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The Role of ICT in Teaching in Secondary Schools

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Abstract:
A descriptive survey was designed to investigate the role ICT in teaching in secondary schools in Kenya. In order to achieve the rationale of this study, the following two specific research objectives were addressed; to determine the role of ICT on the learning process, to establish the effectiveness of teaching using ICT resources.The target population for this study comprised of 4 administrators,297 teachers, 12 heads of departments and 23 technicians in Secondary Schools. Data was analyzed using descriptive and inferential statistics. A one way analysis of variance (ANOVA) was used to analysis the Effects of ICT resources on teaching. Finding shows that the use ICT resources for teaching play an important role on teaching and learning. Teaching using ICT resources is more effective than teaching without. Teaching using ICT has a positive impact on syllabus coverage. The recommendations were; teachers should strengthen their pedagogical use of ICT in teaching and exploit the potential of ICT to improve teaching.

Keywords: *ICT, role, use, effectiveness, teaching*

1. Background of the Study

In developed countries, the trend of using ICT for teaching purpose has been on an increase. Condie and Munro (2007) found that there has been an increase in teachers' time spent using computers at all levels of education between 2005 and 2007.The study also found that there has been an increase in the use of computers, particularly for administrative tasks, preparatory and follow-up work, but a decrease for instruction. The authors observed that in some countries, ICT benefits are emerging. For example, teachers' ICT skills have developed over the years, as have the range of hardware and software available in the classroom. There is evidence that these developments have led to a reduction in teachers' workloads.

In China it was found that ICT has the potential to improve delivery and access to health and education, increase accountability and effectiveness of government business and non-profit organization; all of which contributing to an enabling environment for socio-economic development (Morawczynski et al, 2007).

1.1. Statement of the Problem

The integration of technology into education is an enormous endeavor given the country's poor state of technological infrastructure and manpower, there is therefore, a need for a systematic evaluation of all the activities of ICT in education. From the ICT in education policy paper (MOEST, 2005); it is clear that comprehensive indicators need to be developed to reflect the goals indicated in the ICT in education policy document. Therefore, this study focuses on investigation of the role of ICT in secondary schools in Kenya.

1.2. Purpose of the Study

The purpose of the study was to establish the role of ICT as an aid to learning and teaching in Secondary schools. It focused on initiatives related to measuring and demonstrating the role of ICT with regard to: students, learning and the learning environment; teachers and teaching strategies; organizational change; and other areas relevant to teaching and learning.

1.3. Objective of the Study

The main objective of the study was to investigate the role ICT in teaching in Secondary schools in Kenya. The specific objectives were to:

- Determine the role of ICT on the training process in Secondary Schools
- Establish the effectiveness of teaching using ICT resources in Secondary Schools

1.4. Research Questions

- What is the role of ICT on the training process in Secondary Schools

- What is the effectiveness of teaching using ICT resources in Secondary Schools

1.5. Assumptions of the study

- The selected respondents were a representative of the total population of Secondary Schools in Kenya.
- Respondents were honest and responded to all the issues in questionnaires, FGDs and interviews.
- Respondents have had some exposure to ICT

1.6. Scope of the Study

The study was carried out in the following departments:

- Administration
- Computer department
- Science department
- Humanities department
- Language department
- Business studies
- Hospitality ,Tourism, consumer and service

1.7. Significance of the study

This study provides findings that can be used by:

- Management of Secondary Schools institutions to improve on their ICT resources in order to enhance effectiveness in teaching.
- The government to develop policies that could enhance the usage of ICT for teaching purposes in Secondary Schools
- institutions in Kenya
- Teachers to enhance their skills in ICT and remain current in ICT technology

2. Literature Review

2.1. Effects of ICT on Learning Outcomes

Somekh B. e t al, (2007) found concrete evidence based on using control groups, of the effects of ICT on learning outcomes. Basing on a sample size of 1000 teachers and 3000 pupils they identified the positive impact of ICT in the curriculum on performance and skills. The study found that ICT improves pupils' performance, provided software is used appropriately and coherently in terms of curriculum objectives. Verhallen, (2004) observed that in ICT-rich learning environments with developed teaching programmes, significant developments in student's performance could be achieved, even for those starting from a very lower level(Somekh B. e t al, 2007) found that interactive whiteboards can help pupils grasp abstract ideas through visual representation. These visuals also hold pupils‟ attention in lessons, and work well for learners who find interpreting text difficult. The more experience the teacher had of using the interactive whiteboard, the greater the likelihood of positive attainment.

