ICT Policy Implementation in Physics Instruction: The Status of Tools, Resources and Technologies Currently Used in Public Secondary Schools in Matayos Sub County

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Abstract

In the year 2021 the Ministry of Education enacted the policy on information and communication technology in education and training. The policy spells the whole process of implementation of ICT in teaching and learning in all the secondary schools. However, despite the significant investment in ICT infrastructure and the formulation of national policies to promote the use of technology in teaching, the actual implementation of these policies at the local level remains inconsistent. In some counties overall performance of the subject falls short of the national one (Murei, 2016). In Matayos Sub County, most secondary schools are day replete with infrastructural challenges. Similarly, being close to the border of Kenya and Uganda there are numerous roaming networks which presents diverse challenges related to the effectiveness of some infrastructure for ICT policy implementation. There is also limited research on how the policy is being implemented in public secondary schools, particularly in relation to ICT infrastructure available in schools for the teaching of Physics. The findings indicate that most schools did not have adequate ICT tools and resources while a few that were available were hardly utilized during Physics lessons. The results showed that ICT infrastructure was not sufficient and the frequency of use varied by nature of resource and also by the school type. The sub county schools had a higher mean percentage use of six (6) ICT tools compared to county schools.

Keywords: ICT Policy Implementation, Physics Instruction, Matayos Sub County

1. INTRODUCTION

In the year 2021 the Ministry of Education enacted the policy on information and communication technology in education and training. The policy spells the whole process of implementation of ICT in teaching and learning in all the secondary schools. However, despite the significant investment in ICT infrastructure and the formulation of national policies to promote the use of technology in teaching, the actual implementation of these policies at the local level remains inconsistent. In some counties overall performance of the subject falls short of the national one (Murei, 2016). In Matayos Sub County, most secondary schools are day replete with infrastructural challenges. Similarly, being close to the border of Kenya and Uganda there are numerous roaming networks which presents diverse challenges related to the effectiveness of some infrastructure for ICT policy implementation. There is also limited research on how the policy is being implemented in public secondary schools, particularly in relation to ICT infrastructure available in schools for the teaching of Physics.

1.1The Status of ICT Infrastructure in Kenyan Schools: An Overview.

ICTs are enablers in the acquisition of 21st Century skills in the implementation of the Competency Based Curriculum (CBC) and Competency Based Education and Training (CBET). Seamless integration of ICT in education and training will improve learning outcomes across all levels. Policy formulation, capacity development, digital content and ICT infrastructure are critical pillars for the integration of ICT in education and training" (MOE, 2021). ICT infrastructure measures the perceived availability and suitability of the ICT tools such as hardware, software and peripheral equipment provided in the school (Vanderlinde & Van Braak, 2010). It also refers to the availability of equipment, software, Internet access and other similar resources in the school (Pelgrum, 2001). There is a strong positive correlation between ICT access and academic performance (Ouma and Odongo,2023).

The Ministry of Education in its ICT policy, 2021 is categorical on the crucial part that ICT plays in classroom instruction. According to M.O.E, (2021), infrastructure is an integral component of ICT in education and training. Over the years the government has continuously made huge investments in provision of ICT infrastructure especially power and fibre optic connection across the country. Introduction of the Digital Literacy Programme (DLP) and other government initiatives have increased access to ICTs in educational institutions. However, the number of computing devices is still inadequate and cost of internet connectivity remains prohibitive. Further, a number of these devices have not been adapted for learners and trainees with special needs and disabilities (M.O.E, 2021). This realization from government is a pointer towards challenges that schools are likely to meet in ICT policy implementation especially in STEM instruction such as Physics.

