

## Impact of Integrating ICT Infrastructure in Teaching and Learning in Kenyan Secondary Schools in Meru County

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### Abstract

*Information Communication and Technology has revolutionized education globally. There have been unprecedented benefits in all education institution and individuals who have embraced the technology. Major challenges like access, efficiency and quality have been addressed conclusively through integration of ICT. Kenyan government has developed a policy framework on ICT that spell the whole process of implementation of ICT in teaching and learning in all the secondary schools. However, despite the benefits and measures put in place the there has been scanty empirical research to ascertain the impact of integrating ICT in secondary education in Kenya. A descriptive survey design was used to collect data from the field through the use of questionnaire, interviews and an observation schedule. Random sampling method was used to sample 12 secondary schools from the twenty in the County. A sample of 276 respondents comprising 12 principals, 48 teachers, and 216 Form 3 students was used for the study. A correlation coefficient of 0.75 was realized. Descriptive statistics in form of frequencies and percentages were used to analyze data. The findings indicated that impact of ICT integration has not been established in teaching and learning in schools. The was also low investment in ICT infrastructure due to high costs of computer hardware and software. The study recommended*

*that teachers should be given sufficient training on how to use ICT infrastructure in teaching and learning in schools. Learners should also be equipped with ICT skills such as Microsoft software applications such as word, excel and access.*

**Keywords:** Implementation, Information, Communication, Technology, Globalization, policy, Integration

## **INTRODUCTION**

Information and Communication Technology has currently been classified as an essential component in education sector (Zhang & Aikman, 2007). Recently unprecedented pressure has been meted on educational institution to adopt the use of technology due to its immense benefits and opportunities worldwide (Clegg, Hudson, & Steel, 2003). The integration of ICT in education has a lasting implication to both the learners and instructors such as possession of multi-sensory and interaction that has no limitless (UNESCO, 2006).

Technology advancement involves use of hardware's like computers and the internet that complements the teachers' knowledge and skills and also the provision of learning content which in turn will make it possible to apply various teaching pedagogies (Fuller & Unwin, 2004). The utilization of ICT in teaching and learning is deemed to improve education system by providing efficient pedagogies for learning and sharing of information that supports learning (Privateer, 1999). Similarly, the incorporation of Information Communication Technologies (ICTs) has become a necessity in today's world changing world. The benefits of embracing the process have been widely acknowledged since it has become the major way to enhance access to education, promote efficiency and improve the quality of education.

Globalization and the trends in the world economy has necessitated the integration of ICT in teaching and learning to meet the 21<sup>st</sup> century global demand (Worldbank, 2004). ICT development has improved efficiency in the teaching profession where teachers are compelled to prepare the use of the new teaching resources that are very efficient (UNESCO, 2002). Generally, the balance and

relationship of ICT infrastructure and the teaching curriculum has myriad of benefits in teaching and learning (Laferrrière, Breuleux, & Bracewell, 1999). Similarly, the integration of Information communication and technology has significantly impacted on education by enhancing accessibility to education, improved efficiency and also promoted quality teaching and learning (Haddad, 2005).

Technology has greatly impacted in the society thus the justifiable need for all stakeholders to follow the policy framework and mechanism by aligning the curriculum and providing the necessary infrastructure to bridge the digital divide gap. The process demands the restructuring of the education system to align it with the demands of the technology so as to reap maximum benefits (Tomei, 2005)

The implementation of e-learning in teaching and learning has provided many advantages and created opportunities in that it has minimized the barriers for capacity building, education accessibility and equity by providing chances for training all individuals at any time and any place thus expanding enrolment at all levels in education (Schrum & Ohler, 2005). Further, the impact of ICT integration has changed the normal education culture by enhancing the delivery of content that is timely, independent in location and the space. Thus both learners and the instructors possess a sense of independence by learning and teaching at their own pace, enhancing accessibility and increasing enrolment thus, reducing the cost of learning and attainment of education goals and objectives conveniently (Olakulehin, 2008).

The Kenyan government has supported adoption of ICT integration by establishing a policy framework that supports e-learning so as to create a sustainable economy. The ICT policy was enacted in 2006 developed from a sessional No 1 of 2005 by the ministry of education (MOE, 2005). The policy was also in line with government program to achieve the Millennium Development Goals (MDGs). The policy further addressed pertinent issue on the Utilization of ICT in teaching and learning and also the challenges posed such in adequate electricity especially in rural areas, high levels of poverty, in adequate infrastructure and also lack of technical skills by the teaching staff. Therefore, this study was based on this premise that ICT has been implemented in schools hence the need to establish its impact in teaching and learning.

