DETERMINANTS OF THE INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN PUBLIC SECONDARY SCHOOL CURRICULUM IN KAKAMEGA NORTH DISTRICT, KENYA

BY

WAITI MWACHI JOSIAH

ABSTRACT

This paper discusses the research that was carried out to determine the determinants of the integration of information and communication technology (ICT) in public secondary school curriculum in Kakamega North District, Kenya and thereafter the findings could be generalized to other public secondary schools in Kenya. The main argument of this study is that ICT is prerequisite tool for globally competitive quality education training and research for development. The study was conceived due to the factor that several parts of secondary school were attempting to provide ICT, however, its use at classroom level seemed to be challenging because of the issues affecting integration. To achieve this, the study had five research objectives and questions. The study adopted descriptive survey design targeting 34 public secondary schools and 214 teachers all of whom were purposively sampled because they were viewed as information rich cases. Out of

the target population, a sample size of 32 head teachers and 136 teachers was selected. Data were collected using teachers' and head teachers' questionnaires and observation checklist as instruments. Findings indicated that there is a value attached to integration of ICT in school curriculum. The researcher recommends that schools be equipped with adequate ICT facilities and resources, and adopt the national ICT policy and plan for its implementation.

KEY WORDS: Determinants, Information and Communication Technology, Integration, Curriculum, Implementation, Stakeholders.

INTRODUCTION

Information and Communication Technology (ICT) Skills play a key role in promoting the economic development of a country. Many of the productivity gains in developed world economies over the past two decades can, to a great extent, be attributed to the impact of the ICT (GoK, 2005). Today many developing countries are increasingly using ICT (ICT Task Force, 2005). Information Communication Technology has penetrated all sectors in industrialized nations and at least, there is substantial empirical evidence that some sectors of developing countries are harnessing the social and economic benefits that ICT offer (Pelgrum and Law, 2003).

Globally, governments of the world have made education the natural platform for equipping their nations with ICT skills. The major objective for all nations is to create ICT readiness in schools (UNESCO, 2009). Several World Summits on Information Science (WSIS) have urged nations to adopt characters on the global digital opportunities for all (GODFA) that promotes global ICT participation (EUDC, 2002).

Gakuu (2006) notes that, the Government of Kenya (GoK) is indispensable for the journey towards ICT for all, by 2015. For the purpose of attaining Millennium Development Goals (MDGs) and their set targets, the Ministry of Education, Science and Technology (MoEST) in collaboration with Development partners developed Kenya Education Sector Support Programme (KESSP) in 2005, where ICT features as one of the priority areas identified (GoK, 2006). With the development and approval of ministry's policy through the Sessional Paper No. 1 of 2005 and the approval of the national ICT policy in 2006, the strategy gives a snap shot of what is required for ICT integration.

To recognize the ICT programme, the GoK in the 2009-2010 Budget, allocated education sector Ksh. 1.3 billion to buy computers and build computer laboratories for use by secondary school students. Currently, the 2010-2015 strategic plans focuses on developing physical ICT infrastructure and maintenance of ICT tools and equipment. Besides, the GoK in collaboration with

International Development Research Centre (IDRC) has launched on ICT centre (Sega Silicon Valley (SSV) in Siaya District, Nyanza region, Kenya. This project might equip teachers with computer skills as well as integrate ICT in the school curriculum (The Standard March 29, 2010). According to overview of Kenya Vision 2030, ICT falls under a social pillar that aims to provide a globally competitive quality education, training and research for development (GoK, 2007).

Computers are vital in our daily activities (GoK, 2005). To provide quality basic education for all, the GoK has made computer to be part of the core curriculum at the secondary school level (National Action Plan on EFA, 2005). Currently, computer is an optional and examinable subject by Kenya National Examinations Council (KNEC) in both public and private secondary schools. The penetration of ICT into public secondary schools, however, is still very low (Kessy, Kaemba and Gachoka, 2006) despite the fact that the GoK, through the MoEST and computer for schools Kenya (CFSK) is trying to emphasize its integration at school level. The ICT value in education is not widely felt in some regions. According to Adera (2010) cited in The Standard (March 29,2010), this might be due to the disparity in ICT infrastructure where the major institutions in urban enjoy the benefits of ICT whereas the small institutions in rural are still locked out of the information era, due to poor infrastructure like lack of electricity.

Kakamega North District is one of the locations where the use of computers in teaching and learning is limited to a few public secondary schools, representing 12% of the total public secondary schools in the district (DEOs office, Kakamega North district, December, 2009). This reckoned the need for the study.