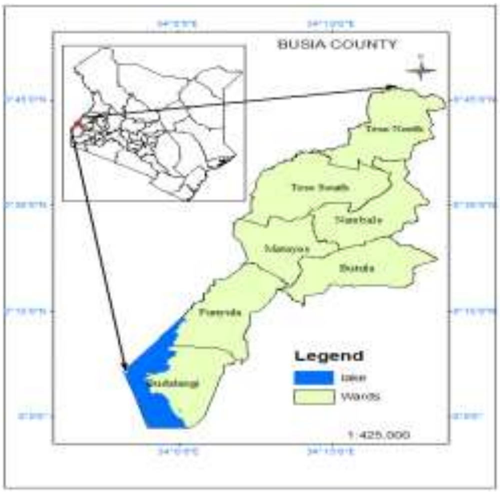
Several studies have been conducted to ascertain the status of ICT tools in general instruction while some were done in relation to specific subject instruction. A study by Eastleigh Voice, (2024) established that only 40 percent of secondary schools have functional computers, 49.8 percent have internet connectivity and 33.9% offer computer lessons. Further, access is highly uneven with 92.1% of national schools offering computer against 17.3% of sub county schools. Schools with access to community resource centres perform better (Ouma and Odongo, 2023). Another study by Kibe and Wambugu, (2023) on ICT use in Mathematics established that: Most schools lacked digitized textbooks, training on subject specific tools and technical support; ICT was used more for lesson preparation than for active classroom teaching. These few studies paint a different picture of what is perceived against what is actually happening in relation to ICT policy implementation on the ground. Amidst this a study by Muthamia and Marangu, (2023) on evaluation of teacher training in integration of ICT showed that 56.57% of teachers lacked basic technical skills while 43.43% had received ICT training often limited to basic computer packages and that most training focused on technology literacy and not how to integrate ICT into teaching.

Prior to the launch of the policy, MOE conducted a needs assessment on the existing ICT infrastructure. The report of the assessment indicates that government has invested in the provision of ICT infrastructure, internet connectivity, capacity development and digital content. However, "the number of available devices compared to the number of learners is still low, internet connectivity is still a challenge, limited and uncoordinated capacity development of educators and other key players remains a major barrier and provision of appropriate digital content has not been realized. Further, overhead costs on power, repair and maintenance and internet among others are a setback to realizing ICT integration. The various initiatives by MoE on ICT in education and training have largely remained uncoordinated, segmented and often, resulted in duplicated efforts by implementing agencies”. (M.O.E, 2021). Against this backdrop the study explored the physics subject specific initiatives and contribution to overall ICT integration in education with reference to ICT tools, resources and technologies that are in current classroom instruction. This appraisal is important because ICT is a remarkable tool towards learner’s acquisition of contemporary skills such as: communication and collaboration; critical thinking and problem solving; creativity and imagination; and digital literacy, among others. A broad body of knowledge has documented how ICT policy implementation has supported ICT in education and training (Connor et al, 2018; Devlin et al,2018; European schoolnet,2018; National Research Council,2018; Terzieva, 2018; Mumcu,2022 Timms, 2018;). Nevertheless, these studies have not adequately addressed pertinent issues related to policy formulation, implementation, capacity development, digital content and infrastructure in the ICT integration process, more so at subject level.

2. Materials and Methods

The study adopted the descriptive survey research design. The Descriptive survey research design is widely acknowledged for its effectiveness in collecting and analyzing data to describe characteristics, behaviouhs within a specific population. The design was handy in allowing the researcher to detect and describe patterns, frequencies, and trends within the data, offering insights into the distribution of variables (Ellis and Hart, 2023). The study was carried in Matayos sub county. The sub county lies between latitude 0º and 0º 45 North and longitude 34º 24 east. It borders Nambale to the east, Butula to the south, Teso North to the north, Funyula and Busia Uganda to the west. Most parts of Matayos fall within the Lake Victoria Basin. The sub- County is referred to as the entry to East and Central Africa since it neighbors Uganda on the eastern side and is at the boarder of Kenya and Uganda. It is the core of Busia County as it houses the county headquarters (Kibos, 2011). The scope of the study covered the following wards: Matayos South, Mayenje, Burumba, Busibwabo, and Bukhayo West wards. The area was selected as a result of: most secondary schools in the area being majorly day school which presented diverse challenges related to infrastructure for ICT use; similarly, most schools are proximal to the county education headquarters and as such it’s assumed that ICT policy implementation has enhanced monitoring and evaluation as well as quality assurance.