Karpati, (2007), revealed that there are improved skills levels, improved student motivation and attendance when ICT is used for learning purposes. ICT is perceived to play an important role in the learning situation, resulting in better understanding and more active and differentiated learning. According to Ramboll Management and Sanya (2006) pupils participate more actively in learning when ICT is used.

2.2. Role of ICT on Teachers and Pedagogy

According to Reform Forum (April, 2003), ICT literacy is very different from being able to integrate technology into teaching to enhance learning. Teachers do not need to learn about technology; they need to learn how to use technology to enhance their learners' understanding and critical thinking skills.

Muriithi (2005) has argued that in Kenya like most developing countries, ICT usage is still limited to computer literacy training. She contends that the present ICT curriculum merely deals with teaching about computers and not how computers can be used to transform the teaching and learning in our learning institutions. In her study, shefound that integration should consider learning pedagogy, the pattern of student use of ICT, and the extent use of teaching and learning program.

2.3. Supporting Teachers In The Use Of Technology

Trucano, Farrell & Isaacs, (2007) asserts that while technicians can be employed to fix and maintain computers, teachers and educators must know how to exploit ICT for what it does best – opening learners up to the world of knowledge. By providing adequate access to ICT, the TTCs can use it to achieve learning objectives at various levels. This point is also noted in the ICT in Education Paper (Kenyan MoEST, 2005) in which large-scale capacity building workshops for teachers have been suggested. Computer systems provide tools for collecting, organizing, processing and communicating information.

Students and teachers have to learn to use the tools effectively.ICT gives teachers access to information to support them in trying new strategies and engaging with new material (Committee on Developments in the Science of Learning, 2000).

3. Research Design and Methodology

3.1. Research Design

Survey design was used to conduct this study. The intention of survey research is to gather data at a particular point in time and use it to describe the nature of existing conditions

3.2. Study Population

- The target population for the study comprised of administrators, lecturers and Secondary Schools
- The study targeted 336respondents.This is shown in table 1

3.2.1. Target Population

Descriptive survey design was adopted in this study. According to Kothari (2004), surveys are used to systematically gather factual quantifiable information necessary for decision making. The sample frame comprised of administration, heads of departments, lecturers and Technicians of Secondary Schools with a target population of 336 respondents. This is shown in table 1.

Category	Target population
Principal;	1
Deputy principal Academic	1
Deputy Administration	1
Examination officer	1
HOD	12
Teachers	297
Technicians	23
Total	336

Table 1: Target Population

Stratified random sampling technique was used. Stratified random sampling is the process of selecting a sample in such a way that identified subgroups in the population are represented in the sample in the same proportion as they exist in the population (Frankel, et al, 2000). This study used Krejcie and morgan table (1970) to calculate the sample size followed by proportional random sampling which attracted a sample size of 181 respondents. The sample proportion from each stratum was determined as:

Category	Target Population(N)	$N_i=(N_i X N)/N$	Sample Size
Principal	1		1
D.p. Academic	1		1
Deputy Administration	1		1
Exam officer	1		1
Lecturers	297	(297/336)X18	159
HODs	12	(12/336)X181	6
Technicians	23	(23/336)X181	12
Total	336		181

