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Effect of ICT on Literacy Levels among Lower Primary School Pupils in Kisii Central Sub-County, Kisii County, Kenya

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Abstract:

Despite reforms in the education sector, literacy levels remain low in Sub-Saharan Africa although literacy levels in lower grades determine end-of-course academic performance of learners. The purpose of the study was to establish the effect of ICT on literacy levels among lower primary school pupils in Kisii Central Sub-county, Kisii County, Kenya. The objectives of the study were; to find the effect of ICT on pupils' writing abilities, to find the effect of ICT on pupils' reading abilities, to find the effect of ICT on pupils' spelling abilities and to find the effect of ICT on pupils' abilities to perform operations of numbers using signs. The study was anchored on Education Production Function Theory. The study adopted descriptive survey research design and was conducted. The target population of the study was, 78 head teachers, 667 teachers of lower primary, 3 curriculum support officers and 2 Quality and Standards Officers. Stratified sampling technique was used to draw a sample of 16 out of schools was used for data collection because this was 20%. The sample of 124 lower primary school teachers was drawn from 667 using stratified sampling while 3 curriculum support officers and 2 QASOs were selected using purposive sampling. Quantitative data was collected by administering questionnaires to class teachers of classes one, two, and three. Academic results of the past three terms needed to establish literacy levels was collected using document analysis guides. Quantitative data from questionnaires was analyzed using descriptive and inferential statistics. The research findings indicated that Pupils exposed to essential instructional practices resources such as iPads, projectors, laptops, and books score highest in examinations. Very strong correlation exists between the use of ICT on pupils' spelling abilities and their scores in examinations, $r = .866$. ICT use enhances pupils' ability in reading and performance operations of numbers using signs. It was also revealed that the more the pupils use ICT tools, the poorer their writing abilities as shown by $r = -.228$. The study recommended that the Ministry of Education should consider increasing the number of ICT resources in schools to match the enrolment of learners. During the holidays, the Ministry of Education should organize and provide in-service training for teachers especially in lower primary classes where the implementation of the competency-based curriculum has started.

Keywords: Information communication technology, literacy levels, examination results

1. Introduction

The test of the education system in any country across the world depends on literacy levels among the youth (Zola, 2008; Park & Kyei, 2011; UNESCO, 2005; UNESCO, 2017; UNICEF, 2018; World Bank, 2018). This shows the importance of literacy levels in lower primary schools. UNICEF (2018) defines literacy and numeracy as the ability to read, write, work out figures and therefore the test of numeracy and literacy can be used to evaluate an education system. It further summarizes that literacy levels among the youth across the world have increased from 83% to 91% over the last two decades, while the number of illiterate youths declined from 170 million to 115 million in the same period. West Africa, Central Africa and South Asia are regions leading in high rates of illiteracy levels among the youths. In addition, Zola (2008) found out that if students' reading literacy level is low; in most cases, it automatically implies difficulties in acquisition of several other subjects, consequently obtaining education in general.

Subsequently, UNESCO (2017) reported that six out of ten children in primary schools are unable to meet the minimum reading and mathematics proficiency set by their respective countries. Even though data about 60% of the countries where UNICEF (2018) has conducted surveys was available to confirm that they have eradicated illiteracy among children in lower grades, less than 50% of children in lower grades in most countries in Sub-Saharan Africa remain illiterate. Illiteracy rates in lower grade learners among male was higher than in female in West, Central and South Asia. Education is regarded as a basic human right, which should be provided to all children or citizens of a country (UNESCO, 2005). It helps any society fashion and model individuals to function well in their environment. According to Boit, Njoki and Chang'ach (2012), the purpose of education is to equip the citizenry to reshape their society and eliminate inequality. The Basic Education act number 14 of 2013 provides that a child be entitled to free basic education, which promotes quality and relevance, and protects the child against any unequal medium of instruction used for all children at the same level (GoK, 2013). Further, the act proposes the introduction of mobile schools within counties and empowering the Cabinet Secretary to ensure free and compulsory admission and attendance of children of compulsory school age at schools offering basic education among other related issues. In Alabama, America, the use of digital technology in education especially in low-income communities showed a positive relationship with literacy levels among learners.