Figure 1 Map of Busia County



The study targeted all the 23 public secondary schools consequently 23 principals, 48 teachers of physics and 620 students drawn from form three and four. A sample size of 376 comprising of 23 schools, 48 teachers and 305 students was selected. The study used simple random sampling and purposive sampling procedures owing to variations in the characteristics of the targeted population. The researcher used Yamane (1967) simplified formula as applied below: $n=N/1+N(e)^2$

Where: n = sample size N = population size e = the level of precision (0.05) 1 = Constant $n = 440/ \{1+ 440(0.05)^2\} = 305$ participants

The researcher studied 305 students undertaking physics in form three and form four. This was because the ICT policy was implemented in 2021 and these were the groups that could inform the study since inception of the policy. The students were selected by simple random selection. The study used three instruments to collect data: questionnaire; in depth interview, and observation checklist. Research instruments were pilot-tested before the actual collection of data from the field. The researcher administered the questionnaires to participants. This was followed by a debriefing session with them to give their assessment of the instruments for clarity, appropriateness, relevance, comments, suggestions and corrections which were incorporated into the research instruments before undertaking the actual study. Prior to the use of research instruments for data collection, validity was confirmed by presenting to faculty research staff. Owing to their vast skills and experience in social science research and expert knowledge in research methodology, they undertook extensive reading of the work and the instruments to determine the coherence of research objectives, research questions, and the study variables. The study utilized Cronbach Alpha coefficient to determine the reliability. The method required only a single test to determine internal consistency of instruments. The reliability of the factors was tested using Cronbach's alpha.The researcher considered several ethical considerations: The necessary approval permits were sought from the ethical review committee of Masinde Muliro University of Science and Technology Similarly, the researcher ensured that relevant organizations related to the study provided written authority to conduct the study, besides ensuring that all the information collected, analyzed and reported was only used for academic purposes. The researcher ventured to eliminate plagiarism by applying plagiarism checker.

Upon meeting the requirements for the research proposal at the faculty, a letter from the university was obtained for the purpose of data collection. The researcher proceeded to seek research authorization from the County Director of Education in Busia County. Thereafter a visit was made to the Matayos Sub-County Education office for introduction, creating rapport and getting permission to conduct research. Visits were made to schools to drop questionnaires for students and teachers which were collected after two days. Arrangements were made with the principals and the sub county director of education on possible timing of the in-depth interviews.

The quantitative data collected was coded, cleaned and relevant diagnostic analysis conducted. In determining the status of ICT tools, resources, and technologies currently used in physics instruction following the policy implementation the quantitative data was descriptively analyzed and presented in tabular form.

3. Results and Discussion

3.1 Descriptive Statistics of Sample Characteristics

Before conducting the analysis, a check of missing data was done, the percent missingness on all demographic variables was 0% (see table 4), an indication that missing data was not a problem for all key variables.

Table 1 Summary of Sample Characteristics in the Study

Variable	Coded	N	Percentage Missing	Frequency	Percentage	Cum.	Skew	Kurtosis
Students related information								
Gender		**266**	**0%**				**-.243**	**1.059**
Female	0			117	43.98	43.98		
Male	1			149	56.02	100		
Student Form/Class		**266**	**0%**				**-.121**	**1.014**
Form 3	0			125	47	47		
Form 4	1			141	53	100		
School Type		**266**	**0%**				**-1.119**	**2.253**
County	0			66	25.6	25.6		
Sub County	1			192	74.42	100		
Prior Computer Training		**266**	0%				**-1.801**	**4.244**
Yes	0			44	16.54	16.54		
No	1			222	83.46	100		
Teacher Related information								
Gender		**71**	**0%**				**.559**	**2.315**
Male	0			53	74.7	74.7		
Female	1			18	24.5	100		
Designation		**71**	**0%**				**-.961**	**2.804**
HoD	0			6	8.45	8.45		
Teacher	1			42	59.15	67.6		
Principal	2			23	32.39	100		
Age		**71**	**0%**				**.496**	**1.881**
25-29	0			7	10	10		
30-34	1			20	28.2	38.03		
35-39	2			18	25.4	63.38		
40-44	3			3	4.23	67.61		
45-49	4			5	7.04	74.65		
50 and above	5			18	25.4	100		
Experience in Years		**71**	**0%**				**-.388**	**1.878**
0-5	0			7	10	9.9		
6-10	1			18	25.4	35.4		
11-15	2			20	28.2	63.5		
16 & above	3			26	36.6	100		

