

ICT INFRASTRUCTURE AND IMPLEMENTATION OF DIGITAL LITERACY PROGRAMME IN PUBLIC PRIMARY SCHOOLS IN ISIOLO COUNTY, KENYA.

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ABSTRACT

The study sought to investigate the influence of school factors on the implementation of digital literacy programme in public primary schools in Isiolo County. The following objective guided the study: To examine how ICT Infrastructure influences the implementation of the digital literacy programme. The study was anchored on Innovation Diffusion Theory (2003), employed a descriptive survey research design, and targeted 89 respondents from 22 public primary schools with digital literacy programs. The study's sample size was 22 Headteachers, 45 lower primary teachers, and the Sub-county director of education, translating to 68 respondents. The primary data was collected using questionnaires, and a statistical Package for Social Sciences Version 22 observation checklist was used to run descriptive and inferential statistics. The study's findings revealed that; the overall DLP implementation level was just average at 42.4%; relationship of ICT Infrastructure was found to be statistically significant with DLP Implementation positively, with a correlation coefficient index of 0.334. Most of the teachers in this study reported that the digital literacy programme was not active, with only 8.9 % agreeing that their schools were very active in DLP. In comparison, 42.2% agreed that DLP was somewhat active, signifying the low levels of DLP Implementation. The study calls for a combined effort from all stakeholders in education to address the challenges affecting digital literacy programme implementation

levels in its early stages after a successful rollout. The study recommended that the Ministry of Education ministry build a functional ICT infrastructure with a well-equipped computer laboratory and employ ICT teachers or technicians in every school to fix technical issues on digital tablets.

Keywords: Digital literacy program, ICT implementation, ICT Infrastructure

I. INTRODUCTION

Digital literacy is listed as a leading project of the Ministry of Information Communications and the Digital Economy, Kenya. It is Implementing a digital literacy programme requires the available technological infrastructure, skilled teachers, and a positive attitude towards necessary teaching and learning practices changes in response to the introduced technology (Fyksen, 2011).

The literature review has established that there are few empirical studies conducted in Kenyan public primary schools on digital literacy implementation, and no single study has been carried out specifically in public primary schools in Merti sub-county, which is one of the ASAL regions; hence the existence of a research gap in the area which this study intended to fill by investigating the school factors influencing the implementation of digital literacy programme in public primary schools in Merti sub-county, Isiolo county.

Understanding and using various technology tools for different reasons is known as digital literacy (Mantiri, Hibbert, & Jacobs, 2019). Digital literacy, according to Widona (2020), is the capacity to utilize and produce technology-based content, such as gathering and exchanging information, responding to inquiries, engaging with people, and computer programming. Digital literacy is a crucial component to include in curricula for students worldwide, and it is already present in developing nations like Finland, where the focus is on building students' skills for the burgeoning digital economy.

Students are digitally literate and capable of integrating digital material into the classroom because they are familiar with digital technology and have the skills to access, create, and share digital information (Ting, 2015). Although most students are considered tech-savvy, some need help efficiently integrating digital tools into their daily lives. Copeland and Greene (2014)

The worldwide COVID-19 pandemic crisis in education has forced the integration of digital technologies to provide crisis relief (UNESCO, 2014). Additionally, the need to address how learning occurs in classrooms has been spurred by the shortage of newly graduated teachers with the skills demanded by the labor market (Global Risks, 2015). Digital literacy is one of the key competencies included in the Kenya Institute of Curriculum Development (KICD) curriculum, which is aligned with UNESCO, research, and the British Council's Connecting Classrooms initiative.

The government of Kenya planned to integrate ICT across all levels of education, particularly public primary schools, by launching the digital literacy program in 2017 with the goal of integrating technology into the teaching process in public primary

schools. This was done in phases across the country and carried out by a multi-organizational method made up of the Ministry of Education, Science and Technology, TSC, KICD, and ICT Authority. The goal of the digital literacy initiative was to use digital technology to improve learning in Kenyan schools (Digi School, 2016). The digital literacy program's failure to gain traction in Kenya was largely caused by school issues and the fact that its design and leadership style did not allow for widespread engagement and involvement of organizations tasked with carrying out crucial project components.