### **Problem Statement**

The Kenyan government has adopted the use of ICT infrastructure in education to increase access, promote efficiency and provide quality education. The sessional paper no 1 of 2005 and national ICT policy of 2006, KESSP, millennium development goals, vision 2030 and new partnership for African development (NEPAD) emphasizes the benefits of adopting ICT in education to attain sustainable development in the country (MOE, 2005). Despite the gains of ICT in different sectors of the Kenyan economy, there is a lag in the education sector. This is revealed by the fact that only a few secondary schools are equipped with the necessary ICT infrastructure for teaching and learning. Integration of ICT in education is considered to bridge the digital divide by improving access, efficiency and promote quality education thus, making the country competitive in personnel development and productivity. However, empirical evidence indicates that there has been studies on impact of ICT infrastructure in education in developed countries, there has been unprecedented limited research in developing countries. Thus the need to bridge that gap by investigating the impact of ICT infrastructure in teaching and learning in secondary schools in Kenya: A case of Meru county.

### **Literature Review**

#### **Impact of ICT infrastructure in teaching and Learning**

Information Communication and Technology has revolutionized education by changing the traditional practices, cultures pedagogies, organization, technology and finance. Aspects of flexibility in teaching and learning has been predominantly experienced whereby content delivery is not limited to time, location and space; thus learners can learn at their own convenience (Schrum & Ohler, 2005). This has therefore increased enrolment since accessibility is enabled at a minimal unit cost. This has positively impacted to learners who are able to access educational resources at affordable costs (Olakulehin, 2008)

Information and Communication and Technology infrastructure enhances personalization, promotes independent learning and creates an enabling environment for teamwork.

Independence is achieved where learning is learner centred and students can operate on their own by doing assignments and solve other academic problems easily since there is great collaboration among learners (Balanskat, Blamire, & Kefala, 2006). Similarly, ICT has been lauded as a bridge by teachers and learners to address the challenges that promote attainment of prerequisite skills (Ribeiro, Moreira, & Almeida, 2009). Similarly through ICT there is social inclusivity by all learners with special needs (Becker, 2000).

Further studies have shown that Information Communication and Technology improves the quality of education by engaging learners through learning by doing, real time and delayed conversation, problem solving, critical analysis of concepts, collaboration and open communication (Yuen, Law, & Wong, 2003). ICT infrastructure provides an avenue for interaction and information sharing and replicating normal procedures (Mason, 2000). Therefore, application of Information, Communication and Technology makes learning affordable in terms of content and examinations making it affordable thus addressing accessibility challenges, while promoting efficiency and improving quality (Ozdemir & Abrevaya, 2007).

However, developing countries Kenya included have experienced several challenges such as: inadequate infrastructure, network breakdown, lack of electricity connectivity, inadequate physical telecommunication infrastructure, restricted regulation by the communication commission, high taxation of ICT infrastructure and lack of technical knowhow (Nwagwu & Abanihe, 2006). Similarly, developing ICT literacy content and curriculum is a challenging course since it requires technical expertise and financial investment which is limited, thus affecting integration of ICT in teaching and learning.

### **Impact on the role of teachers**

There is a direct link between advancement in technology and general transformation of teaching and learning. Integration of ICT infrastructure in teaching and learning has made learning to be learner centred by changing the role of the teacher to be a facilitator and creator of learning environment. Studies have shown that the ICT infrastructural supported learning results to improved learners' competences (Becker, 1994).

Generally, use of Information Communication Infrastructure has transformed education sector by transformation the delivery and recipient of information in teaching and learning process. The instructors need to possess the prerequisite competencies to enhance teaching and learning. The instructors should always upgrade their knowledge and skills pedagogically so as to effectively integrate ICT (Levin, Kim, & Riel, 1990)

### **Teacher-students' relationship**

A teacher is considered to be playing a critical role in advising, dialogue partner in key subject areas thus enhancing great independence in learning. The application of ICT changes the interaction between learners and teachers in that it is learner centred. Teachers play a great role in in enhancing learner outcome. Thus the output in terms of knowledge and skills attained by learners is dependent on the teachers' input (Scardamalia, 2002).

### **Research Methodology**

The study applied both qualitative and quantitative data. Primary data was employed to gather first-hand information to achieve the objectives of the research. Questionnaire was the main instrument used to collect primary data. Generally, 48 questionnaires were distributed for teachers 12 for principals and 216 for students. Further, governments report and journal articles were studied to articulate the problems and give more insights. The study employed both quantitative and qualitative method. Primary data source was collected through questionnaire. Data was processed and analysed using SPSS version 20.0 software. Descriptive statistics was applied to compute the percentage and frequency distributions of the respondents on the variables. Moreover, correlational analysis is used to see the relationship between variables. Finally, the results are summarized and meaningful interpretations of result were made to draw the conclusions and implications.