Academic Qualifications	**71**	**0%**				**2.198**	**4.487**
Diploma 0			3	4.23	4.23		
Bachelors 1			68	95.8	100		
Masters 2			0	0	100		
PHD 3			0	0	100		
Formal computer Training	71	0%				**-1.907**	**4.638**
Yes 0			60	84.51	84.51		
No 1			11	15.49	100		

A check of Skewness and Kurtosis were used to screen the data for distribution of residuals, specifically for the demographic characters and found the data was approximately within the normal range (Sk=-1. to 1 and Kurt(-4 and 4). A total of 337 participants took part in the study. Of the 337 respondents, 266 were students and 71 comprise of physics teachers and principals of the selected schools, representing a response rate of 89.9%

The students' demographic characteristics was assessed on various aspects including: gender, form, school type, and prior training in computer. Similarly, the teacher's demographic information was assessed on, aspects such as, gender, age, experience in years, designation, academic qualification, and if they had formal training in computer. A summary is presented in table 5. From the Table, male respondents were the majority (149) representing 56.02% of the participants and female were 117 representing 44% of the participants. The majority of the student responds were form fours (141) representing 53% and respondents from form three were (125) representing 47%. Whereas 74.4% (192) of the respondents were from subcounty schools, only 66(26%) were from county schools. Of the students' participants, only 17% (66) had prior training in computer and the majority of the student participants, 222(84%) had no prior training in computer.

Teacher participants in the study were drawn from both county and sub county schools. The majority of teacher participants were male (58) representing 75% and female teachers were (18) representing 25% of the participants. Going by teachers' designation, 6(9%) of the teachers were heads of departments, 42(59.2%) were teachers of physics, and the 23(32.4%) were school principals. Teachers experience varied and was categorized into four groups. Teacher with 16 and above years of experience were the majority (26) representing 37. This was followed by teachers who had experience of 11-15 years (20) representing 28.2% of the respondents. Teachers with between 6 to 10 years of experience represented 25.4% and those with 5 and less years of experience were the least (7) representing 10% of the teacher respondents. The majority (68) 96% of the teachers who participated in the study were Bachelor's degree holders. The remaining (3) 4% were diploma holders. Most teacher (60) who participated in the study reported having some formal training in computer representing 85% of the respondents. The remaining (11) 15% had no formal training in computer. The other variables in the study included; the ICT policy implementation factors, the measurement scale for student engagement and the measure of student overall academic performance in physics, which were all derived from the participants responses.

4.3 The Status of ICT Policy Implementation in the Instruction of Physics Lessons

To establish the status of ICT policy implementation in the instruction of physics lessons, the teachers and principals were asked to state the tools, resources, and technologies being used and the frequency of use at their institutions. The summary of the results is presented in Table 2.