In their study on the difficulties implementing computers for administrative use in public secondary schools in Nyamira North District, Nyamira County, Kenya, Ocharo, Irene, and Momanyi (2015) discovered that insufficient teacher training on computer skills, inadequate computer hardware, software, and legislation regarding computer systems' usage in training science subjects have contributed to the schools' limited use of computers, which restricts the practical applications of computers.

In Kenya, where only a small portion of school-age children attend primary school, integrating technology into primary education is a serious problem (MOEST, 2012). However, evidence from studies conducted in numerous counties revealing low application of the digital literacy plan in Kenya's public elementary schools shows that the program's execution was hampered in the early stages of rollout. Mahinda (2018) discovered that students in public elementary schools in Nakuru who used ICT in the classroom had difficulty accessing digital information because of poor computer networks and insufficient ICT knowledge.

No single study focused on the level of implementation of digital literacy programme in public primary schools. On that ground, this study sought to establish the influence of school factors on the implementation of digital literacy programme in public primary schools in Merti sub-county, Isiolo County.

II. STATEMENT OF THE PROBLEM

Developing nations are incorporating ICT into their educational systems to increase access to education and learning. The promotion of the integration of digital technology into the curriculum in public elementary schools is a key component of Kenya's education ICT framework. Despite the government deploying digital literacy devices in public elementary schools, many institutions have yet to benefit from technological integration. The execution of the digital literacy program is behind schedule due to several challenges. There has been little research progress in implementing a digital literacy programme in Merti sub-county, an ASAL area. This study follows up on the need to close the gap by examining how ICT infrastructure affects the program's implementation in public primary schools in Merti Sub-County, Isiolo County.

III. RESEARCH OBJECTIVE

- i. To determine the relationship between ICT infrastructure and the implementation of the digital literacy programme.
- ii.

IV. LITERATURE REVIEW

The Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in Germany recently published its policy document on "education in the digital world," which calls on schools to help students across all subject areas develop digital capabilities.

The European Digital Competence Framework's categories for student competencies are used (Dig Comp, Ferrari 2013). In developing countries such as Nigeria, the application of ICT to the teaching and learning process are still in its infancy, with little or no digital literacy skill on the part of the college of education lecturers (Ebele, Ejedafiru & Oghenetega, 2013). A study by Buabeng-Andoh (2012) in Ghana found that despite the heavy investment in infrastructure equipment, professional development, ICT adoption, and integration in teaching and learning was still limited. Further, they found that lack of teachers' ICT skills, teacher confidence, lack of pedagogical teacher training, lack of suitable educational software, limited access to ICT, the rigid structure of the traditional education system, and restrictive curricula were the main barriers to ICT adoption.

Information and communication technology (ICT) will play a significant role in Kenya's development into a fast-industrializing economy by 2030, according to the country's Vision 2030 program. Establishing a computer supply program to provide students with contemporary IT skills and align ICT integration into teaching and learning was one of the vision 2030 flagship initiatives for education and training. ICT is crucial in achieving Sustainable Development Goals (SDG), and DLP is a reaction to those goals. The use of ICT in school learning was given priority by the Kenyan government in 2005 in order to accomplish the goal.

This was consistent with Sessional Paper No. 1 of 2005, which sought to ensure that ICT was a universal tool for education and training to encourage ICT integration in the curriculum following the National ICT Policy of 2006.

As a result, the Kenyan government launched the DLP for all primary schools in the education system in response to the necessity to utilize technology in the execution of curricula.

The Digital Literacy Programme (DLP) project seeks to make digital use for learning possible for all students. This program introduces students in public elementary schools to digital technology and other communication tools. Early years learners in grades 1 to 3 were the target audience for the Phase I tablet distribution. There was a need to conduct a study to determine the school factors influencing the implementation of the digital literacy program in public primary schools in Merti Sub-county, Isiolo County, due to the low implementation process in public primary schools in Kenya, as indicated by the literature review.