Table 2: Sample Size

Data was collected by use of questionnaires whose selection was based on the nature of the data to be collected, the objective of the study and the time available. The questionnaires adopted 5-pointLikert scaling of Strongly Agree (SA), Agree (A) Undecided (U), Disagree (D) and Strongly Disagree (SD). These were ranked 5, 4, 3, 2 and 1 respectively. Reliability was tested by use of internal consistency technique .18 questionnaires were used for piloting at Olessos Technical Training Institute in order to determine their reliability. The items were considered reliable if they yielded a reliability coefficient of 0.70 and above181 questionnaires were administered through drop and pick method to lecturers, Heads of departments and Technicians of Secondary Schools

.After data collection, responses from all items were crosschecked to facilitate coding and processing for analysis .Statistical analyses of data was done by use of descriptive and inferential statistics using Statistical Program for Social Sciences (SPSS v.11.10).

4. Analysis of Findings

4.1. Descriptive Statistics

An evaluation of the participants training experience indicated that the minimum training experience was a majority of the respondents had served in teaching for more than 5years .This implies that the information they provide for this study can be relied on based on their teaching experience. The results are presented in table 3

Experience	No	Percentage (%)
Less than 5 yrs	7	4
5-10	30	17
10-15	104	57
15-20	40	22

Table 3: Statistics of the Participants Training Experience

4.2. Uses of ICT For Teaching in Secondary Schools

The pie chart in Fig1 shows that a large proportion (32.5%) of the trainers use ICT to create instructional materials; 17.5% of the trainers use ICT to gather information; 12.5% use it to communicate with colleagues; another 12.5% use ICT to access model training plans; 10.0% use ICT to access research and best practices for training; another 10.0% use ICT for multimedia presentations; finally, 5.0% of the trainers use ICT for administrative record keeping.

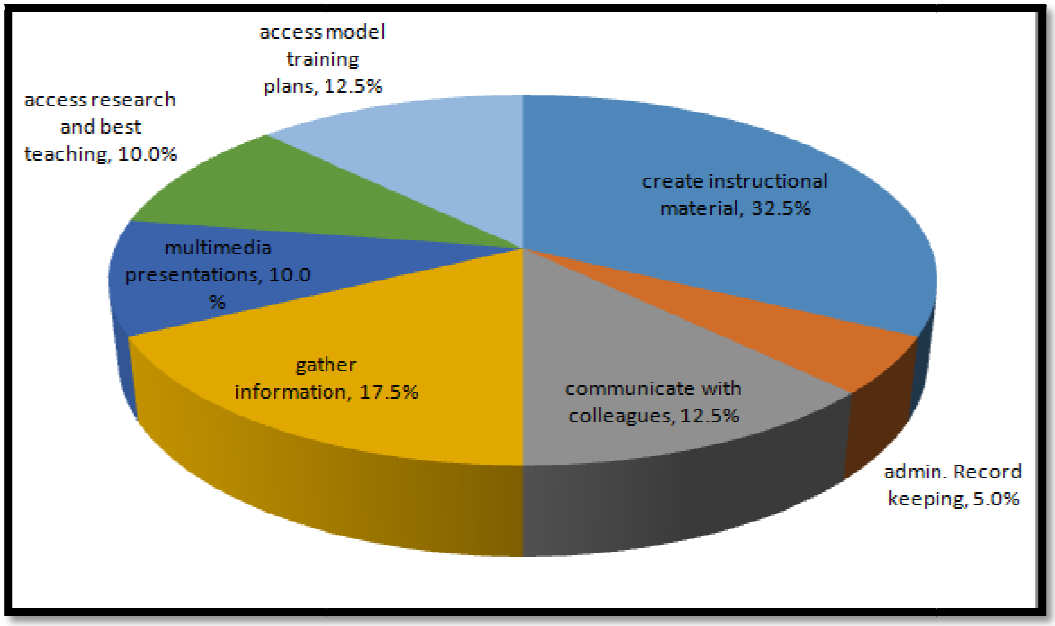

Figure 1: Percentages of Trainers Indicating Their Uses of ICT to Accomplish Various Objectives