The Concept of Information and Communication Technology (ICT)

The force driving globalization in the 21st Century is undoubtedly ICT (GoK, 2005). Information and Communication Technology (ICT) has become the most important issue in the field of current educational theory and practice where many countries of the world are now focusing on applying in education. This reckoned the need to understand what ICT entails and its specified aspect integrated in school curriculum for the sake of the study.

Torero and Braun (2006) cited in Ngoma, (n.d) have defined ICT as the computing industry (hardware, software, networks, the internet and related services); electronic data, processing and display (such as photocopiers, cash registers, calculators and scanners as well as myriad of less-well known machines specifically tailored to production and manufacturing); telecommunication and related services (such as fixed and cellular telephones, facsimile machines, instant messaging and teleconferencing). For the need of this study, the focus was mainly on the use of computers and internet connectivity for instruction to public secondary schools.

STATEMENT OF THE PROBLEM

Kenya has made remarkable progress putting in place an ICT policy framework and implementation strategy complete with measurable outcomes and time frames. The process has had the benefit of sound advice from officials and stakeholders (teachers and head teachers) and perhaps more importantly, strong leadership from the office of the permanent secretary of the MoE (Glen, 2007). This progress has also been supported by computer for schools Kenya (CFSK) project which started in 2002, to equip students and staff with modern ICT skills required for competing in today's global economy (GoK, 2006). The government of Kenya has had a national ICT policy that gives a strategy of what is required for ICT integration in public secondary schools curricula in Kenya (GoK, 2006). Despite the fact that several secondary schools were attempting to provide ICTs, its use at classroom level seemed to be challenging because of the issues affecting its integration. This reckoned the research study to look at the determinants of the integration of ICT in public secondary school curriculum in Kakamega North district.

RESEARCH METHODOLOGY

Research design

The study adopted a descriptive survey research design where the researcher sought to determine respondents' opinions, attitude and ideas towards ICT

integration in public secondary school curriculum by looking into their background information and the school.

Target population

The target population for this study comprised of 34 head teachers and 214 teachers from public secondary schools in Kakamega North district. Teachers and head teachers are rich with ICT information; hence oversee the integration of ICT in school curriculum.

Sample size and sampling techniques

The credibility of this research study was judged by the size of the sample and its sample technique. In choosing a sample size, this study focused on an optimum size of at least 30 participants based on a confidence level of 95% and the significance level of 5%. This implies 1.96 was the standard variate (z) for 95% confidence (Kothari, 2004). The study adopted a purposive sampling technique whose major criterion was of using an adequate number of schools, that is, a sample size of 34 head teachers. However, for the teachers, the study applied Kothari's (2004) formular to calculate sample size $\left[n = \dfrac{Z^2 \bullet P \bullet q \bullet N}{e^2 [N-1] + Z^2 \bullet q} \right]$ to attain a sample size of 4 teachers per school, hence, the study involved 136 teachers in 34 secondary schools.

Research instruments

Head teachers' and teachers' questionnaires and observation check list were the main instruments for data collection. According to Kombo and Tromp (2006), questionnaires gather data over a large sample and diverse regions, saves time, confidentiality is upheld and no opportunities for interviewer bias. Both head teachers' and teachers' questionnaires adopted unstructured and structured format. The questionnaire to the head teachers was divided into four sections. Section 1 gathered data on head teachers' demographic information. Section 2 gathered data on head teachers' attitudes on ICT integration in school curriculum. Section 3 had items on ICT determinants in public secondary school curriculum. Section 4 gathered data on suggested possible measures for ICT integration in public secondary school curriculum.

Questionnaire to the teachers contained 5 sections. Section 1 gathered data on teachers' demographic information. Section 2 gathered data on the extent to which ICT had been integrated in the school curriculum. Section 3 was about teachers' view on the availability of ICT equipments and materials in school. Section 4 and 5 had items on ICT integration determinants in school curriculum and teachers' suggested possible measures for improving ICT integration in school curriculum respectively. In addition, there was a non-participant observational checklist on the availability of ICT equipment and materials in the

school that was meant to supplement a wide range of research techniques used by the researcher in this study.

