Teacher Competencies in using ICT in Curriculum Instruction in Secondary Schools in Bungoma County, Kenya

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Abstract: *This study was set to investigate teacher competencies in using ICT in curriculum instruction in secondary schools in Bungoma County, Kenya. The study was guided by the Adoption and Diffusion Theory and the Technology Acceptance Model. Based on pragmatism paradigm, the study was a survey carried out in Bungoma County. Both qualitative and quantitative methods were used to collect data from teachers. A sample of 102 schools was drawn from a population of 342 secondary schools in the county. 306 teachers were sampled to participate. Instruments for data collection were questionnaire and interview schedule. Data was analyzed using descriptive statistics and presented in frequency distributions and percentages. The study found out that some teachers lacked proper competencies to effectively use ICT resources during classroom instruction. Therefore, the researcher recommended that all teachers should be prepared thoroughly and continuously on practical use of ICTs during instruction.*

Keywords: Teacher Competencies, ICT, Curriculum, Instruction

1. Introduction

Teacher training in the use of technology for education is a key factor for implementation of good ICT based practices. Though the authorities in education have of late made an effort to train serving teachers in use of technology in instruction, there are still many teachers who consider themselves as lacking the necessary skills to take on ICT in their own practice. According to a study done in Spain (Arroyo 2006), the trainings could be failing to deliver on pedagogical implications that link technology and teaching of a particular subject. It could also be the technical character given to training programs in education technology. This research suggests that an innovation is less likely to be adopted if it deviates greatly from previous values, beliefs and practices. At present the question is not whether teachers should use technology in instruction but how they can use it to transform their teaching to create new and interesting learning opportunities, (Kenya SchoolNet 2003). The question still remains, what content is given during training? Is it tailored to match the needs of these teachers?

Kelleher (2000) reviewed the use of ICTs in science classrooms in selected schools in Australia. While he accepts that ICT cannot replace normal classroom teaching, he says it can bring positive forces in science classrooms for a deeper understanding of the principles and concepts of science. It can provide new, authentic, interesting, motivating and successful educational activities. In another study on use of ICTs in teaching science, Pickersgille (2003) explored effective ways of utilizing the internet when teaching science in K – 12 in the US. He found that it expands teachers' pedagogical resources. Teachers can help students to search for information rather than give them facts. Students become aware of the world around them as they research using the internet. These studies show the benefits of using ICT to teach science but do not explore whether the teachers have skills to use these ICT resources.

The importance of technical support in ICT integration cannot be under – estimated. In a research done to find out the role of technical support in ICT integration (Lewis 2003), it was found that many teachers in Sub – Saharan Africa shied away from using ICT because of lack of technical support. Technical problems like waiting for websites to open, failing to connect to the internet, old and mal-functioning computers, printers and projectors could not be handled by teachers. These impeded the smooth delivery of the lesson. Korte & Husing (2007) recommended that ICT technical support staff should be in cooperated to help teachers use ICT without losing time fixing technical breakdowns.

According to (Kashorda et al., 2007) the following five factors influence the likelihood that good ICT learning opportunities will develop in schools. These factors are: ICT resources, ICT leadership, ICT teaching, school leadership and general teaching. The study further indicates that the success of integration of new technology into education varies depending on the ways in which it is applied. This study failed to consider prior preparation yet the preparation stage is important before actual integration takes place. Young & Quin (2003) noted that using computers enabled teachers to facilitate learning. The teacher can interact with individuals and small groups rather than whole classes. They become co-learners with their students, particularly in relation to learning technical skills. This changing role of teachers from their traditional authoritarian /disciplinarian model has been a source of resistance to technology. Even though, the teacher student ratio is reversed from 40:1 to 1:40 (Lever et al., 2003). This is because the student has access to knowledge from a variety of teachers and is not just restricted to the physical classroom teacher. Fairman (2004) supports these views when in his research he says computers in schools have the potential to encourage significant and rapid shifts in the role of teachers and students in classroom instruction. They support broader improvements in teaching and learning.

