Influence of Information Communication Technology Resources Adequacy and Utilization on Students` Academic Achievement in Public Secondary Schools in Kenya

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Abstract: **The study purposed to provide empirical data on the status of Information Communication Technology (ICT) resources in terms of adequacy and utilization and their influence on academic performance in public secondary schools in Kenya. The concern was the large number of students that perpetually performed dismally in national exams and the wide performance variations between schools in the study locale yet investments and level of utilization of ICT resources as well as how this was influencing observed academic performance was not clear. The study adopted the ex-post facto research design and the Context-Inputs - Processes -Outputs (CIPO) model which is a systems theory approach to the determinants of learning outcomes and school effectiveness (Scheerens, 1991,2013). Target population constituted 386 principals,2316 heads of department (HoDs), and 4160 teachers in 386 schools. Sample size was derived from Kothari (2013) formula and constituted 192 principals,330 HoDs and 352 teachers however the fully filled and returned questionnaires were172 for principals ,330 for HoDs and 344 for Teachers. Main data collection method was Principals` questionnaire (r =.89), HoDs` questionnaire (r =.92) and teachers` questionnaire (r =.87). Both qualitative and quantitative data was collected where qualitative data was analyzed using thematic analysis while quantitative data was analyzed using both descriptive and inferential statistics. Due to data non-normality inferential statistics was done by use of Kruskal-Wallis H-test and Mann-Whitney U-test as the non-parametric alternatives to (one-way analysis of variance F-test and independent samples t-test) Findings of the study were that ICT resources investments varied widely between public secondary schools but generally and more perniciously, the level of ICT resource investment was woefully low. Computer availability in schools was the variable that influenced performance with highest effective size as it explained about 13% of the variation in academic achievement in the study area. The level of utilization of ICT resources varied between schools but was generally sub-optimal in most schools. Comparing ICT resource adequacy and level of ICT utilization as explanatory variables for academic achievement, it was found that the effect sizes of some of the ICT resources` level of utilization were higher than those for ICT resource adequacy. This implied that to significantly improve learning outcomes and reduce wide performance variations between schools, focus should not just be to invest in ICT resources adequacy in all the schools but also to ensure that all the ICT resources available in the schools are being optimally utilized.**

Keywords: **Adequacy, Utilization, Information Communication Technology (ICT), Academic achievement.**

I. INTRODUCTION

Since the beginning of 21st century to date, Information communication technology integration in teaching and learning process has been at the center of education reform agenda for many governments mainly to enhance education access, efficiency and quality (Muriithi & Yoo ,2021; ;Pelgrum and Law, 2009). While ICTs have been at the center of education reform efforts, not all countries or schools within a country have been able to reap the benefits that technology can offer due to barriers termed as digital divide. Cassey (2016) indicates that these barriers fall into two levels, physical access to ICT resources due to in availability or inadequacy of the resources and secondly due to the level and way of actual utilization of the available resources to promote learning. ICT constitutes an umbrella term that imply any communication device, whether hardware or software, that can store, retrieve, analyze, organize, transmit information electronically in digital form (Eguavoen, 2016, Jo-Shan-Fu, 2013). In the current study, ICT resources have been operationalized to imply computers and related auxiliary devices and facilities like projectors, smart boards, as well as computer laboratories and related infrastructure essential for ICT integration in teaching and learning including relevant digital content and internet connectivity.

At school level, the general benefits of ICTs in teaching and learning process and their possible impact on learning have been widely extolled in many prior research (Eguavoen, 2016, Ademiluyi 2019, Pelgrum &Law 2009) .Though ICT integration is associated with immense general benefits and possibilities, ICT related literature indicate that there is still scarcity of empirical research on the impact of ICT on academic achievement improvement (Organisation for Economic Co-operation and Development [OECD], 2015). Glewwe,Humpage & Ravina 2011 and 2013 meta-analysis study that involved 20 studies in developing studies found only three positive and significant studies that linked ICT to academic performance. The research by Glewwe and associates concluded that the relationship between ICT and academic performance was mixed at best. Due to the fact that educational investments in inputs must be cost-effective and resources investment in one type of input constitute opportunity cost to

expenditure in other different essential inputs, educators and researchers alike have been concerned about provision of empirical supporting data on the association between technology investment and learning outcomes that they can base critical decision on strategic resource investment. This comes at a backdrop when ICT are taunted as having the potential of moderating the learning achievement gaps or if miss applied in inequitable way aggravating such learning outcomes through what is termed as digital divide (Jose &Sofia ,2016)

