Integration of Information Communication Technology in Teaching in Public Secondary Schools in Nakuru County, Kenya

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Abstract
Global investment in Information Communication Technology (ICT) has been to improve teaching and learning in schools. Kenya's e-government strategy and the National ICT policy gave considerable attention to education and schools to integrate ICT to improve students' academic performance. A study by Computers For Schools Kenya showed that, the entire education system was characterised by a very low integration of ICT. Students' academic performance in KCSE in Kenya and particularly Nakuru County has been poor. This study examined integration of ICT in teaching in public secondary schools in Nakuru County, Kenya. The study used a survey research design. A total of 486 public secondary school teachers (81principals and 405 classroom teachers) participated in the study. They were randomly selected. Three instruments were used to collect the data namely questionnaire for teachers (QT), Principals interview schedule (PIS), and school observation schedule (OS).The study found that ICT facilities ware inadequate and teachers had only basic or no ICT skills. Financial constraints and lack of facilities and equipments ware some of the challenges teachers faced in integration of ICT in teaching. There is a positive significant relationship between integration of ICT and students' academic performance at 0.05 alpha significance levels. The study concluded that integration of ICT is quite important at the current dispensation.
Key words: Information Communication Technology (ICT), Integration, e-government strategy, ICT integration policy.

1. Introduction

Students' academic performance in national examinations is of great importance to the society today as this is being used for students' admission and career placement in university and middle level colleges in most countries all over the world. For this reason Information Communication Technology (ICT) is increasingly becoming a more and more powerful tool for education and economic development world over (Unwin, 2009). Unwin (2009) contends that ICT can be a catalyst by providing tools which teachers use to improve teaching and by giving learners access to electronic media that make concepts clearer and more accessible.

2. Integration of ICT in Teaching

Integration of Information Communication Technology (ICT) is the ability to use technology as a tool to research, organise, evaluate and communicate information (Kenney, 2006). Amara (2006), on the other hand, sees the integration of computers as the extent to which teachers use ICT for teaching and it includes the use of multimedia projectors and overhead projectors for teaching and use of mobile phones. Pernia(2008), notes that ICT integration involves actual application of ICT in teaching work and it means applying computer and Internet technology to enhance the quality of teaching and learning. ICTs consists of hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text and images) (Batchelor & Nocrich, 2005).

 ICT is used for capacity development and citizen empowerment. Ultimately, ICT can enhance teaching opportunities and outcomes for students, including students with intellectual disabilities (Anderson, 2009). Global investment in Information Communication Technology (ICT) has been to improve teaching and learning in schools. This has been initiated by many governments in a view to enhance students' academic performance. Despite all these investments on ICT infrastructure, equipments and professional development to improve teaching in many countries, Gulbahar (2007) claimed that the huge educational investment have produced little evidence on improvement of students' academic performance.

Students who integrate ICT in learning gain deeper understanding of complex topics and concepts. They are more likely to recall information and use it to solve problems in the classroom (Apple Computer, 2002). Through ICT integration, students extend and deepen their knowledge, investigation, and inquiry according to their needs and interest when access to information is available on multiple levels (CEO Forum on Education and Technology, 2001).

Cotton (2001) observed that teaching is in the process of a major change. Through innovations in ICT technology, cademic institutions are being given an opportunity to work for better students' academic performance. Wango (2009) suggested that the quality of teaching and learning can be enhanced through improved teaching practices. The increasing changes in teaching practices and the need for creative, divergent and unexpected solutions to improve teaching and learning situations, require a challenging approach to the field of instructional practices (Steyn & Kamper, 2001). Improving school ICT facilities is essential in view of the current global revolution in teaching due to the changing nature of teachers' work, the realities of the information age, new global partnerships and awareness of technological changes (Feldner, 2003). Schools should provide adequate ICT to enhance integration of ICT in teaching.

Persaud (2006) observed that integration of ICT has become an issue. The process of integrating ICT into teaching involves a paradigm shift, where new insights and information, facilitates and new forms of understanding are necessary for teachers. Persaud (2006) noted the need to take action towards developing ICT skills among teachers. Selwood, Fung and O'Mahony (2003) observed that

teachers who become more comfortable with and competent in integrating ICT are likely to improve students' academic performance by integrating ICT in teaching. Wagner et al. (2005) observed that ICT Technology plays a key role in enhancing the quality of students' performance but successful implementation of ICT requires strategic planning. Research suggests that simply putting computers into classrooms is not enough to impact on students' academic performance.

