as per Table 1 above. Of the 329 responses expected from the learners, 275 were achieved, making it 83.6%. The average response rate from all the respondents was 85.7%.

4.2 Reliability Results

A pre-test study was conducted in Laikipia North Sub-County. The questionnaires were tested and re-tested with 7% of the sample making 1 school. The fitness for analysis of the data collected was statistically determined using the Cronbach's Alpha coefficient test as indicated in Table 2.

Table 2: Reliability Results

Section	Number of Items	Cronbach's Alpha
Grade 6 Class Teachers	4	0.707
Grade 6 Learners	5	0.922
ICT Support Teachers	5	0.817

Table 2 shows that the Cronbach Alpha coefficient values were above the acceptable 0.7, indicating the reliability of the instruments used in the study.

4.3 The Availability of Digital Learning Infrastructures

The indicators of this study were; available electricity, available digital gadgets, and adequacy of the available gadgets. The study administered questionnaires to the respondents whose results are shown in Table 3.

Table 3: Grade 6 Learners - Digital Literacy Infrastructures - Sponsored Schools

Classroom quality and Electricity Access

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My classroom is built of concrete stones, metal doors, and windows.	79.9%	17.5%	2.1%	0.0%	0.5%
My classroom has wiring and power sockets to support use of digital devices	49.5%	26.3%	6.7%	10.3%	7.2%
My classroom has Electricity power from Kenya's power	50.0%	21.6%	4.1%	3.6%	20.1%
My classroom has a solar-powered connection	27.3%	7.2%	1.0%	21.1%	43.3%
We have a safe place to store digital devices	58.8%	25.3%	10.3%	2.1%	1.0%

Table 4. Grade 6 Learners - Digital Literacy Infrastructures - Comparative Schools

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My classroom is built of concrete stones, metal doors, and windows.	62.0%	8.5%	2.8%	4.2%	18.3%
My classroom has wiring and power sockets to support use of digital devices	29.6%	11.3%	2.8%	8.5%	45.1%
My classroom has Electricity power from Kenya power	33.8%	5.6%	1.4%	4.2%	47.9%
My classroom has a solar-powered connection	18.3%	4.2%	4.2%	9.9%	59.2%
We have a safe place to store digital devices	45.1%	9.9%	2.8%	8.5%	26.8%

Table 3 and Table 4 indicate that 79.9% of learners in sponsored schools strongly agreed that their classrooms were built with robust materials compared to only 62.0% in non-sponsored schools. 70.0% of teachers in sponsored schools confirmed these findings strongly agreeing that their classrooms were built of concrete stones with metal doors and windows, compared to 60.0% in non-sponsored schools. This indicates a significant difference in infrastructure quality, with sponsored schools showing better construction (97.4% vs. 70.5%).

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4.4 Qualitative Analysis Results

Headteachers from NGO-sponsored schools highlighted the crucial role of NGOs in providing and maintaining digital infrastructures. They noted that without NGO support, their schools would struggle to meet digital literacy goals due to limited governmental support. Specifically,

> ***Respondent F:*** *"The digital infrastructure provided by NGOs has been crucial for our school's digital literacy programs. Without their support, we would not have been able to meet our goals."*
>
> ***Respondent G:*** *"Our school lacks many digital devices that NGO-sponsored schools have. This disparity makes it challenging to offer the same quality of digital education."*
> This finding is further supported by that of Kiugu (2020)

Access to digital resources and facilities is key to enhancing the acquisition of digital literacy skills and overcoming material access barriers. Schools with sponsors have increased access to these resources and are even able to interact with the technological resources without the need for the Internet because the sponsor has invested in technology that does not need Internet access. Most of the non-sponsored schools have access to the internet but still, the facilities and resources available are not easily accessible to the learners and teachers. The internet is mostly used for administrative purposes, with headteachers commenting they must have access to it because the TSC and MOE require them to submit so much data online. They do not report so much use of the internet for learning purposes, citing other challenges like insufficient devices, faulty learner devices, and lack of digital content. This means that the availability of the Internet in public primary schools does not necessarily contribute to acquisition of digital skills among learners and teachers.

4.5 Correlation Analysis to Test Hypothesis of the Study

Regression analysis was used to determine whether there is a significant difference in the availability of digital learning infrastructures between schools with NGO support and those without.

Regression Model: Enhanced Digital Literacy Access $= \beta 0 + \beta 1 \times$ Availability of Digital Learning Infrastructures $+ \epsilon$

Table 5: Regression Variables

Variable	Sponsored β	Sponsored p	Non-Sponsored β	Non-Sponsored p
Power Availability	0.50	0.01	0.35	0.05
Digital Hardware	0.40	0.01	0.30	0.05
Adequate Gadgets	0.30	0.05	0.20	0.10

In examining the availability of digital learning infrastructures, it was found that power availability significantly impacts digital literacy access in NGO-sponsored schools, with a beta coefficient (β) of 0.50 and a p-value of 0.01. This indicates a highly significant relationship. In contrast, non-sponsored schools also show a significant impact of power availability on digital literacy access, but to a lesser extent ($\beta = 0.35$, $p = 0.05$).

For digital hardware, NGO-sponsored schools demonstrate a strong influence on digital literacy access ($\beta = 0.40$, $p = 0.01$), while non-sponsored schools also display a significant influence, though slightly less robust ($\beta = 0.30$, $p = 0.05$). Adequate gadgets have a positive effect in sponsored schools ($\beta = 0.30$, $p = 0.05$), whereas in non-sponsored schools, the effect is minimal and not significant ($\beta = 0.20$, $p = 0.10$).

The first hypothesis (H01) stated that there is no significant difference in digital learning infrastructure between public primary schools with NGO sponsorship and those without sponsorship. The data indicates significant differences in favor of NGO-sponsored schools across multiple measures of digital learning infrastructure. Sponsored schools consistently reported higher levels of infrastructure availability, including classroom robustness, wiring and power sockets, electricity supply, solar power, safe storage for digital devices, and the devices themselves.

The P values for the indicators in the sponsored schools meet the threshold of less than or equal to 0.05 indicating a significant difference and supporting the rejection of the null hypothesis. The values are above 0.05 in the non-sponsored schools.

Therefore, H01 can be rejected, indicating that there is indeed a significant difference in the availability of digital learning infrastructure between NGO-sponsored and non-sponsored public primary schools. This finding underscores the positive impact of NGO sponsorship on enhancing the digital learning environment in these schools.

4.6 Summary

NGO-sponsored schools demonstrated a significantly higher availability of essential digital learning infrastructures compared to their non-sponsored counterparts. Also, necessary electrical wiring and power sockets were much more prevalent in sponsored schools. The reliability of the electricity supply, sourced from both Kenya Power and solar connections, was markedly higher in sponsored schools. This ensured a steady and consistent power supply for digital devices, which is crucial for maintaining uninterrupted digital learning activities. The more reliable electricity infrastructure in sponsored schools underscores their enhanced capacity to support digital education effectively compared to non-sponsored schools.

5.0 Conclusion

The conclusion made was that NGO-sponsored schools possess significantly superior digital learning infrastructures compared to their non-sponsored counterparts. The robust construction of classrooms, reliable electricity supply, and the availability of essential wiring and power sockets collectively create an environment that is highly conducive to effective digital literacy programs. This enhanced infrastructure provides a stable foundation for the integration and use of digital technologies in the school.

6.0 Recommendations

The study recommends that efforts be made to increase NGO sponsorship in public primary schools to increase the chances of learners attending the schools getting access to essential digital skills. This could involve intentional efforts by the Ministry of Education to reach out to NGOs and pursue partnership opportunities in this direction.

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