Access to ICT resources in the developed countries is more widespread than in developing countries Kenya included. Analysis by OECD (2020) indicates that across schools in OECD countries on average, there is almost at least one computer available for every secondary school going student (average computer student ratio is 0.8) and that at least nine out of ten schools within OECD are connected to reliable internet for use in teaching and learning purposes. The situation within developing countries (which usually operate under more constrained educational budgets) is however different as most have lagged behind in technology investment in schools though some progress is being realized (Eguavoen, 2016, Muema ,2018).

Public secondary schools in Kenya continue to invest in ICT as a pedagogical tool to enhance teaching and learning (Ministry of Education [MoE], 2018) and Kenya national ICT policy 2016 and 2019 indicate that objective of the ICT investment in schools is to seamlessly integrate ICT for enhancing administration and teaching and learning in all education levels. Consequently, there has been efforts to deploy ICT infrastructure in public secondary schools, though extent of the investment and usage of this resources is still unclear. Among South Saharan Africa (SSA) countries, Global innovation index (GII) (2019) ranks South Africa, Kenya and Mauritania as innovation hubs in Africa which have made a head start in technology. This makes it interesting to explore how such technology is being integrated in education within any one of these countries and the influence this has on learning achievement.

The objectives of the current study were:

i) To establish the adequacy and level of utilization of ICT resources in public secondary schools in Nyeri and Nyandarua counties in Kenya

ii) To determine the association between students' academic performance and adequacy of ICT resources in public secondary in Nyeri and Nyandarua counties in Kenya

iii) To determine the association between students' academic performance and level of utilization of ICT resources in public secondary in Nyeri and Nyandarua counties in Kenya.

Arising from the stated objectives, the study had two hypotheses;

H_0 1: Adequacy of Information Communication technology resources does not significantly influence academic performance in public secondary schools in Nyeri and Nyandarua counties in Kenya.

H_0 2: Level of Information Communication technology resources utilization does not significantly influence academic performance in public secondary schools in Nyeri and Nyandarua counties in Kenya.

II. METHODOLOGY

The study was conducted in two counties (Nyeri and Nyandarua) of the 47 counties in Kenya. Counties are devolved administrative units formed after promulgation of a new constitution in Kenya in 2010.The study was delimited to focus only on public secondary schools. The study adopted the ex-post facto research design which was appropriate in a study where the antecedent factors as independent variables were considered to have already contributed to observed outcomes and thus there was no manipulation of these variables (Cresswell,2014). The study was predicated on the systems theory using the Context-Inputs-Processes-Outputs (CIPO) model which was considered appropriate in analysis of learning outcomes determinants relating to school effectiveness. (Scheerens, 1991 ,2013).Validity of the questionnaires was addressed by ensuring that the questionnaire items were based on the objectives and variables of the study moreover, the instruments were further given to four validators and their input was incorporated .Reliability of the instruments was done using split-half technique and spearman brown prophecy formula was used .The principals questionnaire, HoD questionnaire and teachers questionnaire had a reliability coefficient of 0.89,0.92 and 0.87 respectively which were considered appropriate (Royal ,2017