Table 2 Summary of ICT Resource Availability and Frequency of Use in Instruction of Physics

Resources	Percentage Availability F(100%)		**Percentage frequency of Use**				
	Yes	No	**Daily**	**Once a Week**	**Once a Month**	**A few times a Years**	**Never**
Hand held smart device(tablet)	25(35)	46(65)	24(33.8)	7(9.9)	8(11.3)	6(8.5)	26(36.6)
Interactive whiteboards	31(44)	40(56)	26(36.6)	4 (5.6)	3 (4.2)	3(4.2)	33(46.5)
Reference software (Encyclopedia)	16(22.5)	55(77.5)	5(7.0)	8 (11.3)	0	15(21.1)	43 (60.5)
Simulations (virtual labs) software	19(26.8)	52(73.2)	0	17(24)	4(5.6)	10 (14.1)	40(56.3)
Tutorial software	13(18.3)	58(81.7)	5 (7.7)	9(14)	9 (13.9)	3(4.6)	39(60)
Drill and practice software	7 (9.9)	64(90.1)	5(7.4)	3(4.4)	4(5.9)	4(5.9)	52(76.5)
Free subscription to online resources for students	12 (16.9)	59(83.1)	5 (7.5)	0	3 (4.5)	0	59(88.1)
Internet access from physics lab	27 (38)	27(38)	22(32.4)	16(23.5)	0	0	30(44.1)
Internet access from staffroom	46(64.8)	25(35.2)	22(31)	5(7.0)	7 (10)	0	37(52.1)
Internet access from computer lab	34 (47.9)	37(52.1)	16(22.5)	2(16.9)	3 (4.2)	0	40 (56.3)
Internet access from classroom	10(14.1)	61(85.9)	0	5(7.5)	0	5 (7.5)	57(85.1)
Google app for education	3(4.2)	8(95.8)	9 (12.7)	3(4.2)	4 (5.6)	9(12.7)	46(64.8)
E assessment tools	8(11.3)	63(89)	22 (31)	5(7.0)	7(10)	0	37(52.1)
E textbooks	19(26.8)	2(73.2)	8 (21.1)	0	0	6 (15.8)	4(63.2)

NOTE: Figures in brackets () are percentage use

From Table 2, while 35% of the respondents said they had Hand-held smart device(tablets) and the majority 65% did not have. Of those who had tablets, only 34% of the respondents used them daily, whereas the majority 37% never use them at all. Those who use tablets once a week represented 10%, once a month were 11% and a few times a year were 9%. A possible explanation for the high percentage of teachers without tablets could be the relatively high cost of acquiring the devices and lack of capacity and reluctance by school managers to source them for use in classroom instruction. The inability to regularly utilize the devices by those who have them may be related to challenges faced by teachers not accustomed to these relatively novel technologies and the cost of internet especially in schools that do not provide free Wi-Fi other than the overarching effect of social media apps. This is in agreement with a study by Sung et al. (2016), a meta-analysis about mobile education. Results indicated that learning with mobile devices was more effective than educational interventions with computers or pen-and-paper. Despite the findings, it was also observed that many interventions were not as effective because teachers were ill-prepared to deal with the mobile technologies or their educational application. The wider implication for this is that schools may be obliged to be creative and source for tablets specifically as learning materials for physics instruction as well as induct teachers on their effective utilization.

The results from Table 2, showed that 44% of the respondents had interactive whiteboards and 56% did not have. Of the 44% of those who interactive whiteboards, the majority 47% (33) never used them, 37% (26) used them daily, 6% (4) used once a week,4% (3) used once a month and a few times a year respectively. Generally, the use of interactive white boards is a new technology that is slowly taking shape in a number of schools mostly funded by some non-governmental organization in selected schools, it's a break away from the ordinary white board use hence it's a adoption is gradual and teachers may need to be trained and prepared for its use as well as diverse application in physics instruction. Research by Mokibelo et al, (2022) on challenges and solutions for teachers' Use of Interactive Whiteboards in high schools mentioned several challenges that may come into play: They include but not limited to technique, teaching material and lessons, lack of engagement, health, and lack of electricity. They suggest that if teachers could adopt positive problem perceptions, they could be successful in solving the problem with the use of interactive white boards.