4.2.1. Objective One: The Role of ICT on the Training Process

Statements	Mean	Standard Deviation	Skewness	Kurtosis
Access to worldwide information	3.8269	1.00427	-.807	.410
Ease of communication generation	4.0192	.85362	-.667	.246
Analysis and modeling of realistic examples	4.1218	.78980	-.539	-.333
visualizing , organizing and analyzing data	3.8718	.98844	-.795	.361
Provision of immediate feedback	4.1218	.93217	-.263	1.819

Table 4: ICT and Training Process in Secondary Schools

From the study respondents with a mean of 3.869 (SD=1.00467) tend to agree that ICT resources are used to access worldwide information. Respondents with a mean of 4.0192 (SD=.85362) agree that ICT resources ease communication generation .Respondents also agree that ICT resources helps in the analysis and modelling of realistic examples with a mean 4.1218 (SD= .78980). They also tend to agree that ICT resources aids in visualizing, organizing and analysing data with a mean

of 3.8718(SD=.98844).ICT resources also help in providing immediate feedback with a mean of 4.1218 (SD=.93217). Normality of data was assessed using Skewness and Kurtosis statistics (Tabachnick & Fidell, 2007). Hair, Money, Samouel and Page (2007)indicated that data skewness values must fall within +1 and -1 and kurtosis values must be in the range of +3 and -3. If both tests have been fulfilled, then the data can be considered as normally distributed and no any skewed distribution.

4.2.2. Objective Two: Effectiveness of Teaching Using ICT Resources

Statements	Mean	Standard Deviation	Skewness	Kurtosis
Improved syllabus coverage	3.8269	1.00427	-.807	.410
Increased pass rates	4.1218	.82964	-.850	.730
Student contact hours used effectively	4.0192	.92612	-.828	.409
Students are able to hand in assignments in time	4.1090	.83915	-.740	.354
Students are able to utilize online resources	3.9038	.88558	-.544	-.071

Table 5: Effectiveness of Teaching Using ICT Resources in Secondary Schools

Participants 'responses pertaining to effectiveness in teaching ain Secondary Schools revealed the results presented in table 5. Respondents tend to agree that there is improved syllabus coverage at 3.8269(1.00427). They agree that they have witnessed increased pass rates at 4.1218 (SD=.82964).Student contact hours have been used effectively 4.0192(SD=.83915). Students are able to hand in assignments in time 4.1090(SD= .83915). Students utilize online learning resources 3.9038 (SD=.88558). Normality of data was assessed using Skewness and Kurtosis statistics (Tabachnick & Fidell, 2007). Hair, Money, Samouel and Page (2007)indicated that data skewness values must fall within +1 and -1 and kurtosis values must be in the range of +3 and -3. If both tests have been fulfilled, then the data can be considered as normally distributed and no any skewed distribution.

4.3. Influence of ICT on Teaching

Pearson Product Moment Correlation Coefficient was used to establish the influence of ICT resources on teaching. It was used to measure the degree of relationship between the two variables. There was a positive relationship between ICT resources and teaching (r=.901, *n*=156, p<.01), this indicated that an increase in the use of ICT resources improves teaching.

		ICT Resources	Teaching
ICT Resources	Pearson Correlation	1	.901**
	Sig. (2-tailed)		.000
Teaching	Pearson Correlation	.901**	1
	Sig. (2-tailed)	.000	
Correlation is significant at the 0.01 level (2-tailed).			

Table: 6: Correlations

4.4. Effects of ICT Resources on Teaching

Multiple regression analysis was used to test the magnitude of effect of ICT resources on teaching. First, the model summary was analyzed to establish the strength of ICT resources in predicting teaching. Results presented in Table 7 reveal that ICT resource gives 81.1 % of the variation in teaching (Adjusted R Square = .811).The remaining 18.9 % can be explained by other factors not considered in the study.