III. LITERATURE REVIEW

Adequacy of ICTs and its association with academic achievement

While there has been consensus on the importance of ICT integration in improvement of education quality and relevance, empirical evidence to support a causal linkage between learning outcomes and ICT resources access or level of utilization remains inconclusive or mixed at best (Glewwe et.al, 2013). Research findings also seem to depend on the context in which the studied are done since in most developing countries, technology device access has lagged behind while the situation in most developed countries is near universal. This situation has been partly accentuated by the fact that equipping schools with technology devices remains quite an expensive endeavor (Pelgrum and Law, 2009; Eguavoen, 2016). In Europe, Rodrigue & Biangi (2017) conducted a study on the association between level of accessibility and utilization of digital technology resources and academic performance of fifteen-year-old students from twenty-five European member states. The study focused on comparing students from low social

economic status with the rest of the students and hence it used a large sample of 109,967 students from Program for International Student Assessment (PISA) 2015 data. In this study, access to digital technology was not significantly associated with academic performance since ICT resources adequacy or accessibility in European schools was widespread to a level of near universal. The accessibility in the schools for all the resources considered including computers, tablets, laptops, data projectors and interactive whiteboards was rated at an average of 99.9% for all students irrespective of their socio-economic background. The only notable variation in ICT resources access was at home where it stood at an average of 98.2% for all students but it was slightly lower for students from low socio-economic background at 94.4%. This finding did not, however, undermine the importance of digital technologies investment but underscored the fact that access to ICT resources did not constitute a learning barrier in the schools considered. A similar finding of non-significant association between accessibility of ICT resources and academic performance was arrived at in a study by Ben Youssef, Dahmani & Ragni (2022). The study by Ben Yousesef et. al (2022) constituted 1469 university students from three universities in France and used logistic regression to determine the relationship between variables. The study found that the level of ICT resource accessibility to university students both at school and at home was not significantly associated with high students' academic performance, however, the innovative utilization of available ICT resources was found to be positively and significantly associated with high student performance. The study further highlighted that ICT resources access in universities on its own did not manage to overcome the digital divide. Consequently, if universities were keen to reap maximum benefit of their ICT investments, they had to simultaneously increase supervision of utilization of ICT resources invested in the universities so that students learning and performance would be enhanced. The study by Rodrigue and Biangi (2017) and Ben Youssef et. al (2022) focused on accessibility of ICT resources in European countries context from the student's perspective, however, the current study focused on the Kenyan context from the teachers and Heads of department perspectives.

In other contexts, some studies done have found significant association between ICT resource access or adequacy and academic performance. In Iran, Nouri Taleb and Hedayatollah (2022) conducted a study to determine the influence of ICT resources access and utilization on student performance and motivation. Data was collected from 300 students from secondary schools in Sanandaj city. The study found that while students had access to ICT resources both at home and at school. Significant association between ICT resource access and student performance through canonical correlation was found to exist only for ICT resources at school and not at home. The research also found that the possible reason why accessibility of ICTs resources at home were not significantly associated with academic performance was due to the fact that the ICT resources were largely utilized for nonacademic purposes. In Nigeria, a study by Ademiluyi (2019) that focused on ICT resources for teaching business studies in secondary schools in Osun State found that most of the ICT resources that were considered including computers, projectors, interactive whiteboard, digital content and internet connectivity were grossly inadequate. The only ICT resources that were available to a moderate extent were tablets which were distributed to final year students following a government initiative project. The study by Ademiluyi (2019) did not however explore the association between digital resource adequacy and students' academic performance which is the focus of the current study. Despite the fact that the MoE in Kenya recognizes the benefit of technology integration in education at all levels of education, accessibility and equitable distribution of this resources remains a challenge. A study by Muema (2018) on influence of ICT resources on mathematics performance in secondary schools in Dadaab sub- county in Kenya established that schools lacked sufficient ICT resources due to inadequate school funds. Most of the available resources were acquired through donations from government, local politicians, private entities and parents and other development partners like Computer for Schools Kenya (CFSK). The study by Muema (2018) found a positive and significant influence between ICT and performance in mathematics only but did not focus on the overall school performance based on overall school academic performance means score which is the focus of the current study.