Instrument validity

The study employed content and construct validity (Ary, Jacobs, *et al.,* 2006). Content validity was significant because it addressed two important variables that influenced the validity of the questionnaire. The first was on how the topic was important to the respondent. Here the study assumed more valid responses from individuals who were interested in the topic and informed about it. The second was on how the questions would protect the respondents' anonymity. The aspects that were found in the demographic information section of the questionnaire, for instance, gender and teaching experience formed the constructs. These were measured by construct validity where the test items and the structure of the questionnaire were accounted for by the supervisors who hypothesized that the teachers and head teachers had different characteristics and would perform differently. Teachers and head teachers with ICT experience, for instance, would perform different from those who do not have. Content validity was also established by supervisors, who were experts in curriculum issues. In addition, before distributing the questionnaires to the participants, a pilot study was carried out to provide information about deficiencies and suggestions for improvement by the respondents.

Instrument reliability

To determine instrument reliability, the raw scores for teachers' and head teachers' questionnaires were summarized, coded, edited and then the information synthesized to reveal the essence of data. The open ended questions were analyzed qualitatively and quantitatively respectively. For ease of analysis, qualitative data was first coded then assigned numeric values. The results for teachers' and head teachers' questionnaires were then used to calculate the reliability using the Pearson Product Moment Correlation formular (Best and Kahn, 2006). Split-half technique was adopted by creating equivalent forms which were then correlated with each other. The correlation coefficient was then adjusted to reflect the entire test length using Spearman-Brown prophesy formular (Best and Kahn, 2006). The reliability values were found to be 0.96 and 0.99 for teachers' and head teachers' questionnaires respectively and were considered reliable given that the positive coefficient reliability ranges from 0 to 1.

Research objectives and questions

The objectives of the research were as follows:

(i)   To assess the extent to which ICT has been integrated in public secondary school curriculum in Kakamega North district.

(ii)   Analyze the stakeholders' (teachers and head teachers) attitudes towards ICT integration in public secondary school curriculum in Kakamega North district.

(iii)   To assess other ICT media education devices beside computers and internet that might have enhanced ICT integration in public secondary school curriculum in Kakamega North district.

(iv)   To identify various determinants of the integration of ICT in public secondary school curriculum in Kakamega North district.

(v)   To suggest possible measures for improving the integration of ICT in public secondary school curriculum in Kakamega North district.

The following research questions were formulated from the stated objectives:

(i)   To what extent has ICT been integrated in public secondary school curriculum in Kakamega North district?

(ii)   What are the teachers' and head teachers' attitudes towards ICT integration in public secondary school curriculum in Kakamega North district?

(iii)   What ICT media education devices have enhanced ICT integration in public secondary school curriculum in Kakamega North district?

(iv)   What determinants can be considered for the integration of ICT in public secondary school curriculum in Kakamega North district?

(v)   What measures can be taken and improve the integration of ICT in public secondary school curriculum in Kakamega North district?

RESEARCH FINDINGS AND DISCUSSION

The researcher was able to administer 32 head teachers' questionnaires and 136 teachers' questionnaires. Out of which, 25 head teacher questionnaires and 106 teacher questionnaires were returned dully completed. These questionnaires were then analyzed and interpreted. Data were analyzed using appropriate descriptive statistics and the major findings of the research discussed. The findings comprise the information obtained from analyzed questionnaires, observational checklist and literature review. The findings are reported on the basis of the questions formulated from research objectives.

Question 1: To what extent has ICT been integrated in public secondary school curriculum in Kakamega North district?

In order to answer this question, it was prerequisite for the researcher to establish whether respondents were engaged in any observable ICT integration in school curriculum. It was also necessary to find out on: the distribution of computer teachers in school; head teachers' computer literacy; number of students taking computer studies; and the availability of computers in school and any future plan of acquiring more ICT facilities. The information is recorded in Table 4.9, Table 4.10 and Figure 4.2 respectively.
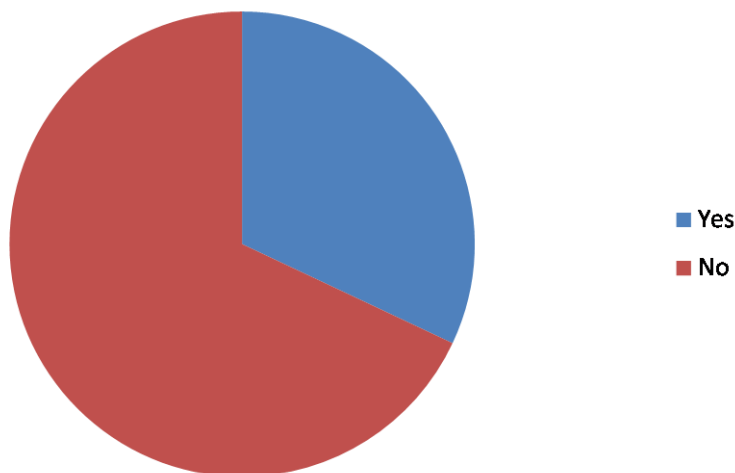
Table 4.9: Number of students taking computer