Learners at elementary level and lower grades learned independently and such a practice enhanced their numeracy and reading abilities (Schacter, 2016). Motor skills improved hence enhancing the child's ability to be creative and critical in performing academic activities.

The Center for Education Statistics and Evaluation defined literacy and numeracy in the Australian context. Literacy encompass the knowledge and skills learners need in order to access, understand, analyze, evaluate information, conceptualize ideas, and make meaningful conclusions with others not only in the school environment, but also in the outside community (Center for Education Statistics and Evaluation, 2016). Numeracy encompasses the knowledge, skills, dispositions and behaviors that a learner needs to use mathematical concepts in a wide range of situations. Since the introduction of National Assessment Program (NAPLAN) for assessing learners in grades three, five, seven and nine in 2008, Australian reading and numeracy abilities in learners in lower grades have improved and internationally, learners are able to score high grades not only in national but also in international numeracy and literacy tests (Australian Curriculum, Assessment and Reporting Authority, 2017).

In Taiwan, integrating mobile devices with learning was observed to enhance numeracy and literacy capacities of learners who were able benefit from the individualized interfaces, access to real-time information, communicate, and rely feedback (Sung, Chang & Liu, 2016). In such an environment according to the authors, learners enhance interactive learning, and teachers embrace the use of technology in giving academic instructions. Wajszczyk (2014) in a study in Sweden found that a number of different aspects and issues that introduction of ICT into early education has caused and how it influences both teachers and students.

Cener, Acun and Demirhah (2015) conducted a study in Turkey to investigate the impact of teaching social studies with the help of ICT on pupils' achievement in social studies and concluded that pupil attitudes towards the subject and ICT do not have an effect on their post-test achievement scores. In Spain, Ziden, Ismail, Spian and Kumutha's (2012) study in Malaysia on the relationship between the ICT use in teaching and learning towards the achievement of primary school students in Science subject revealed that ICT use in teaching and learning increased the students' ability to read and conceptualize science concepts in lower primary classes.

In Malawi, for 20 years, reading and numeracy skills among learners in lower primary have been characterized by high rates of class repetition and school dropouts as Hubber, Outhwaite, Chigeda, Mcgrath, Hodgen and Pitford (2016) observed. However, after the introduction of One Laptop per Child, OLPC, numeracy skills improved because it encouraged an interactive methodology of learning. Literacy in reading improved after the installation of software with aspects of English grammar such as spelling, sounds, and tense among others. In order to unlock talent through technology, the Malawian government initiated the mobile technology "one class" in collaboration with an NGO, Voluntary Service Overseas where standard 1 and 2 learners adopted the use of mathematical interactive applications. The mathematical application delivers concepts through a virtual teacher who speaks in the local language, a move that improved literacy levels especially in schools in rural areas (Huber et al., 2016).

In Kenya, since independence, the government has recognized the value of education and in support of it, changes in law, policy and practice have been witnessed (GoK, 2013). The enactment of Basic Education Act Number 14 of 2013, which seeks to provide, free, quality and compulsory education to all children is a milestone that the education sector made. The piloting of the Early Grade Reading Assessment, which was piloted in Malindi in 2007 improved literacy and numeracy abilities in English, Kiswahili and Mathematics in 2007 – 2009 and the findings from it suggested that lower primary children receives less interest and attention regarding reading, writing, spelling and numeracy from parents and teachers (Batilol, 2015). Findings from the analysis provided the foundation for Primary Math and Reading (PRIMR) initiative, which was implemented by the government through support from USAID in 2011 to 2014. In an effort to achieve the goals of PRIMR, the TUSOME program was initiated and 60,000 teachers and 22,600 schools were used for piloting (RTI, 2015). The program envisaged that over 5.4 million classes 1 and 2 would be twice likely to meet the Ministry of Education, Science and Technology (MOEST) benchmarks for literacy.