Utilization of ICTs and its association with academic performance

Technology is as good as its utilization in a particular aspect of education like in real teaching and learning process. While lack of availability or inadequacy of physical access to ICT resources constitute the first level of the digital divide the level of utilization and how the resources are actually being used constitute the second level of the digital divide in ICT integration in teaching and learning. Several studies like Ghavifekr, Kunjappan &Ramasammy (2016) , Jo-Shan-fu (2013) and Muriithi and Yao (2021) have Identified a myriad of factors that usually militate against effective utilization of ICT in teaching and learning in schools .These factors included scarcity or lack of access to ICT resources in schools, low levels of digital literacy or competence, low level of motivation or negative attitude toward ICT integration, phobia of technology and resistant to change especially among the aged teachers, inadequate technical and administrative support.

OECD (2020) indicates that while adequacy of ICT resources was near universal in most schools within OECD countries, only about 60% of the principals considered that their teachers had ample time to adequately prepare and integrate ICTs in their classroom teaching. This underscored the fact that time factor and teachers work load may affect level of ICT integration in some school which may consequently manifest in learning outcome variations.

Just like for ICT resource availability or access, empirical studies linking level or intensity of ICT utilization and academic performance also seem to vary with context. The

study by Rodrigues &Biangi (2017) based on European countries context did not find any significant association between the general intensity of ICT utilization for all students and academic performance. However, the intensity of ICT utilization was seen to be significantly associated with being a resilient student-a student from low socio-economic background that performs better than expected. This implied that in European countries, some learning disadvantage of students from low socio-economic status and hailing from homes with less ICT resources access could be overcome by ICT utilization at school. The level of ICT utilization for students from low socio-economic backgrounds was also found to be significant in some functions. The study by Rodrigue & Biangi (2017) seemed to clearly underscore that ICT access and utilization is only significantly associated with academic performance up to a certain threshold where optimal benefit from ICTs is attained in most schools such that access or utilization ceases to be a significant barrier to effective learning. Beyond this threshold, further accessibility of more ICT resources or increase of the intensity of use may cease to be significantly associated with learning outcomes partly due to the law of diminishing marginal returns to the investments. In some specific areas, however, innovative ICT related interventions leading to high ICT resources utilization have been seen to improve learning outcomes. A study by Hyland, Lyte,Lyons, McCoy & Silles (2013) found that Broadband internet subsidized by the Ireland government led to increased utilization of broadband internet in primary schools. This was also associated with significant improvement in mathematics scores among the pupils. In Pakistan, Hussain, Suleman, Naseer & Farham (2017) through an experimental study found that ICT utilization was beneficial in improving teaching, learning and retention of content in sciences. The study used pre-test post-test equivalent group design and found that experimental group taught chemistry using ICT integrated methods outperformed the control group taught the same content using conventional techniques of teaching. In Nigeria, the study by Ademiluyi (2019) indicated that resource utilization of available ICT resources was of great concern, despite tablets that were being utilized to a small extent the rest of the resources were rarely utilized for teaching and learning purposes in public secondary schools in Osun State Nigeria. The study by Ademiluyi (2019) also observed that performance at end of secondary school was abysmal in most schools but this study did not directly relate the level of ICT use to academic performance which is the focus of this current study.

IV. FINDINGS AND DISCUSSIONS

Objective 1: The first objective of the study was to establish the adequacy and level of utilization of ICT resources in public secondary schools in Nyeri and Nyandarua counties in Kenya.

ICT resources adequacy

No school had adequate number of computers or computer labs. Worse still, 68 (40%) of the schools completely lacked computers while 75 (44%) of the schools lacked computer labs. Most of the schools had only one projector with an overall low mean of 1.122 (SD=0.938) devices per school which was grossly inadequate as ideally, projectors in a school should be equal to the number of classrooms available. In terms of teacher laptops for use in technology aided instructions 46(28%) schools lacked these essential electronic devices while the rest of the schools had either one or two laptops. This yielded an overall low mean of 1.65(SD=2.14) devices per school. It is worth noting that teacher laptops and projectors are functionally used together during an ICT integrated lesson hence inadequacy of such resources pose a barrier to effective ICT integration. Furthermore, it was found that only 5 (3%) schools had all the five ICT integration or auxiliary facilities that were examined that included (1) availability of electricity and proper lighting in all classrooms (2) availability of power sockets in all classrooms, (3) availability of interactive whiteboards, (4) Internet connection and (5) availability of relevant and subject specific digital content.