In his study on teachers use of ICTs Schoepp (2005) is of the view that when new technologies need to be integrated in the classroom, teachers have to be trained on the use of these new innovations. Despite initial training to develop appropriate skills, knowledge and attitudes in ICT use, there should be continuing provision of professional development to maintain appropriate skills and knowledge. Another research done on ICT integration in science education, potential benefits were reported. It encourages communication and collaboration in science research activities. Gillespie (2006) says new technologies enable students to collect science information and interact with resources like the internet. This increases student motivation, facilitates, clearer thinking and develops data interpretation skills. In view of these benefits and need for teacher competencies, the present study was designed to find out whether teachers actually have skills to use ICT during instruction. Empirica (2006) produced a report on the use of ICT in European schools. This was a survey of head-teachers and classroom teachers done in 27 countries. The findings show that teachers who did not use computers in classrooms lacked basic skills. This view is similar to that of Balanskat et al.(2006) done in Denmark and Netherlands. Lack of competencies contributed to the teachers' resistance to change in classroom practices. In a study on the use of ICT in pre-service Teacher Education programs in Turkey done in 2009 the findings revealed that the following strategies could provide a generic approach towards enhancing ICT integration: technology plans, in-service training, strong infrastructure, technical support and role models.

From the above studies based on use of ICTs in education, these technologies are important in changing teaching and learning. However, these studies have not explored the issue of preparation. The study by Arroyo (2006) showed that teachers could not link technology and teaching of a particular subject. This view points out the fact that perhaps prior preparation of relevant content is not made so the trainings do not benefit the teachers. Another study by Pickersgille (2003) explains that both teachers and students can use the internet to get the current information. It is imperative that internet signals are availed and teachers and students have knowledge on how to get to the internet and how to search for information. This calls for prior preparation which was a major objective of the present study. The report by Empirica (2006) on ICT use shows that teachers were reluctant to change their teaching methods because they were not competent enough to use ICTs. This could be as a result of them not being prepared adequately. Preparation is important before any innovation is rolled out. In these previous studies, much more could have been achieved if the users had been well prepared to use these new innovative technologies.

2. Methodology

2.1. Research Design

The study adopted pragmatism as it is a philosophical paradigm. Pragmatism is action oriented research that seeks solutions to problems in a practical manner (Cohen, 2000). Truth is rooted in practice, meaning an ideology is true if it works satisfactorily. According to (Rescher, 2000)

pragmatism works on the assumption that reality is different for all of us.

Sampling techniques

Since the target population was big (342 schools) a sample was selected to provide information that would be generalized to the whole population. The study used stratified and simple random sampling techniques to get a sample. Using stratified sampling, schools were categorized as rural and urban. Simple random sampling was used to select (3) three teachers from every sampled school who participated in the study. Names of teachers were randomly selected from the school Time Table in the Principals' office.

Research Instruments

The study used questionnaire. The purpose of the questionnaire in this study was to collect data concerning teachers' competencies in the use of ICT for instruction. Teachers responded to a questionnaire. Teachers were also interviewed to find out how competent they were in ICT use.

3. Results and Discussions

Table 3.1: Teachers' knowledge in ICT use in instruction

Knowledge	Frequency (n)	Percentage (%)
Have Knowledge	273	89.2
Do not have Knowledge	33	10.8
Total	306	100

Results in table 3.1 show that 273 (89.2%) teachers have knowledge in using ICTs for instruction. They understand that different ICT tools can be used to improve learning outcomes. Even though, 33 (10.8%) do not have any knowledge on how to use ICT for instruction. Most teachers indicated that they had knowledge in computer applications like MS Word, Excel, Power point and use of Internet. This result implies that a high percentage of teachers (89.2%) have knowledge in ICT and can use ICTs for classroom instruction. This also means there are varied teaching strategies that can be used by teachers during instruction as a result of their ICT knowledge. A study by Lau & Sim (2008) exploring the extend of adoption of ICT in secondary schools in Malaysia showed that the teachers considered themselves to be good in using ICT for instruction. They supported the use of internet and ICTs for teaching and continuous skills improvement so as to be more effective. A report by Kidombo (2010) on factors influencing ICT usage among teachers in Kenya and Uganda indicated that nearly half of teachers in public schools were computer illiterate. As a result they were not using computers and internet to get the most current information and also enrich their teaching. This is not the case anymore according to the findings of this study which is summarized in table 4.18.

Higgins &Mosley (2010) stress that teachers should understand the need to implement ICT in teaching and exactly how to implement it during teaching in classroom. Basing on this view, the researcher asked teachers whether they had knowledge in ICT use and if so, how they had

acquired these skills. The results that were analyzed are given in table 3.2

Table 3.2: Teachers' Acquisition of ICT skills

Source	Frequency (n)	Percentage (%)
College	88	28.8
SMASSE	76	24.8
ICT centre	12	3.9
KESI/ KEMI	44	14.4
Personal effort	55	18.1

From table 3.2, it is evident teachers got training on use of ICT from various sources. There were 88(28.4%) teachers who went through this training while they were in college. The SMASSE project gave knowledge to 76 (24.4%) and these were mostly mathematics and science teachers. ICT centers in the District catered for 12 (3.9%) teachers while 44 (14.4%) who had attended Kenya Education Management courses got ICT knowledge while undergoing these in – service workshops. Some 55 (18.1%) teachers got ICT knowledge through their personal efforts. These teachers admitted they had learnt from colleges and cyber cafes close to them and they had financed these trainings themselves. However, 31 (10%) teachers said they had no training in ICT use in the classroom citing the example of computers. These findings imply that teachers have ICT knowledge. However, there are 10% of teachers who do not have any ICT knowledge. This calls for exposure and sensitization so that these particular teachers can embrace new technology.