Number of Students	Teachers	%
None	92	86.8
1-5	7	6.6
6-10	2	1.9
Above 10	5	4.7
Total	**106**	**100.0**

Table 4.10: Computer Teachers, Computers available and future plan of acquisition

Response	Teachers	%	Computers	%	Plan	%
Yes	5	20.0	3	12.0	16	64.0
No	20	80.0	22	88.0	9	36.0
Total	**25**	**100.0**	**25**	**100.0**	**25**	**100.0**

Figure 4.2: Headteachers' Level of Computer Literacy

The data in Table 4.9, Table 4.10 and Figure 4.2 clearly indicate that at least there is a representation of each stakeholder in school (students, teachers and head teachers) seen to be engaged in ICT integration in school curriculum. The percentages of those engaged in ICT integration were low and that is one of the determinants that this study sought to establish. Besides, a good number of respondents (64.0%) indicated that schools had a plan of equipping computer laboratories with computers. What this implies in practical sense is that in this era of ICT schools had realized the need of ICT integration in school curriculum.

Question 2: What are the teachers' and head teachers' attitudes towards ICT integration in school curriculum in Kakamega North district?

The research study also had to collect data that would show teachers' and head teachers' attitudes towards ICT integration in school curriculum. Teachers and head teachers' were presented with a number of questions regarding what they felt about or how they perceived the concept of ICT in school curriculum. Teachers and head teachers were to indicate whether they 'strongly agreed', 'agreed,' 'disagreed,' strongly disagreed,' or were 'undecided' about the issue of ICT integration in school curriculum. To obtain attitude scores, six (6) items were ranked on a five-point Likert scale and analyzed using scores assigned to each of them. The scores were then added to obtain the measure of the teachers and head teachers. The results were as recorded in Table 4.13.

Table 4.13: Teachers' and head teachers' attitude towards ICT integration

Range of Scores	Category	Number of Respondents	%
6-17	N	28	23.7
18	Ne	1	0.8
19-30	P	89	75.4
Total		**118**	**100.0**

From the table, 89 respondents (75.4%) were in the range of 19-30 indicating a positive attitude towards ICT integration in school curriculum. Only 1respondent (0.8%) was in the neutral category. A larger percent (75.4%) indicated that teachers and head teachers recognized the value attached to ICT integration in school curriculum.

Question 3: What ICT media education devices have enhanced ICT integration in public secondary school curriculum in Kakamega North district?

This research questions was basically concerned about other ICT devices used in school for teaching and learning. Respondents were to identify other ICT media education devices beside computers that were being used to equip learners with ICT skills to improve the quality of education. The table below indicates the frequencies and percentages for the ICT media education devices in the public secondary schools in Kakamega North district.

Table 4.2: Frequency distribution of ICT media education devices

Devices	HT$_S$		Teachers		Total	
	F	%	F	%	F	%
Radio	8	32.0	60	30.3	68	30.5
Television	4	16.0	28	14.1	32	14.3
Video	3	12.0	19	9.6	22	9.9
Telephone	5	20.0	34	17.2	39	17.5
Photocopiers	2	8.0	14	7.1	16	7.2
Tape recorders	3	12.0	43	21.7	46	20.6

The results from the table show that majority of the individuals (30.5%) indicated that the radio was the commonly used ICT media education device in school curriculum. A fairly good percent indicated that tape-recorders (20.6%), telephone (17.5%), and television (14.3%) are the commonly used ICT media education devices in school curriculum. Video (9.9%) and photocopiers (7.2%) were used to a smaller extent. This indicated that ICT integration in school curriculum was being implemented even though there were factors impeding the process.

Question 4: What determinants can be considered for the integration of ICT in public secondary school curriculum in Kakamega North District?

In order to identify the determinants of the integration of ICT in public secondary school curriculum in Kakamega North district, head teachers were asked to rate

the importance of the stated determinants according to the scale of 1-5.They were to indicate whether the determinants were 'not important' (NI), 'less important' (LI), 'important' (I), 'very important' (VI), or 'uncertain' (U). The responses by the head teachers were tabulated as shown in table 4.11.