Level of ICT resources utilization in teaching and learning

General ICT utilization extent had a mean of 2.6 (SD=0.82) implying that on average ICT resources in general were occasionally utilized in teaching and learning process in most schools. Schools that rarely utilized ICT were 83(48%) implying that traditional approaches were still pervasive. Computer labs were most less frequently utilized facilities for ICT integration with an overall mean of 2.0 (SD=1.02). About 110(64%) schools indicated that the computer laboratory facility was either rarely or not at all utilized for purposes of general ICT integration in other subjects other than computer studies. It was further observed that most schools that had computer labs had only one computer labs and most also had computers studies offered as a subject and consequently, priority for lab utilization was given to computer studies lessons as compared to general ICT integration in other subjects.

To clearly understand the influence of integrating ICTs in improving learning and academic performance from the teacher's perspective, the researcher through an open-ended question asked teachers in the study locale, their opinions in terms of their personal teaching experience on the importance of ICT integration and how in their views it affected learning and academic performance. An analysis of their responses and views underscored that ICT usage was beneficial and it acted as a catalyst to learning. Some teachers highlighted the fact that whenever they integrate ICTs in their classroom teaching, students' motivation level to learn is usually high and concepts are usually grasped faster. Two teachers from the study locale had this to say about their experiences with ICTs in their teaching;

> "ICTs improves student understanding in some abstract topics in the syllabus. If you use ICT in teaching your pace and effectiveness of teaching increases as students tend to grasp content easily and faster. "

> (Teacher 1, School KE-15)

> "The multi-sensory approach afforded by ICT utilization stimulates learners, creates enthusiasm and interest in

learners. This also promotes more retention of content due to visual memory. "

(Teacher 2, School KP-08)

These two excerpts (from teacher 1 and teacher 2 responses) succinctly expressed the largely positive perceptions held by teachers in the study locale about the positive mediating role of embedding ICTs in teaching and learning.

Despite the largely positive perceptions held by teachers about the benefit of using or integrating ICTs in teaching and learning, the traditional methods of teaching were still pervasive indicating existence of some barriers limiting uptake of ICTs in teaching and learning. The researcher through an open-ended question asked the opinions and views of teachers on the factors that were militating against high ICT uptake in teaching and learning in their schools. An analysis of the teachers' responses revealed some key barriers that teachers felt limited ICTs usage in their schools. This included; inadequacy and lack of essential ICT resources, Frequent power outages that necessitates supplementary power arrangement like generators, Inadequate digital literacy and competency on ICT integration in specific subjects, lack or inadequate digital content as well as lack of unified and seamless administrative and policy guidelines on ICT integration in schools. These challenges partly contributed in causing traditional teaching methods to remain more commonplace.

Relationship between ICT resources adequacy and academic performance

Objective 2: The second objective of the study was to determine the association between students' academic performance and adequacy of ICT resources in public secondary in Nyeri and Nyandarua counties in Kenya. This objective was underpinned by the first hypothesis of the study;

Ho1: Adequacy of Information Communication technology resource does not significantly influence academic performance in public secondary schools in Nyeri and Nyandarua counties in Kenya.

To be able to test this hypothesis, schools were sorted into groups based on their adequacy or resource availability status.

Table 1: Mann-Whitney *U* -test summary table comparing Computers and computers Laboratory availability and academic performance

Group	n	Mean rank	n	Mean rank
		Computers		Computer laboratory
Not Available	68	64.41	75	71.35
Available but inadequate	104	100.94	97	98.72
Total	172		172	
Test statistics		U=5038 Z=4.704 r^2=0.13		U=4774 Z=3.509 r^2=0.072
P -Value		<.001**		<.001**

Note: * Significance attained at p < .05 level,

* * Significance attained at p < .001 Level [NS] Not Significant

Since there was no school with adequate number of **computers** available based on the number of computers available versus the total population of students the study had only two groups of schools, those which completely lacked computers for use in teaching and learning and those which had available but inadequate computers available for use in teaching and learning purpose.