An earlier study by Toure (2008) in Ghana revealed that whereas teachers got training in ICT not much stress was put on exactly how to use these tools to teach. In the same view, a study by Kiptalam & Rodrigues (2010) done in Kenya showed that some teachers did not receive any prior ICT training during their formative years at university or teacher training colleges. These teachers had taken the self-initiative to undergo ICT training especially after getting employed. This finding implies that such teachers had seen the need to update their skills because of newer technologies so that they can be competent and relevant in the current technological era. Research has also shown that students taught using ICTs in the Western World performed better in mathematics, reading and writing, (Volman, 2005). Further, teachers were asked whether their schools had organized any in – service courses on ICT use and how many they had attended. Out of the 306 sampled teachers, 215 had at least attended an ICT in – service but 91 had not. Table 3.3 shows the frequency of ICT in – service attendance.

Table 3.3: Frequency of ICT in – service attendance

	Attendance	Frequency (n)	Percentage (%)
Not in serviced	None	15	4.9
In serviced	Once	84	27.4
	Twice	117	38.2
	Many times	90	29.4
Total		306	100

Table 3.3 shows that 15 (4.9%) teachers had not attended any in – service course on ICT use while 84 (27.4%) had attended once. There were 117 (38.2%) teachers who had attended twice while 90 (29.4%) had attended this in – service courses many times. This finding indicates there are efforts being made in schools to have teachers embrace ICT in instruction. Staff professional development is an important strategy especially if it focusing on how to equip teachers with proper skills and attitudes on ICT use in education (Kozma 2007). Kozma further says that ICTs are exerting impacts on pedagogical approaches in the classroom. He suggests that impacts of ICTs can be assessed by looking at student outcomes and learning of new skills, development of teachers' new pedagogical approaches and attitudes and finally other outcomes in schools and the community. New technologies and ideas can be given to teachers when they attend frequent in – service courses so that they continue to improve and vary their teaching strategies. To confirm their competencies, teachers were asked some of the ICT resources which they had used during teaching. They named: internet, radio, DVD machine, mobile phones, computers, laptops, printers, projectors and flash disks. From the interview schedule, the study confirmed that some teachers were able to comfortably use the named resources during instruction. This finding shows that some teachers indeed have knowledge in ICT use for instruction. This finding can be supported by the findings of a research done in Ghana, Cameroon and Mali to measure teachers' readiness to adopt ICT for instruction, (Boakye & Banini, 2008). That study revealed that teachers occasionally used ICTs to teach but used these tools mostly to do research, type lesson notes and design teaching and learning materials. Since ICTs offer a wide range of benefits to students and teachers these teachers are actually ready to adopt ICT for instruction. However, these are just a few of the entire teaching population. Some teachers may have knowledge but are not actually competent to use ICTs during instruction. Bingimlas (2009) notes that in Australia teachers lacked confidence and competencies in ICT use. Wabuyela (2003) says teachers avoid using ICTs because they lack the necessary competencies. This views and the findings of the present study show that maybe training in ICT use for instruction is not thorough. Perhaps the training is theoretical so the trainees have no real practical or hands on competencies to use ICTs during classroom instruction. These teachers need regular in – service training to improve their competencies.

The teachers were asked whether they had sourced for any content to use for teaching using any ICT resources. Their responses are given in table 3.4.

Table 3.4: Sourcing for teaching content using ICT resources

Sourcing	Frequency (n)	Percentage (%)
Sourced for content	**192**	**62.8**
Not sourced for content	114	37.2
Total	306	100

Table 3.4 shows that most teachers, 192 (62.8%) had at least sourced for content using ICT resources. They had sourced for information from the internet, colleagues in the teaching profession, well performing schools, KICD, Radio, TV and vendors in the streets in various towns. However 114 (37.2%) teachers had not sourced for any content using ICT resources. This finding implies that ICTs provide information through the wide network they provide. If teachers can get into this network through ICT use they can acquire a lot of knowledge

and materials to help them carry out instruction in a better way. Teachers should be aggressive even on their own to explore with newer technologies to improve instruction and also their knowledge base. Watson (2001) says many teachers are not in a position to make informed judgments on ICTs to support their teaching goals. ICTs shift the learning approaches which contributes to a more constructivist learning, increase in activity and greater responsibility of students. The teacher remains to support, advice and coach students rather than merely transmitting knowledge. By using ICTs teachers can get most current information, variety of ideas and this can enrich their teaching.