According to Information and Communication Authority of Kenya, Digital Learning Program was initiated in 2013 with an aim of integrating digital technologies in learning (Information and Communication Technology Authority-Government of Kenya, 2016). The project was implemented in phases, with the pilot phase covering 150 schools in 2015. It was expected that by 2017, almost all the public primary schools should be provided with the learning devices to improve literacy and numeracy using software like eLIMU that has videos and programs on spellings, reading, writing, and numeracy. The outcome of this program has shown that in both Kiswahili and English, pupils made strong gains in reading in grades one and two (RTI, 2015). In recent evaluation the percentage of pupils reading fluently increased from 12 per cent to 47 per cent between 2015 and 2016 (RTI, 2018). Despite the efforts by government, learners in lower primary public schools were poor in reading, writing and could not do basic arithmetic using simple operations like adding, subtracting, multiplying and dividing.

Despite the Kenyan Government's effort to provide quality resources such as infrastructure materials, qualified teaching personnel, physical facilities and financial assistance through the Free Primary Education Program to promote effective teaching in primary schools' pupils from class 1 to 3 still fail to master the skills of reading and numeracy (Uwezo, 2015). According to Institute for Economic Affairs (IEA, 2013), most of the money allocated to education in Kenya is spent on teachers' salaries with little regard to physical facilities and development, which are paramount in facilitating literacy and numeracy skill acquisition (IEA, 2013). Unless the problem is mitigated, the implementation of the new curriculum being rolled over might still suffer challenges of the previous.

Gachinu's (2014) study in Embu North District, Kenya with the result indicating that in schools where ICT was integrated in the pedagogy of mathematics, which was learner-centered, the learners performed much better than similar

groups taught using the teacher-led method, which was teacher-centered in the achievement test. During the education stakeholders meeting held after the annual school standards assessment in Kisii County, the standards assessment report showed poor performance of pupils between class one to three (MoE, 2016). According to statistics from the KNEC, since 2013 Kisii County, and specifically Kisii central Sub-county has been among the top non-performing primary schools in Kenya. According to KNEC KCPE results of 2013, 2014, 2015, and 2016, neighboring counties to Kisii such as Nyamira, Narok, and Homabay have been performing relatively better. In the Uwezo Report (2013), student's achievement in national examinations is determined by the foundation laid by teachers in elementary and primary level. It is against this background that this study attempted to establish the effects ICT as one of the determinants of literacy on literacy levels among learners in lower grades in Kisii Central Sub-County.

2. Methodology

The objectives of the study

- To find the effect of ICT on pupils' writing abilities
- To find the effect of ICT on pupils' reading abilities
- To find the effect of ICT on pupils' spelling abilities
- To find the effect of ICT on pupils' abilities to perform operations of numbers using signs.

2.1. Research Design

Survey research design was used to collect quantitative data. According to Orodho (2009), a descriptive survey research design facilitates description of the nature of the existing conditions, identifies the standards against which existing conditions can be compared and determine relationships that exist between specific events. The theoretical framework used in this study was Education Production Function (Simmons, 1980). The production function is used to explain the relationship between inputs and outputs of a firm, in this case the output of a school. The dependent variable is the pupils' end year examination results.

2.2. Population and Sampling

The target population of the study was 78 head teachers, 667 teachers of lower primary, 3 curriculum support officers and 2 Quality and Standards Officers. Stratified sampling technique was used to draw a sample of 16 out of schools was used for data collection because this was 20%, as recommended by Gay (1992). The sample of 124 lower primary school teachers was drawn from 667 using stratified sampling while 3 curriculum support officers and 2 QASOs were selected using purposive sampling.

2.3. Data Analysis

Quantitative data was collected by administering Likert scale questionnaires to class teachers of classes one, two and three. Moreover, academic results of the past three terms needed to establish literacy levels was collected using document analysis guides. Quantitative data from questionnaires was analyzed using descriptive and inferential statistics. A Computer Statistical Package SPSS (Version 22) was used to establish the relationship between the independent variables and dependent variable.