3. Problem of study

Investment in ICT has been initiated by many governments globally in a view to improve on students' academic performance. For example in United Kingdom (UK) the government spending on educational ICT in 2008–09 was £2.5bn, in United States, the expenditure on K-12 schools and higher education institutions was $6 billion and $4.7 billion respectively in 2009 and in New Zealand, the government spends over $ 410 million every year on schools ICT infrastructure. Despite all these investments on ICT infrastructure, equipments and professional development to improve teaching in many countries, the huge educational investment have produced little evidence on improvement of students' academic performance. This has been a concern to the students, parents, the government of Kenya and other stakeholders. For a student to be admitted for a course in any university in Kenya, one must have an aggregate grade c plus (C+). However, due to competitiveness for the few vacancies in public Universities a student must have acquired an aggregate of grade B or above to be admitted. The National students' performance in KCSE for the years 2010 and 2011 was poor, Table1.

Table 1

National KCSE examination results 2010-2011 overall grade summary B and above.

Year	Grade			
	A	A-	B+	B
2010	1566	6565	12737	18173
2011	1930	9063	16390	22944

Source: Kenya National Examinations Council (KNEC) 2012

The total number of candidates were 411,783 and 357,488 for the years 2011and 2010 respectively. The same (KCSE) examination performance results for students' in Nakuru County were similarly poor Table 2.

Table 2

Nakuru County KCSE examination results 2010-2011 aggregate grade B and above summary.

Year	Grade				
	A	A-	B+	B	Total
2010	22	83	138	239	482
2011	17	108	157	202	484

Source: County Director of Education (CDE) Nakuru County.

Total KCSE student candidates were 19,139 and 17,723 in the year 2010, 2011 respectively. An observation of Table 2 shows that students' KCSE examinations performance in Nakuru County was similarly low as that of the national results.

This study looked at availability of ICT facilities and equipment in public secondary schools in Nakuru County and teachers' knowledge and skills for integrating ICT in teaching.

The objective of the study was to identify the ICT facilities and equipment available for teachers to integrate in teaching and to determine teachers' ICT integration knowledge and skills in public secondary schools in Nakuru County.

3. Methodology

The study used survey research design to investigate integration of ICT in teaching and teachers' ICT knowledge and skills in public secondary schools. The sampling unit for this study was a teacher from the 1644 teachers in public secondary schools in Nakuru County, while the sampling frame was the 274 public secondary schools. Cluster sampling was done to select schools for study from each category of schools namely National, extra-County and County public secondary schools where 81 public secondary schools were selected. To select a teacher from each of the 5 cluster subjects in each school, simple random sampling was done and a total of 405 teachers were selected. The sampling error was 4.87 at 95% confidence level P≤.05 and Z=1.96. All the 81 principals of the selected schools were interviewed. Three instruments were used to collect data namely questionnaire for teachers (QT), Principals interview schedule (PIS), and school observation schedule (OS). The instruments were pretested. The three instruments TQ, PIS and OS were checked by a team of experts in educational research from the Faculty of education, Masai Mara University and the supervisors. To enhance reliability, internal consistency of the questionnaire was calculated and a Cronbach index of 0.736 was obtained from the pretest. Data analysis was done using both the descriptive and inferential statistics. With help of a Statistical Package for the Social Sciences (SPSS) version 20 computer program, the data was analysed to increase the accuracy of results. The computer produced data which was presented in form of tables, frequencies, percentages and means as the descriptive data and a Chi-square (χ^2) test was done for inferential data.

4. Results and Discussion

The study sought to find out the ICT facilities and equipment available for integration in teaching and teachers ICT integration knowledge and skills in public secondary schools. The findings of the study were established as follows.

4.1. Availability of ICT Facilities and Equipment

To establish the availability of ICT facilities and equipment available a list of ICT hardware, software, equipments and facilities was presented in the questionnaire and the respondents were to tick (√) Yes or No to the availability or none availability. The outcome was presented as on Table 3. Table 3 shows that a percentage of 85.2% of schools had computers though the computers were not adequate. The only software available to majority (63.7%) of the teachers was word processors. The rest of ICT hardware and soft ware available in the public secondary schools were less than 44.4%. Some ICT like electronic white board and video conferencing devises were not available at all in any of the public schools. Only 14.8% of schools had internet service connectivity although internet is one of the most useful ICT software for integration in teaching. The researcher's observation

schedule result showed that 33.3% of the teachers accessed internet through a modem though it was not clear whether the modem was personal or owned by the schools. The principals' interview result on internet connectivity showed 100% of the principals' stated that there was no internet service provided. The results showed that ICT hardware and software in public secondary schools were not enough.