The majority of the respondents 55(78%) said their school had no referencing software. Of the 22% (16) who said their school had referencing software, 61% never used them, followed by 21% who used a few times a year, then 11% used them once a week, and only 7% of the respondents said they used referencing software on a daily basis. Most schools in the study did not have modern libraries that are replete with reference software for use. Those that had the software were mainly a few teachers and principals who acquired them for their personal use. Moreso many teachers lacked the pre requisite skills for the utilization of the same. Going forward it may be imperative that policy considers the modernization of school libraries from manual searches to e libraries that may accord referencing software. Further there is need for capacity building of teachers of physics with skills to enable utilization of the software for cutting edge literature in their field. Research by Speare, (2018) on use and non-use of reference software shows that non-users managed their citations and references with a variety of other tools. The main explanation for non-use were that individuals did not know the options that were available, and the extent of time needed to learn the program. Similarly, there were issues related to the steep learning curve, problems with extracting metadata from PDFs, technical issues, and problems with inaccurate citation styles.

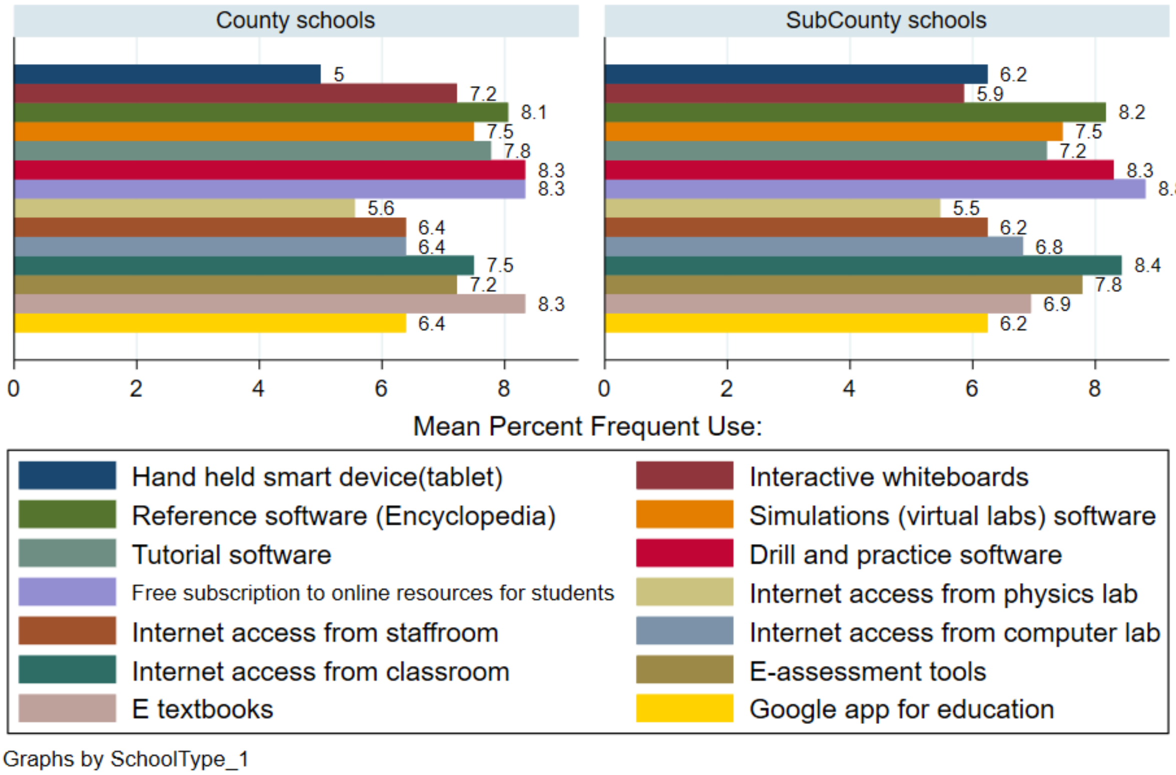
In relation to the utilization of virtual labs software majority of the schools (73.2%) did not have while 26.8%. for those in possession majority (56.3%) have never utilized them in classroom instruction for physics lessons. The challenges of using virtual laboratories that impinge on effective policy implementation in education include cost, device availability, teacher readiness, and potential sickness. Studies by alnagrat et al, (2022) indicate that virtual laboratories in education present both challenges and benefits. One of the challenges is the time-consuming process of analyzing, understanding, and implementing virtual experiments, especially when creating new ones or redesigning existing ones for different educational settings. That notwithstanding, virtual laboratories are crucial in realizing ICT policy implementation: They have a positive pedagogical and cognitive impact on Physics instruction enhancing students' understanding and overall satisfaction. Additionally, virtual laboratories can reduce school liability, infrastructure, and costs compared to physical laboratories owing to reduced liability and infrastructure costs. There is need for educational stakeholders to reconsider additional funding and capacity building for acquisition and effective utilization of virtual laboratories. Based on the findings most schools lacked recommended ICT tools for Physics learning as indicated by the high percentages of NO responses. This is al, (in tandem with findings from M.O.E, (2021) which indicate that access to ICT resources is hampered by a number of factors including: high cost of acquiring ICT infrastructure and equipment; limited access to affordable internet connectivity; poor internet connection in rural and remote parts of the country; limited access to reliable electricity supply; insecurity; lack of awareness; concern about children accessing inappropriate content; and negative attitude towards ICT in education and training. Other researchers (schoolnet,2012; Ngololo et al,2012; and Waiti et al,2018) are in agreement that the barriers fall within the physical realm, and are beyond the direct control of the teacher. They include; limited infrastructure, in terms of satisfactory physical conditions of laboratories; The availability and accessibility of infrastructure, and decisions about purchasing and placement of computers in centralized laboratories versus classrooms. Other studies with similar findings include (Mwambela et al, 2019, Yehya et al, 2018). The findings confirm the notion that in some instances ICT integration is only theoretical and away from real actions in the classrooms.