The teachers were also asked whether they had used ICTs to prepare lesson content in their subject areas. Table 3.5 gives a summary of the findings.

Table 3.5: Use of ICT to prepare lesson content

Use of ICTs	Frequency (n)	Percentage (%)
Used	79	25.8
Not used	227	74.2
Total	306	100

Table 3.5 shows that only 79 (25.8%) teachers from the selected schools had used ICT resources to prepare content for their lessons. Majority 227 (74.2%) teachers had not used any ICTs to prepare their lessons. This finding implies many teachers still rely on books as the only source of information to be used to teach. The teachers admitted they used recommended texts and set books. A few teachers said they had used the computer to type their schemes of work, make lessons plans and type tests for their students. Others had

used the TV and DVD to show students set books in Kiswahili and English Literature. The internet had been used to source for information in Chemistry, Biology and Geography subject areas. Some teachers used the internet to come up with projects for science congress competitions. This shows that some teachers have knowledge on how to use ICT to prepare lesson content. If more in-service workshops were held in the area of ICT use more teachers would actually improve their ICT skills.

Teachers' attitudes, beliefs, skills and practices affect the way they choose to use ICTs during instruction (Higgins &Mosley 2010). A study done in Syria, (Abdulkafi 2006) based on teachers competencies, access to ICT resources, cultural perceptions and personal attributes revealed a positive attitude towards ICT use. Empirica (2006) says teachers were reluctant to use ICTs because they were not competent enough. The Adoption and Diffusion Theory which was the theoretical framework for the present study stresses that teachers need to acquire knowledge about ICTs first then form an attitude, which will in turn lead to implementation or use. If their needs are met, they will continue to use. In order to find out teachers' attitude towards ICT integration in instruction this study analyzed responses from teachers' questionnaire based on their sex, age, location and teaching experience. (See Appendix B (1) page 166)Their responses are rated on a 4 Likert scale.

Table 3.6 gives results based on sex of teachers.

Table 3.6: Teachers' Sex and use of ICTs

Frequency of ICT use	Sex			
	M		F	
	Frequency (n)	%	Frequency (n)	%
Very often	32	32	54	20.2
Often	27	27	72	34.9
Rarely	29	29	47	22.8
Never	12	12	33	16
Total	100	100	206	100

Results in table 4.23 show that 32 (32%) female teachers from selected schools could use ICTs very often, 27 (27%) would use them often, 29 (29%) would rarely use ICTs and 12 (12%) would never use them at all. Looking at their male counterparts, results show that 54 (26.2%) male teachers would use ICTs very often, 72 (34.9%) would use them often, 47 (22.8%) would rarely use ICTs and 33 (16.0%) would never use this technologies during instruction. The EFA Report (2012) shows that girls face challenges in entering schools than boys.

Most males were involved in ICT activities than females who have more roles to play in the home environment. Jimoyanis & Komin (2007) observed that the male teachers were more positive about ICTs than females who were either neutral or negative. However, the findings of the study imply that most teachers would use ICTs for instruction despite their sex. In this age of globalization and networking it is imperative that both men and women should have ICT knowledge. This will vary and improve their teaching, improve students' academic achievement and make learning an interesting activity. But this study found that more male teachers were more likely to use ICTs to teach than the female teachers. The teachers' age was also analyzed to find out if it had any effect on ICT use in the classroom. The results are shown in table 3.7.

Table 3.7: Teachers' Age and use of ICTs

Frequency of use	Age bracket							
	20-30		31-40		41-50		Above 50	
	Frequency (n)	%	Frequency (n)	%	Frequency (n)	%	Frequency (n)	%
Very often	25	37.3	27	34.6	17	17.1	5	8.0
Often	27	40.2	30	38.2	28	28.2	17	27.4
Rarely	11	16.4	19	24.3	42	42.4	21	33.8
Never	4	5.9	2	2.5	12	12.1	19	30.6