Table 4.11: Determinant of the integration of ICT

Determinants	VI	I	U	LI	NI
	%	%	%	%	%
Qualified computer teachers	9.8	20.0	29.4	-	-
Funds	16.4	12.5	-	-	-
Electricity	13.9	12.5	-	-	-
Teachers' and students' interest	2.5	10.0	11.8	40.0	87.5
School image	8.2	20.0	23.5	40.0	87.0
Classroom space	15.6	10.0	11.8	-	-
Clearly revised ICT policy	17.2	10.0	-	-	-
Adequate ICT materials	16.4	5.0	5.9	20.0	6.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

From the table, a fair percent of the head teachers considered funds, electricity, classroom space, clearly revised ICT policy, and adequate ICT materials as very important for ICT integration in school curriculum. However, others (87.5%)

indicated that teachers' and students' interest is not important. Statistics from the respondents indicate that the stated determinants were important for ICT integration to succeed. Those percentages in the column of 'uncertain' meant that some head teachers had little or no knowledge of the importance of the stated determinants for ICT integration to be adopted.

Question 5: What measures can be taken to improve the integration of ICT in public secondary school curriculum in Kakamega North district?

This question aimed at capturing possible measures to improve ICT integration in school curriculum. The findings were recorded in Table 4.15.

Table 4.15: Suggested possible measures to improve ICT integration

Suggestions	HT$_S$		Teachers	
	F	%	F	%
Build computer laboratories	5	20.0	4	3.8
Teacher in-service course in ICT	10	40.0	80	75.5
Need for electrification	8	32.0	20	18.9
Government Sponsorship	2	8.0	2	1.9
Total	**25**	**100.0**	**106**	**100.0**

From table 4.15, the results indicate that most teachers (75.5%) and head teachers (40.0%) recommended for teacher in-service courses on ICT integration. This is an important aspect because if teachers were allowed to go for in-service courses on ICT, they would be comfortable to apply the skills in teaching and learning. Other respondents advocated for the need to: equip the schools with power (18.9%), build computer laboratories (3.8%), and Government sponsorship (1.9%).

CONCLUSION AND RECOMMENDATION

Conclusion

The study found that the integration of ICT in public secondary school curriculum, given the right conditions, would provide teachers and head teachers with opportunities to improve professionally through in-service courses on ICT. These teachers and head teachers would then transform education and help students acquire confidence and pleasure in new technologies by being familiar with ICT application skills for problem-solving, information gathering and interpretation. Teachers' and head teachers' positive attitude towards ICT integration could reckon the provision of ICT infrastructure, facilities, and equipment which could enable the realization of effective integration. Other ICT media education devices beside computers and internet play great role in increasing teachers' opportunities to bring illustrative material into the classroom. This would increase the extent of ICT integration to school curriculum. Besides,

there is no one determinant that can be exclusively attributed to the integration of ICT in school curriculum. The determinants are interrelated. Teachers and head teachers as the key implementers of ICT in school curriculum advocated for teacher in-service courses on ICT integration, equipping schools with power, building computer, laboratories, and Government sponsorship as major determinants of the integration of ICT in public secondary school curriculum.

Recommendations

For the integration of ICT in public secondary schools to be realized, there was need for the study to provide recommendations that would guide policy-makers. The recommendations are therefore divided into those with policy implications and those meant for further research.

Policy Implications

(i)   The GoK should collaborate with Computer for Schools Kenya (CFSK), NEPAD and other legalised Development Partners (DP) to equip public secondary schools with adequate ICT facilities and resources to encourage the integration of ICT in teaching and learning.

(ii)   Teachers and head teachers should be encouraged to take lead in promoting ICT integration in school curriculum to prepare the students for the technological changes in education.

(iii)   Every school should adopt the national ICT policy plan for its implementation. This could act as a guide for teachers in choosing the

right content, methodology, objectives, values and attitudes that would be of benefit to students.

Recommendations for further research

The following are recommended areas for further research basing on this study:

(i) The impact of ICT integration on teaching and learning. This area could be researched on because with the growth of internet from a mainly closed academic network to a common feature, many people's lives are driven by a number of factors which affect education, for instance, the TV integration, radio and entertainment systems and the communication opportunity offered by the email, audio and video-conferencing, which in turn have a major impact on teaching and learning.

(ii) The role of Kenya Education Management Institute (KEMI) in ICT integration in school curriculum as perceived by head teachers and teachers.

(iii) The initiative of ICT mobile laboratories in stimulating demand for ICT integration in both public and private secondary school curriculum in rural areas. This area could make people begin to understand that there are other faster and cheaper ways of doing things by computer and therefore, create demand.

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