Table 2
Distribution of ICT hardware and software available to Teachers

ICT Facility/Equipment	Percent	
Available	No	Yes
N=405		
Electricity	32.3	67.7
Internet	85.2	14.8
Computers	14.8	85.2
E-materials	37.0	63.0
Television	55.6	44.4
Projectors	92.6	7.4
CD/DVD Player	92.6	7.4
Word processors	36.3	63.7
Spread sheet	63.0	37.0
Database	63.0	37.0
Presentation applications	63.0	37.0

Results revealed that 67.7% of the public secondary schools had electricity. Thus majority of secondary schools had no challenge with the source of power needed in integrating ICT. A Outcome of a question asked over the frequency of integration of ICT available in teaching were as on Table 4.

Table 3
Frequency of integration of ICT in teaching

Teachers' level of integrating ICT in teaching	N=405	Frequency	Percent
None		127	31.4
Basic		145	35.8
Average		100	24.6
High		33	8.2

Table 4 shows that 127 (31.4%) of the respondents never integrated ICT, 145 (35.8%) basically integrated ICT, 100 (24.6) averagely integrated ICT and 33(8.2%) highly integrate ICT. The study reveals that virtually 31.4% of the teachers did not have access to ICT for integration in teaching. Thus the ICT facilities and equipment were not provided. This is in contrast to the study in South Africa where a teacher was provided with a professional ICT toolkit comprising high-quality, multimedia materials including classroom resources and planning tools (centred around a handheld computer, a laptop, digital audiovisual equipment and accessories) (Leach, 2008; Leach et al., 2005) where the teacher could integrate ICT in classroom teaching at all times. An observation made by the researcher while completing the observation schedule (OS) checklist showed that the integration of the ICT varied with respect to teachers' access to ICT facilities Table 5.

Table 4
Available ICT Facilities

ICT Observed		Percent	
	N= 81	Available	Not Available
Electricity		85.2	14.8
Internet facilities		33.3	66.7
Computers in classrooms		45.4	54.6
E-Library materials		11.1	88.9

The study found that 85.2% of the schools had electricity, while 66.7% of the schools had no internet, 92.6% of the schools had no projection equipment and 88.9% of the schools had no E-library.

ICT consistently facilitate new forms of teacher-to-teacher cooperation that address their challenging circumstances: Large class sizes, lack of electricity and telephone connectivity, heating and other resources. This study agree with the findings by Anderson (1997) andHennessy and Onguko (1997) who observed that teachers' integration of ICT in teaching may be affected by lack

of reliable access to electricity, limited ICT (especially internet access, bandwidth, hardware and software provision), language of instruction ; class size and communications. Lack of school ICT facilities and technical support, lack of teacher confidence and skills, and lack of teachers' understanding about the potential in integration of ICT to make a difference to student learning are issues around teacher professional development which is in agreement with study by Cowie and Jones (2005).

4.2. Teachers' Knowledge and skills on Integration of ICT in Teaching

Teachers' ICT knowledge and skill to integrate ICT in teaching were determined through question statements that were asked to seek the teachers' ability to operate on various ICT hardware and software Table 6.

Table 5
Teachers' skills on Integration of ICT in Teaching

ICT Operative Skill	Percent		
	N=405	No	Yes
Start and shut a computer		36.6	63.4
Use internet		59.4	40.6
Use word processor		23.9	76.1
Use spread sheets		75.6	24.4
Use database applications		76.1	23.9
Use presentations applications		79.4	20.9

The study found out that 63.4% of the teachers did not know how to start or shut down a computer, 59.4% do not know how to use internet services, 76.1% do not know how to use word processor, 75.6% do not know how to use spread sheet, 76.1% do not know how to use data base applications and 79.4% do not know how to use presentations applications Table 6. This was an indicator that teachers lack ICT integration skills that would enhance integration of ICT in classroom teaching. Thus there may be schools with ICT facilities but the teachers in these schools may not be integrating ICT in teaching due to lack of skills as observed on a descriptive analysis of the data in Table 6 presented on Table 7.