That notwithstanding the findings also show that overly, while some school have resources, tools and technologies for ICT Policy implementations, they hardly used. This is indicated by the high percentage responses of Never used and or use a few times a year, which could be during the national examinations. Effective integration of ICT in schools would call for a whole institution to be networked, to ensure access to multimedia and learning-rich resources via the school's Intranet and the Internet, wherever students and teachers are, in or out of school. The ICT laboratories and classrooms need to be equipped sufficiently to allow ready access and utilization by students and staff. Studies by Gil, (2017) depict a different scenario. A study on the use of ICT in Spanish schools established a low usage rate for these resources in Spanish secondary schools. However, the availability of ICT infrastructure was high. It implies that the Education Administration needs to develop policies and additional strategies aimed at incorporating ICT into teaching.

4.4 The Status of ICT Policy Implementation (Resource Availability and Frequency of use in Physics instruction) by School Type

The teachers and principals' responses on the status of tools, resources, and technologies being used and the frequency of use was also analyzed by school type. The summary of the results is presented in Figure 2 below.

Figure 2 Status of Availability and Use of ICT Policy Implementation in Physics Instruction by School Type



Based on Figure 2, both county and sub county schools to some extent had resources, tools and technologies for ICT Policy implementation. From the Figure, both school types reported equal mean percentage use of simulations (virtual labs) software and use of drill and practice software represented by mean percent frequent use of 7.5 and 8.3 respectively. This implies that the type of school did not affect the mean percentage use of this ICT devices. It also maybe a pointer towards uniformity in teacher attitudes and perceptions in the use of this devices for physics instruction. This is in tandem with the findings by Wastiau, (2013) that a high percentage of digitally supportive schools include high percentages of digitally confident and positive teachers and student. Studies by Almamary, (2022) show that easy access to the ICT infrastructure, availability of support from technical support team, time availability, and training for technology use are important factors that impacted on teachers' technology use.