The lack of adequate infrastructure has hampered the implementation of the laptops project in public primary schools in the country. According to the World Bank Institute report of 2010, the backbone of ICT projects in education ties itself to infrastructural facilities that range from hard infrastructure like computer laboratories, computers, and electricity and computer hardware to software infrastructure like local internet connection and computer software. According to Broadley (2012), ICT project implementation requires physical infrastructure that is not limited to the power supply and structures like buildings, technical expertise, and psychological readiness. ICT projects can only be managed and used by people with technical skills. Ghavifekr & Rosdy (2015), in their study on the level of technology integration in Malaysian schools, established that the ICT project implementation in the schools in Kuala Lumpur was successful mainly due to

the presence of well-established infrastructure teacher training and preparedness.

Arinze & Okonkwo (2012) established that ICT facilities in Nigerian schools were still inadequate while students' competence in using ICT for learning was still low. ICT use influenced students' interest in learning and their performance in social studies. Malero, Ismail, and Manyлізу (2015), in Tanzania's study results, indicated that lack of ICT facilities in the schools is a major factor contributing to the low Implementation of ICT. Access to ICT infrastructure and resources in schools is a necessary condition.

In Kenya, Muriithi (2017) found that inadequate infrastructure was one of the main issues leading to the ICT project's failure. Nyaundi (2019) found that poor training of teachers, lack of electrical power, and power disconnections due to non-payment of electricity bills were the main reasons for the failure of ICT projects in schools. The digital literacy programme implementation is the dependent variable influenced by independent variables of ICT Infrastructure.

V. RESEARCH METHODOLOGY

This study adopted the descriptive survey design. The target population for this study was 22 public schools in Merti sub-county implementing the digital literacy programme. The sample for the study was composed of 22 head teachers, 66 teachers in lower primary school, and 1 sub-county director of education, making a total target population of 89 respondents. Therefore, all 22 head teachers and 1 sub-county director of education were selected purposively by census. Simple random sampling was used to select 45 (68.2%) teachers from lower primary school. 2 teachers from each of 21 schools were selected, and 3 teachers were

selected from one school, which had the highest enrolment in grades 1-3, to ensure the quality of the responses. This translated to a sample size of 68 respondents, as shown in Table 3

Table 1: Sample Size

| Category | Total population | Sample size | Percentage % |
|---------------------|------------------|-------------|--------------|
| Headteachers | 22 | 22 | 100 |
| Teachers | 66 | 45 | 68.2 |
| Sub-county Director | 1 | 1 | 100 |
| Total (N) | 89 | 68 | 76.4 |

Source: SCDE Office Merti sub-county

The study used questionnaires to collect data from teachers and head teachers and an unstructured interview schedule for the sub-county director of education. In addition, an observation checklist was used to determine the availability of ICT resources at schools. The questionnaires had both open and closed-ended questions. An ICT score was calculated for the school, and this was further correlated with digital Literacy programme implementation, measured by the number of times the digital devices were used in a week.

Results and Discussion

Table 2 below summarises how often teachers used digital tablets in class and a measure of how active the digital literacy program was in the school.

Table 2: Digital Devices Usage

| | Frequency | Percent |
|--------------|-----------|--------------|
| Never | 13 | 28.9 |
| rarely | 16 | 35.6 |
| sometimes | 16 | 35.6 |
| Total | 45 | 100.0 |

From Table 2, most of the teachers (Almost two-thirds), 64.5 %, reported rarely or never using digital tablets per week despite the

availability of digital tablets in their school. This result gives a worrying trend in the level of DLP implementation in Merti sub-county, considering that each school should have some digital learning lessons in a week. On a similar question, the following Table 3 summarises the responses of the lower class teachers to their rating of the DLP activeness in their school.

Table 3 Teacher rating of Digital Literacy Programme Activeness

The overall level of DLP

| | Frequency | Percent | Valid Percent |
|-----------------|-----------|--------------|---------------|
| not active | 22 | 48.9 | 48.9 |
| somewhat active | 19 | 42.2 | 42.2 |
| much active | 3 | 6.7 | 6.7 |
| very active | 1 | 2.2 | 2.2 |
| Total | 45 | 100.0 | 100.0 |

Table 3 shows that only 8.9 % of teachers thought their school DLP was Much active, while most of the teachers (91.1%) in this study reported that DLP was barely active in their schools. Only one school reported a very active DLP implementation. From the descriptive statistics, the overall score on DLP is somewhat active at 1.62, translating to 40.5%, somewhat active. Table 4 shows the ICT infrastructure in the schools sampled.