## Results and Discussions

### Use of ICT infrastructure in Teaching and learning

**Table 1 Use of ICT infrastructure in Schools**

Respondents	YES		NO	
	No	%	No	%
Principals	2	22.2	7	77.8
Teachers	11	30.6	25	69.4
Form 3 students	50	30.7	112	69.1
Total	63	30.4	144	69.6

According to the results in Table 1, 22.2% of the principal's respondents indicated that ICT was being used in their schools while 77.9% indicated otherwise.

On the use of ICT, 30.6% of the teacher's respondents indicated they were being used in their schools while 69.4% indicated otherwise. Among the Form 3 student's respondents, 30.9% indicated they were being used while 69.1% indicated they were not being used in their respective schools.

Majority of the respondents 144 (69.6%) indicated that ICT were not being used in teaching and learning in their schools while a minority of the respondents 63(30.4) agreed that they were being used. This suggests that most the secondary schools in the County were not using ICT. The National Council for Science and Technology (2010), confirms that the perceptions of teachers and school managers do play a crucial role in the use of computers in Kenyan classrooms which is very essential for the development of ICT in schools. This suggests that most secondary schools in Meru County were not using ICT in teaching and learning activities. Further, the respondents who indicated that ICT was used in their schools were asked to indicate how it was used. The findings are presented in Table 2.

**Table 2 Impact of ICT Infrastructure in Schools**

ICTs	Respondent	Teaching/ learning		Office work		Exams		Instruction		Research	
		No	%	No	%	No	%	No	%	No	%
Computers	Principals	1	50.0	1	50.0	00	0.0	00	0.0	00	0.0
	Teachers	5	45.5	2	18.2	02	18.2	00	0.0	2	18.2
	Form 3	40	63.5	5	07.9	04	63.4	00	0.0	14	22.2
Printers	Principals	1	50.0	1	50.0	00	0.0	00	0.0	00	0.0
	Teachers	7	45.5	2	18.2	02	18.2	00	0.0	00	0.0
	Form 3	30	47.6	6	9.5	27	42.9	00	0.0	00	0.0
Cameras	Principals	1	50.0	1	50.0	00	0.0	00	0.0	03	27.3
	Teachers	6	54.6	2	18.2	00	0.0	00	0.0	00	0.0
	Form 3	50	79.4	5	07.9	00	0.0	08	12.7	00	0.0
Scanners	Principals	1	50.0	1	50.0	00	0.0	00	0.0	00	0.0
	Teachers	8	72.7	2	18.2	01	9.1	00	0.0	00	0.0
	Form 3	63	100.0	0	0.0	00	0.0	00	0.0	00	0.0
Photocopiers	Principals	00	00.0	1	50.0	01	50	00	0.0	00	0.0
	Teachers	4	36.4	2	18.2	05	45.5	00	0.0	00	0.0
	Form 3	63	100.0	0	0.0	00	0.0	00	0.0	00	0.0
Internet	Principals	1	50.0	1	50.0	00	0.0	00	0.0	00	0.0
	Teachers	6	54.5	0	00.0	00	0.0	00	0.0	05	45.5
	Form 3	63	100.0	0	00.0	00	0.0	00	0.0	00	0.0

The findings on table 2 indicate that 50% of principals' respondents who were in agreement that ICT was in use in their school indicated computers were used only in computer teaching and learning while the other 50% indicated they were only used for office work. Among the teachers 45.5% indicated computers were only used for computer teaching and learning, 18.2% indicated office work, 18.2 % exams preparation while the other 18.2 % indicated they were used for research. Among the form 3 students 63.5% indicated that computers were only used for computer teaching and learning, 7.9% indicated office work, 6.4% indicated exam preparation while 22.2% indicated



research. These findings suggest that most secondary schools in Meru county use computers in computer lesson (teachings). This is in line with studies that shows that schools should increasingly employ multimedia (ICT) applications to stimulate teaching and provide exciting opportunities for student learning (Neyland, 2011).

On real use of printers, 50% of the principal's respondents indicated they were used in computer teaching & learning while the other 50% indicated they were used in school office only. Among the teachers 45.5% indicated printers were for teaching and learning computer, 18.18% for indicated they were used in preparation of exams. Among the form 3 students 47.6% indicated printers were only used to teach and learn computers 9.5% indicated office work only while the rest 42.9% indicated exam preparation. This finding suggests that in Meru county that most schools used printers in teaching computers lessons and not instructional activities.

On the use of cameras in the schools 50% of the principals indicated they were used in computer classes while the other 50% indicated office work. Among the teachers 54.5% indicated computer lessons only, 18.2% office work while the rest 27.2% indicated research work. Among the form 3 students 79.4% indicated they were used in computer lessons, 7.9% indicated office work while the rest 12.7% indicated instruction purposes. These findings suggest that most secondary schools in Meru county used cameras in computer classes only.