The results in Figure 2 also showed that the frequency of use varied by nature of resource and also by the school type. For instance, the sub county school fared better in six (6) aspects compared to county schools. This included the use of Hand-held smart device(tablet) represented by the mean percentage use of 6.2 against 5 in county schools. The sub county schools also reported the highest use of referencing software (Encyclopedia) represented by a mean percent frequency use of 8.2, free subscription to online resources for students represented by mean percent frequency use 8.8, internet access from computer lab represented by mean percent frequency use 6.8, internet access from classroom (mean percent frequency use 8.4), and use of E-assessment tools represented by mean percent frequency use 7.8. This indicates that sub county schools despite the unavailability of ICT tools are making an effort in ICT policy implementation

From the table, the county schools excelled in six (6) areas; the use of Interactive whiteboards represented by mean percent frequent use of 7.2; tutorial software represented by mean percent frequent use of 7.8;

internet access from the physics lab represented by mean percent frequent use of 5.6; internet access from classroom represented by mean percent frequent use of 6.4; use of E-textbooks represented by mean percent frequent use of 8.3 and use of Google App for education represented by mean percent frequent use of 6.4.

Generally, according to Gil, (2017) ICT use by teachers can be divided into two levels. The first level involves relatively ineffective use, such as basic support for teachers, which most often involves use in class preparation. The second level is effective use, which involves the use of ICT as an educational resource in the teacher's daily work with students. ICT implementation in Matayos Sub County seems to be at stage one of ineffective use that requires teacher support and infrastructural acquisition before the actual take off.

In summary, the findings here are concomitant with those in MOE, (2021) that showed that number of computing devices is still inadequate and cost of internet connectivity remains a hindrance to policy implementation. This realization from government is a pointer towards challenges that schools face in ICT policy implementation especially in STEM instruction such as Physics. The needs assessment by MOE, (2021) affirms that government has invested in the provision of ICT infrastructure, internet connectivity, capacity development and digital content. Findings here contradict this as the number of available devices compared to the number of learners is still low, internet connectivity is still a challenge, limited and uncoordinated capacity development of educators and other key players remains a major barrier and provision of appropriate digital content has not been realized. Further, overhead costs on power, repair and maintenance and internet among others are a setback to realizing ICT integration. In addition, the ministry of education contends that various initiatives by MoE on ICT in education and training have largely remained uncoordinated, segmented and often, resulted in duplicated efforts by implementing agencies". (M.O.E, 2021). The divergence of this study from previous ones is that apart from examining the availability of ICT tools and resources it brings into focus the mean percentage frequency of use of each recommended device. This is crucial since some ICT tools might be available but not being utilized effectively for efficient teaching and learning implying that policy implementation must address quality assurance details of frequency of use on top of availability.

Based on the low mean percentage frequency in utilization of available devices the study aligns with the formative stages of ICT policy implementation according to literature by Mooij and Smeets, (2011). The researchers posit that there are five phases of ICT implementation within schools, they are: incidental and isolated use of ICT by one or more teachers; increasing school awareness of ICT relevance for the school at all levels; emphasis on ICT coordination and hardware within school; emphasis on didactic innovation and ICT support; and the use of ICT integrated teaching and learning that is independent of time and place. There must be concerted efforts to buttress policy implementation to transition schools in Matayos Sub County from non-frequent use of ICT to full-fledged utilization irrespective of space and time. This can be achieved through what Bodong et al, (2015) identified as; new hardware and software materials; the adoption of new activities, behaviors or practices; and changes in beliefs and understanding. Supporting literature from Mukhula, (2021) recommend that ICT laboratories and classrooms need to be equipped sufficiently to allow ready access and utilization by students and staff. Other studies with similar findings include (Awour and Okono,2022, Kaptingei et al,2014; Kisirkoi,2015, Mwambela et al, 2019, Ngololo et al,2012; schoolnet,2012; and Waiti et al,2018 Yehya et al, 2018 Wim's et al,2007).

In a nut shell ICTs are enablers in the acquisition of 21st Century skills in the implementation of the Competency Based Curriculum (CBC) and Competency Based Education and Training (CBET). Seamless integration of ICT in education and training has proven to improve learning outcomes across all levels. Policy implementation cannot be deemed to be effective if the mean percentage frequency of use is below par and availability of basic infrastructure such as the 14 ICT tools in the study are insufficient.

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