Table 6
A Descriptive Data of Teachers' ICT Knowledge and skills

ICT Skill	N=405	Mean	Std. Deviation
Start and shut a computer		.62	.487
Use internet		.37	.483
Use word processor		.41	.493
Use spread sheets		.24	.428
Use database applications		.24	.428
Use presentations applications		.21	.408
Teachers' ICT skills mean		.3458	.37941

The study shows the teachers' ICT skills mean to be 0.3458. This tells us that the teachers' ICT integration skills level was very low hence majority of teachers did not have skills on integration of ICT in teaching. The ICT skills that majority of the respondents had was to open and shut the computer with a mean of 0.62 which shows that many teachers were computer-illiterate and were not positioned to participate in implementing the new ICT approach to teaching. The study supports an observation by Ngare (2007) that teachers do not have ICT integration skills hence need to be trained.
The findings of a question asked over teachers' ICT skills levels were analysed and tabulated on Table 8.

Table 7
A Descriptive Data of Teachers' ICT Skills Levels

Level of ICT integration	N=405	Frequency	Percent
None		63	15.6
Low		201	49.6
Moderate		60	14.8
High		81	20.0

The study observed that 15.6% of the teachers had no ICT skills at all, 49.6% had basic ICT skills, 14.8% had moderate ICT skills and only 20.0% had advanced or high level ICT skills. This indicated that majority of teachers would not integrate ICT in teaching hence students academic performance remained low. Pelgrum, (2002) observed that teachers should have ICT knowledge and skills for effective integration of ICT an observation that was also supported by BECTA (2003) who observed that teachers' confidence in integration of ICT in teaching is directly affected by

levels of personal ICT skills, levels of technical support and the quality of training in ICT integration.

A question was set to find the areas in which teachers integrated ICT in teaching. The outcome was as on Table 9.

Table 8
Descriptive Data on Use of ICT in Teaching

Area of ICT Integration	Percent	
N=405	Yes	No
Timetable preparation	80.0	20.0
Preparation of schemes of work	52.2	47.8
Instructional materials	54.1	45.9
Students' progress reports	54.8	45.2
Instruction in class	84.4	15.6
Library management	80.0	20.0
Students' records	79.3	20.7
Corroboration with peers	78.5	21.5
Class attendance management	85.2	14.8

The study revealed that 80% of the teachers integrate ICT on time table preparation, 52.2% use ICT in preparing schemes of work, 54.1% integrate ICT in preparation of instructional materials, 54.8% integrate ICT in preparing students' progress reports, 84.4% integrate ICT for students' instruction in class, 80.0% integrate ICT in library management, 79.3% integrate ICT in preparing students' records, 78.5% integrate ICT for corroborating with peers and 85.2% integrate ICT in class attendance management. The study observed that integration of ICT in teaching in public secondary schools is rather significant. The study further revealed that much of ICT is also integrated in the preparation of professional documents such as schemes of work and students' progress reports.

5. Conclusions and Recommendations

The study found out that majority of the public secondary schools had few or no ICTs for integration in teaching. Though the government has installed electricity to most (67.7%) of the public secondary schools, other ICT facilities are limited. This means that some teachers do not integrate ICT in teaching as ICTs are not available. The study found out that teachers' ICT integration skill level is low. Thus 15.6% of the teachers had no ICT integration skill, 49.6% had low ICT integration skills, 14.8% had moderate ICT integration skill and only 20.0% had high or advanced ICT integration skills. The majority (65.2%) of teachers were not able to integrate ICT in teaching as they had none or only low ICT integration skills. Some lack basic operations skills

which are necessary for integration of ICT. Few teachers can collaborate with peers via internet over curriculum issues. These make the teachers not to be able to consult with other colleagues over topical subject matter as well as gather information in preparation for teaching.

The study recommend to the ministry of education the need for an approach to manage the change in integration of ICT in education sector that include finding means to secure ICT for integration in teaching in order to successfully implement the integration of ICT and achieve a planned technological change. The study recommends training of teachers through pre-service and in service courses on ICT integration skills. The study recommend the Ministry of Education through BAM and PTA to contract ICT technicians in schools to aid in maintenance of ICT facilities and assist teachers build confidence in the integration of ICT in teaching. The ministry should introduce and make compulsory a course on ICT integration in every subject taught in secondary schools, prioritize school electrification programs to schools without electricity and provide lacking facilities like internet in schools.

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