Model Summary[b]						
R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	Sig. F Change	Durbin-Watson
.901	.812	.811	.34990	665.737	.000	1.473

Table 7: Model Summary
Predictors: (Constant), ICT Resources
Dependent Variable: Teaching

The ANOVA output was examined to check whether the proposed model was viable. Results shown in Table 8 reveal that the F-statistic was highly significant (F= 665.737 $p<0.05$), this shows that the model was valid.

ANOVA[a]						
Model		**Sum Of Squares**	**Df**	**F**	**Mean Sq**	**Sig**
1	Regression	81.504	1	665.737	81.504	.000[b]
	Residual	18.854	154		.122	
	Total	100.358	155			

Table 8: ANOVA[a]
Dependent Variable: Teaching [a]
Predictors: (Constant), ICT Resources [b]

4.5. Multiple Regression Results

Results of the regression coefficients presented shows that the estimates of β values and give an individual contribution of the predictor to the model. The β value tells us about the relationship between ICT resources with teaching effectiveness. The positive β values indicate the positive relationship between the ICT and the outcome. The β value, for ICT resources (0.901) was positive. The positive β value indicates the direction of relationship between predictor and outcome. From the results the model was then specified as:

$Y=\beta_1 X_1 + Ɛ$

Teaching =.901 ICT resources

Results reveal standardized regression coefficient for ICT resources (β=0.901), implies that an increase of 1 standard deviation in use of ICT resources is likely to result in a 0.901 standard deviations increase in the efficiency of teaching.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.325	.145		2.242	.026
	ICT Resources	.920	.036	.901	25.802	.000

Table 9: Coefficients[a]
a. Dependent Variable: Teaching

5. Discussion of the Findings

5.1. The Role of ICT on the Training Process

5.1.1. ICT Plays an Important Role in the Training Process

ICT resources are used to access worldwide information, ease communication generation, help in the analysis and modelling of realistic examples, aids in visualizing, organizing and analysing data and also help in providing immediate feedback. This finding concurs with that of Trucano, Farrell & Isaacs, (2007) who asserts that while technicians can be employed to fix and maintain computers, teachers and educators must know how to exploit ICT for what it does best – opening learners up to the world of knowledge. By providing adequate access to ICT, the TTCs can use it to achieve learning objectives at various levels. This point is also noted in the ICT in Education Paper (Kenyan MoEST, 2005) in which large-scale capacity building workshops for teachers have been suggested. Computer systems provide tools for collecting, organizing, processing and communicating information.ICT gives teachers access to information to support them in trying new strategies and engaging with new material (Committee on Developments in the Science of Learning, 2000).

5.2 Effectiveness of Teaching Using ICT Resources

Findings show that when ICT is used for teaching: there is Improvement in syllabus coverage, increased pass rates, student contact hours used effectively, students are able to hand in assignments in time, and students are able to utilize online resources effectively.

The findings agree with that of (Bransford, Brown, &Cocking, 2000) who observed that many computer applications provide the tools to support students in quickly completing lower level tasks so that they can focus on the main purpose of the activity.

Word processors, graphic packages, database packages spread sheets and other software do support the performance of students. It has been observed that students often learn more in less time, that is , their productivity increases when they use computer support appropriately (Samlabsky 82,2007).Computer systems do provide the opportunity to create a wide range of interesting learning experiences. This is likely to help maintain student interest (Cradler &Bridgforth, 2002).

5.3. Conclusion

The use of ICT resources for teaching plays an important role on teaching and learning. Some of the ICT resources included use of projectors/computers and smart boards in teaching, extensive use of internets as a research centre by both students and lecturers among other resources**.** Lecturers who use ICT for teaching effectively deliver knowledge and skills and access more information through internet and library and therefore, are able to cover the syllabus in time before students sit for their examinations. These findings can be generalized to all Secondary Schools in Kenya.

5.4. Recommendations

1. Lecturers should embrace use of ICT in teaching in order to improve on the quality of teaching. They should use ICT for the purpose of demonstration, simulation and prototype.
2. Lecturers should strengthen their pedagogical use of ICT in teaching and exploit the potential of ICT to improve on knowledge delivery and skills.

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