Table 4: Availability of resources for digital Literacy program implementation

| serial | Criteria | No of schools | % Schools |
|--------|--|---------------|-----------|
| 1 | The school has a computer laboratory | 1 | 4.5 |
| 2 | The school has adequate Computers/Laptops | 13 | 59 |
| 3 | Availability of reliable Power supply in the school | 11 | 50 |
| 4 | Availability of reliable Internet connectivity | 0 | 0 |
| 5 | There is LCD Projector in the school | 20 | 90.9 |
| 6 | There is adequate computer software's on digital tablets | 20 | 90.9 |
| 7 | There is a digital wireless router in the school | 21 | 95.4 |

To test the relationship between infrastructure and DLP implementation, we set a hypothesis, testable at alpha 0.05;
H0: There is no relationship between ICT infrastructure and the level of Digital Literacy Programme implementation in Merti public primary schools.

Table 5: ICT Infrastructure and DLP Implementation

| | | Level of DLP | ICT Infrastructure |
|--------------------|---------------------|--------------|--------------------|
| Level of DLP | Pearson Correlation | .390 | .390 |
| | Sig. (2-tailed) | .008 | .008 |
| | N | 45 | 45 |
| ICT Infrastructure | Pearson Correlation | .390 | .390 |
| | Sig. (2-tailed) | .008 | .008 |
| | N | 45 | 45 |

ICT Infrastructure availability was measured using overall scores on the scoresheet to determine this correlation. In contrast, the level of DLP was measured by the number of times the digital devices were used in a week. The results from the analysis in Table 5 illustrate that the Pearson product-moment correlation index obtained on the level of DLP and ICT Infrastructure is $r = 0.390$ with significance $p\text{-value} = 0.008$, which is less than $\alpha = 0.05$. Statistically, since the $p\text{-value}$ for the relationship variable is less than $0.05 (0.008 < 0.05)$, we reject the null hypothesis and conclude that a significant relationship exists between ICT Infrastructure and DLP implementation. This implies that the availability of ICT Infrastructure is statistically significant and positively related to digital literacy implementation.

This study's findings are consistent with those of Ghavifekr & Rosdy (2015), whose research on ICT project implementation in schools found that its success highly depended on a well-established ICT infrastructure. The availability of ICT structures is key to successfully implementing the digital literacy program. Therefore the null hypothesis that we set out to prove was rejected. Generally, ICT Infrastructure influences were positively related to DLP Implementation. Schools with more ICT Infrastructure had higher levels of DLP implementation than those with little or no ICT Infrastructure.

Challenges to DLP implementation.

Table 6 summarises headteachers' views on the challenges they faced in implementing the Digital Literacy Program.

Table 6: Headteacher Responses on challenges faced in DLP Implementation*n* = 22

| Challenge | % |
|--|--------|
| Teacher lacks ICT skills | 72.75% |
| Learners are not interested in digital services. | 38.75% |
| Teachers are not willing to teach with digital devices | 43.25% |
| Power supply not reliable | 79.5% |
| Inadequate internet connectivity in school | 100% |
| Financial constraints to repair devices | 100% |
| Lack of technical support to repair devices | 100% |

Table 6 presents the response rates on various highlighted challenges faced in DLP implementation in this study. From the analysis, it's worth noting that; inadequate internet connectivity, financial constraints to repair devices and lack of technical support had an overall response rate of 100%, implying these challenges cut across all the schools. Most headteachers (72.7%) mentioned that teachers lacked ICT skills. However, when asked if they have the necessary ICT skills for the DLP, 90.5% of teachers answered in the affirmative. According to 43.3 % of the managers, only teachers were unwilling to teach using digital devices, implying most teachers embraced the DLP implementation. Similarly, it was noted that only about a third (38.7%) of headteachers thought that learners had no interest in digital devices.