3. Findings

School	English	Kiswahili	Mathematics	Science/hygiene
1	38.9	41.64	36.52	40.61
2	75.42	69.43	72.1	80.16
3	34.75	39.52	38.18	42.66
4	38.92	43.64	41.07	45.81
5	49.17	48.63	42.97	46.67
6	49.18	44.69	45.74	42.71
7	55.74	47.62	51.68	41.72
8	43.39	42.63	40.71	48.53
9	51.73	49.74	48.18	46.83
10	32.76	35.57	34.69	42.38
11	69.18	82.18	74.45	80.55
12	44.61	46.53	45.86	49.41
13	46.34	43.83	42.84	48.21
14	51.68	48.81	50.73	49.62
15	70.81	75.68	71.42	79.73
16	33.47	36.71	34.97	35.98
Total	49.12813	49.80313	48.25688	51.34875

Table 1: Examination Results Mean Score in Class 1, 2 and 3 in 16 Sampled Schools

Source- Author, 2018

Table 1 shows that the subjects' mean scores in English, Kiswahili and mathematics were slightly below average apart from science subject whose subject mean score in the 16 schools was average. An individual analysis results from schools follows in observation checklist results. This is a sign that performance of the pupils is generally below average hence a justification for conducting the research in Kisii Sub-county.

4. Findings from Observation Checklist

School	Average Entry for Class 1,2 and 3 As at 2018	Ipad/Tablet			Computer			Projector			Usability of ICT Devises			Teacher's Competence	
		Adequacy		Qty	Adequacy		Qty	Adequacy		Qty	Frequently	Sometimes	Rarely	Yes	No
		Yes	No		Yes	No		Yes	No						
1	32	√	---	18	√	---	2	√	---	1	---	---	√	---	√
2	94	√	---	62	√	---	2	√	---	1	√	---	---	√	---
3	24	√	---	42	√	---	2	√	---	1	---	---	√	---	√
4	41	√	---	32	√	---	2	√	---	1	---	---	√	---	√
5	38	√	---	25	√	---	2	√	---	1	---	√	---	√	---
6	46	√	---	36	√	---	2	√	---	1	---	√	---	√	---
7	60	√	---	49	√	---	2	√	---	1	---	---	√	---	√
8	162	√	---	128	√	---	2	√	---	1	---	√	---	√	---
9	81	√	---	64	√	---	2	√	---	1	---	√	---	√	---
10	21	√	---	36	√	---	2	√	---	1	---	---	√	---	√
11	71	√	---	51	√	---	2	√	---	1	√	---	---	√	---
12	78	√	---	62	√	---	2	√	---	1	---	---	√	---	√
13	36	√	---	52	√	---	2	√	---	1	---	---	√	√	---
14	40	√	---	24	√	---	2	√	---	1	---	√	---	√	---
15	56	√	---	35	√	---	2	√	---	1	√	---	---	√	---
16	38	√	---	46	√	---	2	√	---	1	---	---	√	---	√
Total	918			762			32			16	3	5	8	9	7

Table 2: Observation Checklist Results
Source- Author, 2018

In table 2 the aim was to establish the average entry per class per school as at 2018 and relate it to the number of available iPads and other ICT resources at schools. Further, it was deemed wise to consider the frequency of usability of the technological devises and relate it to teachers' competence in every school. In this table, the researcher was able to determine the adequacy of ICT devises teacher's competency and frequency of usability of ICT devises, which in turn was related to findings in document analysis. From the table, it is clear that schools most schools do not have enough iPads that would be needed per child in a class. For instance, all the schools except school 3, 13, and 15 had less number of iPads compared to the number of children as averaged for class 1, 2 and 3. The usability of the said resources influences examination results in respective schools and per subject. Consider schools 2, 11 and 15 whose usability of iPads and other ICT devises is frequently recorded high achievement in mean scores as shown in table 4.10 where the school 2 has mean scores of 75.42, 72.1, and 80.16 in English, Mathematics, and Science subjects respectively. In table 4.21, similar results were posted by school 11, which had mean scores of 69.18, 82.18, 74.45, and 80.55 in English, Kiswahili, Mathematics, and Science subjects respectively. In the same schools, (2, 11 and 15) teachers in lower primary were competent and exhibited exemplary skills in handling and using iPads and other ICT devises meant for enhancing literacy skills. All schools that rarely used ICT devises except school 13 indicated that teachers were incompetent and lacked essential skills in the handling and usability of ICT devises. The same schools posted below average mean score for individual subjects considered. Example, schools 1, 5, 6, 8, 9, 12, and 16 recorded below average mean scores in English, Kiswahili, Mathematics and Science/hygiene subjects.