Mann-Whitney U-test was used to establish whether there was any association between academic performance between schools with available but inadequate computers and those with no computers at all. Results as showed in table 1, showed a positive and significant association between computer availability and academic performance U(N=172) =5038, P < .001 The magnitude or effect size (R^2) of the association between computer availability and students' academic performance was 0.13 which was moderate. This implied that about 13% of the variation in academic performance observed was contributed by computer availability within the public secondary schools in the study locale and thus computers were very crucial ICT resources in explaining academic performance variations. In a similar way to computers, there was no school with adequate **computer laboratory** capacity, there were only two groups of schools, those without computer laboratories and those with available but inadequate computers laboratories. Mann-Whitney U-test was used to establish whether there was any relationship between academic performance and computers laboratory availability. Results as shown in table 1, showed a positive and significant association between computer laboratory availability and academic performance U(N=172) =4774, P < .001 The magnitude or effect size (R^2) of the association between computer availability and students' academic performance was 0.072 which was moderate. This implied that about 7% of the variation in academic performance observed was contributed by computer laboratory availability within the public secondary schools in the study locale. The null hypothesis was rejected

The study further sought to establish whether the availability and adequacy of **ICT support/auxiliary** resources influenced academic performance based on five ICT resources considered (1) availability of electricity and proper lighting in all classrooms (2) availability of power sockets in all classrooms, (3) availability of interactive whiteboards, (4) reliable internet connection and (5) availability of relevant and subject specific digital content. Schools were classified into four groups based on how many resources out of the five considered were adequately available in that school.

Kruskal-Wallis H- test was used to test the Null hypothesis that there was no positive influence between ICT resources and academic performance.

Table 2: Kruskal-Wallis H -test summary table comparing ICT auxiliary facility adequacy and academic performance

Groups	n	Mean Rank	df	H	P-value	r^2
One or Two facilities out of five	34	67.53				
Three facilities out of five	86	88.16				
Four facilities out of five	47	93.15				
Five facilities out of five	5	124.4				
Total	172		3	8.765	.033 *	.051

Note: * Significance attained at p < .05 level [NS] Not Significant

* * Significance attained at p < .001 Level

The results as shown in table 2 indicated that adequacy of ICT integration auxiliary facilities in a school positively and significantly related with students' academic performance (X^2 (4, N=172) =15.27, P=0.033). The null hypothesis was consequently rejected since the P -value was less than alpha value of 0.05. The magnitude or effect size (R^2) of the association between level of ICT integration auxiliary facilities and students' academic performance was 0.051 which was moderate. This implied that about 5% of the variation in academic performance observed was contributed by variation in adequacy of ICT integration auxiliary facilities within the public secondary schools in the study locale.

Relationship between level of ICT resources utilization and academic performance

Objective 3: The third objective of the study was to determine the association between students' academic performance and level of utilization of ICT resources in public secondary in Nyeri and Nyandarua counties in Kenya..

This objective was underpinned by the second hypothesis of the study;

Ho2: Level of Information Communication technology resource utilization does not significantly influence academic performance in public secondary schools in Nyeri and Nyandarua counties in Kenya.

To test this hypothesis, the study sought the perceptions of schools Heads of Department (HoDs) on the level to which they perceived various ICT resources were being utilized in actual teaching and learning in their department. The HoD were to choose the level from a list of five-point likert scale items ranging from Not at all/Almost never to Very high utilization/Almost always.