A majority of the headteachers (79.5%) agreed that the power supply was not reliable across the schools and the findings are in line with a study conducted by Nyaundi (2019), who found that poor training of teachers, lack of electrical power and lack of technical support were the main reasons for the failure of ICT projects in schools hence for the government to realize the set goals of DLP the obstacles addressed by this study need to mitigate.

These results bring to light some positivity toward embracing the Implementation of the DLP among teachers.

It was worth noting that most teachers acknowledged the challenges linked to solutions raised. This is also supported by feedback from the interview with the Sub County director of education. Among them, the provision of enough digital devices was key because some schools in the sub-county were yet to receive a single digital device. Other suggestions include providing technical training on use to learners and teachers, safe storage for devices, technicians for frequent software installation and repairs, providing reliable internet connections and power, and promoting a positive attitude towards embracing digital literacy.

Only one school accounting for 4.5%, had a computer laboratory; this could be explained by the fact that the schools visited were public primary schools where most of them lack important ICT Infrastructure, a situation that compromises the achievement of digital learning goals in public primary schools in Merti sub-county. The total number of schools visited in this study had been earmarked for the DLP implementation in the Sub County; of these, 13, which accounts for a majority, 59.1% had adequate computers/laptops available, with rest lacking an adequate number of laptops. This challenge of inadequate laptops was witnessed across the county, backed by the Sub County director of education, who reported some schools were yet to receive a single tablet. Half of the schools had mains power available in this study, while the remaining 50% lacked mains power. This raises concern since a reliable energy source is crucial for a successful DLP implementation.

It was evident that none of the schools had a reliable internet connection. Many schools explain this huge number of schools lack the Local Area Network, which could guarantee a reliable internet source. All the visited schools relied on wireless routers for internet connectivity, as observed during data collection. Of all schools rolling out DLP majority of these schools (90.5%) had LCD projectors available for use in digital learning, 95.5% of the schools had a wireless router, and a vast majority of schools at 90.9% had computer software installed in the tablets. Generally, the availability of these ICT resources is crucial to achieving a high level of digital literacy programme, as evidenced in a study by Manylizu (2015), whose study concluded that ICT infrastructure was the main reason for low DLP implementation and that the ICT infrastructure is very necessary if DLP implementation must be achieved in public primary schools in Merti sub-county.

VI. CONCLUSION AND RECOMMENDATIONS

The study aimed to examine how ICT infrastructure influences the implementation of digital literacy programme in public primary schools in Merti sub-county, Isiolo County. The study found that ICT infrastructure had a significant effect and influenced DLP implementation. Generally, ICT Infrastructure influences were positively related to DLP Implementation, and schools with more ICT resources have higher DLP activity and a higher level of DLP implementation than those with limited ICT resources. Also, inadequate digital tablets in schools to be used by e-learners classes has affected the implementing of the digital literacy programme in public primary schools in Merti sub-county.

The total number of schools visited in this study had been earmarked for the DLP implementation in the Sub County; of these, 13, which accounts for a majority, 59.1% had adequate computers/laptops available, while the rest lacked an adequate number of laptops. This challenge of inadequate laptops was witnessed across the county, backed by the Sub County director of education, who reported some schools were yet to receive a single tablet. Generally, the availability of ICT resources in school is crucial to achieving high levels of digital literacy programme.

Based on the findings and conclusions of this study, the ministry of education should train more teachers on ICT and procure adequate digital tablets to take care of the influx of learners' grades to ensure no compromise on the quality and effectiveness of digital learning. The Education ministry should build a functional ICT infrastructure consisting of a well-equipped computer laboratory where all digital literacy learning can be effectively stored and scheduled. The Education Ministry should hire ICT technicians and deploy them to various schools to support the digital literacy programme in schools to regularly inspect and fix any technical hitches. We also recommend that the education Ministry supports a few schools in the counties to serve as real daily examples of the ministry's ideal Digital Literacy Programme for other schools and teachers to emulate.

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