Results from table 3.7 show that teachers aged between 20 and 40 years (52) would use ICT more often than their colleagues who were aged above 40 years (22). There were more teachers in the 20 – 40 years category who could use ICTs often (57) as compared to those in the category above 40 years (45). Those who rarely used in the category of 20 – 40 years were 30 while there were 63 teachers who would rarely use ICTs. Those who would never use ICTs in the 20 – 40 years category were only 6 while the above 40 age bracket had 31. This finding implies that indeed age has an impact on ICT use. The younger teachers are more likely to use ICTs during instruction as compared to those teachers who are older. The finding also points to the fact that younger teachers are more competent and willing to use ICTs than the older ones. This could be because they are more exposed and ready to experiment with newer technologies. A study by Andoh (2012) shows that the quality of ICT uses is linked to teachers age and experience. He points out in his study that majority of teachers aged below 41 years used ICTs more often to teach as compared to those aged above 50 years. The latter had no proper ICT skills to enable them use ICTs for instruction. The report by Kidombo (2010) reveals that younger teachers use ICTs more often than the older teachers. These senior teachers see ICT as a threat and cause of much anxiety therefore avoid using them. It could also mean that these older teachers were not exposed to newer technologies during pre-service training. These older teachers are also in management positions like Heads of Department, Senior Master/Mistress, Deputy Principal and hence have other duties to attend to and not just classroom teaching. The younger teachers being relatively new in the field have all the time to experiment with technologies in order to make their lessons varied and interesting. A study done by Kwapong (2007) in Ghana revealed that young professionals aged between 20 – 30 years were more eager to use ICTs. This is because of higher curiosity and also they were still building their careers. These views do apply to present study since younger teachers were found to use ICTs more often that their older colleagues. The present study also surveyed the location of teachers in the urban and rural areas with a view to establishing if it had any effect on use of ICTs in instruction. Results are given in table 3.8.

Table 3.8: Teachers' Location and use of ICTs

Frequency of use	Rural		Urban	
	Frequency (n)	%	Frequency (n)	%
Very often	44	29.4	68	43.6
Often	49	32.6	50	32.1
Rarely	39	26	32	20.5
Never	18	12	6	3.8
Total	150	100	156	100

The findings in table 3.8 indicate that more teachers 68 (43.6%) in urban areas, would use ICTs very often as compared to only 44 (29.4) teachers in rural areas. Those teachers who would use ICTs often in the urban areas were 50 (32.1%) as compared to 49 (32.6%) in rural areas. In urban areas those teachers who rarely used ICTs were fewer, 32 (20.5%) while there are more teachers in rural areas, at 39 (26%). Again those teachers who would never use ICTs in rural areas were found to be more, 18 (12%) while in urban areas there were only 6 (3.8%) teachers. This finding shows that where a school is located can influence teachers' use of ICTs. Those teachers in urban areas used ICTs more often because these resources are easily available in their schools. It is also in urban areas where the latest technologies, goods and services are easily available. The teachers in rural areas are not so lucky because some of their schools do not have ICT resources and even relevant ICT infrastructure.

4. Conclusions

Teachers' responses showed that only a few of them prepared what to teach using ICTs, but they did not actually use ICTs during instruction. Some teachers used the internet to get information to teach especially in science subjects. The teachers admitted they lacked confidence to use ICTs in the classroom. This is because their training focused on ICT literacy skills and not using ICTs to teach in the classroom. The study therefore summarizes that most teachers have ICT knowledge but these teachers are not competent enough to use ICTs during classroom instruction**.** Therefore it was concluded that teachers are required to be equipped with knowledge and skills so that they can be competent enough to use ICT resources to teach.

5. Recommendations

Training in use of ICT should focus on its use in the classroom. This should be stressed in pre-service training in Kenya to make teachers more competent. Training should also stress on acquisition of practical skills so that examinations on this aspect are given to candidates. During Teaching Practice sessions, student teachers should be assessed by their lecturers and tutors on their ability to use ICTs during instruction. Refresher courses to update teachers on use of newer technologies should be regular.

References

[1] Andoh, C (2012) Factors Influencing Teachers adoption and integration of ICT into teaching. A review of the Literature. International Journal of Education and communication Technology. 8 (1) 136 – 155.

[2] Arroyo, M.C Sanchez, F. Diaz, S. (2006) Pedagogical innovations and ICT. Factors that favour good practices with ICT in primary and secondary schools, University of Extramandura Caceres, Spain.

[3] Ary, D. Jacob, L. Razieriah A (1972). Introduction to Research in Education. New York: Holt, Reinhart, Winston.

[4] Bingimlas, K.A (2009) Barriers to the successful integration of ICT in teaching and learning environments. A review of Literature. Unpublished PhD Thesis Bundoora: VIC Australia