On the use of scanners 50% of the school principals indicated they were used in computer lesson while the rest 50% indicated they were used in school office only. Among the teachers 72.73% indicated they were only for computer teaching, 18.2% office work while 9.1% indicated they were used in preparation of exams in the schools. Among the form 3 students all the respondents (100%) were in agreement that scanners were only used in teaching computer classes. These findings suggest that most schools in Meru County use scanners in teaching of computer lessons.

On photocopies 50% of the school principals indicated they were used for office work while the rest 50% indicated preparation of exams. Among the teachers 36.4% indicated computer teaching, 18.2% indicated office work while 45.5% indicated preparation of exams. among the form 3 students all the students' respondents (100%) were

in agreements that photocopies were used in computer lessons only. These findings suggest that most secondary schools in Meru County use photocopies for teaching computers in their respective schools.

On internet use in schools 50% of the principals indicated it was used only in computer classes while the rest 50% indicated it was used for office work only. Among the teachers 54.5% indicated computer classes while 45.5% indicated research. Among the form 3 students all the respondents in the study indicated that internet was used in computer classes only. Studies confirms that a networked (ICT) school is not just a school with a physical network but where it is beneficial to do so, utilization of resources from outside the schools own network can be applied (Bielefeldt, 2012) .

**Table 3 Challenges of Using ICT infrastructure**

Respondents	Power Blackout		Inadequate ICT Gadgets		Equipment Breakdown		Expensive in Maintenance		Shortage		Poor Handset	
	No	%	No	%	No	%	No	%	No	%	No	%
	Principals	1	50.0	00	0.0	00	00.0	01	50.0	00	00.	00
Teachers	2	18.2	03	27.3	02	18.2	03	27.3	01	9.1	00	00
Form 3 Students	10	20.0	20	40.0	23	46.0	00	0.0	00	0.0	10	20
<b>Total</b>	<b>13</b>	<b>88.2</b>	<b>23</b>	<b>67.3</b>	<b>25</b>	<b>64.2</b>	<b>04</b>	<b>77.3</b>	<b>01</b>	<b>9.1</b>	<b>10</b>	<b>20</b>

According to results on Table 3, 50 % of the principal’s respondents who were in agreement that ICT was being used in their respective schools indicated they were experiencing the problem of power blackout while 50% indicated the problem of maintenance of ICT. Among the teachers 18.2% indicated problem of power blackout 27.3% indicated that ICT were not enough, 18.2% indicated the problem of ICT maintenance while 9.1% indicated problem of poor storage of ICT. Among the form 3 student’s respondents, 20% indicated the problem of power blackout, 40% indicated ICTs were not enough, 46% indicated problem of ICT gadgets breakdown while 20% indicated that mobile phone handsets were not allowed in their school. Out of the total 63 respondents, who agreed that their school was using ICT,

20.6% indicated they were facing problem of power blackout, 36.5% indicated ICTs were not enough, 39.7% indicated breakdown of the ICT, 6.3% indicated lack of maintenance of ICT, 1.6% indicated poor shortage while 15.9% indicated prohibition of mobile phone handsets in their respective school.

These finding suggests that in spite of having and using ICT, most secondary schools were facing various ICT related problems in the course of using them. This is confirmed by studies that most institutions are not adequately preparing their teacher trainees to effectively use the technology (ICT) in teaching and learning (Buabeng-Andoh, 2012).

### **Conclusion**

The results of the study indicated that integration of ICT in teaching and learning supported the development of students and teachers' expertise in ICT and enhanced students' in critical thinking skills, teacher and student intervention and increase students' learning motivation. Further, ICT can offer opportunities to teachers for obtaining educational resources from the internet to enrich course content. These result are in agreement with studies that most teachers have embraced integration of ICT in their teaching (Chapman, 2003) .

Generally, use ICT infrastructure has a crucial impact on teaching and learning. Therefore, secondary schools have experienced transformational changes in education through integration of ICT infrastructure in teaching and learning. Further, the findings indicated that teachers as they get involved in the use of ICT they develop a positive perception towards the integration of ICT infrastructure in teaching and learning. Further, the findings indicate that several learning institutions have embraced the integration of ICT in teaching and learning. Similarly, majority of the teaching staff have been sensitized on the need to have a paradigm shift from the old norm of teaching and learning to technologically viable methods so to make the integration of ICT in education to be effective and address the global and 21<sup>st</sup> challenges.

## **Recommendations**

From the findings of the study, it is recommended that;

- (i) Instructors be need to be acquitted with the relevant knowledge and skills on ICT so to enhance the integration process.
- (ii) Technology resources are key towards ICT integration thus teachers and learners should be provided with adequate facilities.
- (iii) Teachers should always involve learners on the Use of ICT infrastructure in their learning to motivate, encourage, set an example and show them the importance of using ICT.

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