In relation to association between level of computer laboratory utilization and academic performance a Kruskal-Wallis H test was used determine whether there was any association between level of computer laboratory utilization and academic performance

Table 3: Kruskal-Wallis H -test summary table comparing Computer Laboratory utilization (as perceived by Heads of Departments) and academic performance

Groups	n	Mean Rank	df	H	P-value	r^2
Not at All (Almost Never)	75	71.35				
Low Utilization(rarely)	35	88.51				
Moderate Utilization (Occasionally)	50	105.24				
High Utilization (Often)	12	97.25				
Total	172		3	14.64	.002 *	.086

Note: * Significance attained at p < .05 level [NS] Not Significant

* * Significance attained at p < .001 Level

The results of the analysis (X^2 (4, N=172) =14.64, P=0.04). Indicated that high level of computer laboratory utilization positively and significantly influenced academic performance. The null hypothesis was consequently rejected Since the P -value was less than alpha value of 0.05. The magnitude or effect size (R^2) of the association between level computer laboratory utilization and students' academic performance was 0.09 which was moderate. This implied that about 9% of the variation in academic performance observed was contributed by variation in level of computer laboratory utilization within the public secondary schools in the study locale.

In relation to association between computers and associated auxiliary devices level of utilization and academic performance, it was observed that since computers and related auxiliary devices were functionally used together during computer integrated lessons, the study sought to establish the schools' general level of ICT resources utilization and related this to academic performance.

Table 4: Kruskal-Wallis *H* -test summary table comparing general ICTs utilization extent and academic performance

Groups	n	Mean Rank	df	H	P-value	r^2
Almost never	12	41.67				
Low Utilization(rarely)	71	89.76				
Moderate Utilization (Occasionally)	64	86.30				
High Utilization (Often)	25	99.26				
Total	172		3	11.675	.009 *	.068

Note: * Significance attained at p < .05 level [NS] Not Significant

* * Significance attained at p < .001 Level

To test for the overall association between general level of ICT utilization (ICT integration) of a school and students' academic performance, the Kruskal-Wallis H test was used which indicated as shown in table 4 that there was a positive and significant influence between a school general level of ICT utilization/integration in teaching and learning and its academic performance (X^2 (3, N=172) =11.675, P=0.09). The null hypothesis was consequently rejected Since the P -value was less than alpha value of 0.05. The magnitude or effect size (R^2) of the association between level ICT utilization and students' academic performance was 0.068 which was moderate. This implied that about 7% of the variation in academic performance observed was contributed by variation in the general level of ICT resources utilization/integration in teaching and learning in the public secondary schools in the study locale.

V. CONCLUSIONS

1)Most ICT resources considered were grossly inadequate in the schools sampled. Moreover, an even more appalling revelation was the very high number of schools (about 40%) that completely lacked access to computers and computer labs facilities.

2)Computer availability in schools was the ICT resource with the highest influence on academic performance as it explained about 13% (r^2=.13) of the performance variation in the schools within the study locale

3)Though both ICT resources adequacy as well as level of ICT utilization were observed to be positively and significantly associated with academic performance, the level of ICT utilization for some of the resources considered had higher effective sizes compared to mere ICT adequacy status of a school. This implied that to ensure ICT resources contribute to learning outcome, the resources need not just be available or adequate in a school but be optimally utilized in teaching and learning.

4)Level of ICT resources utilization was largely sup -optimal with many public secondary schools indicating that ICT resources were just occasionally utilized in teaching and learning

VI. RECOMMENDATIONS

1. Schools in the study area need to increase their investment in ICT facilities particularly through raising the number of computers accessible to students as well as constructing related physical facilities like computer laboratories. Financing initiatives from individual schools as well as from government through the ministry of education in partnership with development partners may be very crucial in this endeavor.

2. Most of the schools that had access to computer lab facility had only one computer lab which was oftentimes not available for ICT integration in other subjects as it was by priority dedicated for computer studies lessons. This makes it imperative for schools to consider having more than one computer laboratories so that while one computer lab is dedicated for computer studies lessons and digital literacy, the other computer lab(s) can be available for use by teachers for general ICT integration in other subjects other than computer studies.

3. Due to the fact that utilization of the already available ICT resources was found to be sub-optimal in most schools, administrators as instructional leaders may need to not only increase their close supervision on utilization of available ICT resources in their schools but also seek innovative ways to facilitate teachers to overcome barriers that limit ICT utilization. The leaders may also need to device ways to motivate and incentivize both teachers and students to optimally utilize ICTs in teaching and learning for enhanced learning and academic performance.

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