Item	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
	F	%	F	%	F	%	F	%	F	%
Use of technology influences pupils' writing abilities	22	17.7	33	26.6	6	4.8	44	35.5	19	15.3
Use of technology influences pupils' reading abilities	8	6.5	16	12.9	12	9.7	61	49.2	27	21.8
Use of technology influences pupils' spelling abilities	3	2.4	13	10.5	12	9.7	83	66.9	13	10.5
Use of technology influences pupils' abilities to perform operations of numbers using signs	3	2.4	23	18.5	12	9.7	67	54.0	19	15.3

Table 3: Influence of Technology on Literacy Levels among Lower Primary Children
Source- Author, 2018

In the findings presented in table 3, it is clear that 63 (50.8%) of the respondents agreed that use of iPads in teaching influenced learners' writing abilities. The number of respondents who attested that use of iPad in teaching influences pupils' reading abilities was 88 (71.0 %). From the same table 3, it is glaring that 96 (77.1%) of the respondents agreed that use of technology influences pupils' spelling abilities while the respondents who agreed that use of technology influences pupils' abilities to perform operations of numbers using signs was 86 (68.3%).

		Correlations				
		End Term	ICTW	ICTR	ICTS	ICTN
End Term Result	Pearson Correlation	1	-.228**	.628**	.866	.528
	Sig. (2-tailed)		.000	.007	.605	.476
	N	124	124	124	124	124
ICTW	Pearson Correlation	-.228**	1	.675*	-.048	.149
	Sig. (2-tailed)	.000		.016	.881	.643
	N	124	124	124	124	124
ICTR	Pearson Correlation	.628**	.675*	1	.291	.401
	Sig. (2-tailed)	.007	.016		.358	.197
	N	124	124	124	124	124
ICTS	Pearson Correlation	.866	-.048	.291	1	.373
	Sig. (2-tailed)	.605	.881	.358		.233
	N	124	124	124	124	124
ICTN	Pearson Correlation	.528	.149	.401	.373	1
	Sig. (2-tailed)	.476	.643	.197	.233	
	N	124	124	124	124	124

Table 4: Relationship between Influence of Use of Technology and Pupil's Examination Results
Source- Author, 2018

** . Correlation Is Significant at the 0.01 Level (2-Tailed)

* . Correlation Is Significant at the 0.05 Level (2-Tailed)

Key;

- ICTW - ICT on pupils' writing abilities
- ICTR - ICT on pupils' reading abilities
- ICTS - ICT on pupils' spelling abilities
- ICTN - ICT on pupils' abilities to perform operations of numbers using signs.

Table 4 shows that there is weak inverse correlation between use of ICT on pupils' writing abilities and pupils' scores in examinations, $r = -.228$. This means that the more the pupils use ICT tools, the poorer their writing abilities. There is strong correlation between use of ICT on pupils' reading abilities and pupils' scores in examinations, $r = 0.628$. Very strong correlation exists between the use of ICT on pupils' spelling abilities and their scores in examinations, $r = .866$. This reveals that the more the pupils use the ICT tools, the better their scores in spelling. Moderate correlation exists between pupils' examination results and their operations of numbers using signs.

5. Conclusion

Pupils exposed to essential instructional practices resources such as iPads, projectors, laptops, and books score highest in examinations. Very strong correlation exists between the use of ICT on pupils' spelling abilities and their scores in examinations, $r = .866$. This reveals that the more the pupils use the ICT tools, the better their scores in spelling. ICT use enhances pupils' ability in reading and performance operations of numbers using signs. However, it was also revealed that the more the pupils use ICT tools, the poorer their writing abilities as shown by $r = -.228$.

6. Recommendations

The Ministry of Education should consider increasing the number of ICT resources in schools to match the enrolment of learners. This should be coupled with the repair and replacement of faulty devices to ensure teachers' abilities to integrate ICT in instructional practice is not jeopardized. During the holidays, the Ministry of Education should organize and provide in-service training for teachers especially in lower primary classes where the implementation of the competency-based curriculum has started. Even though teachers were trained, a number of them did not grasp the new concepts needed for effective instructional practice. There is need for the Ministry of Education to review and increase the time allocated per lesson in lower primary because integration of ICT in teaching/learning take time. Strict institutional policy should be formulated to ensure teachers minimize time wastage during lesson hours.

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