

## **Full length Research Article**

# **ASSESSMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) INTEGRATION IN INSTRUCTION IN TEACHER EDUCATION INSTITUTIONS IN KENYA**

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There has been remarkable increase in access of ICT equipment in teacher education institutions. However, reports indicate that teacher educators are not integrating these technologies in their instruction in ways that make a difference in student learning. To help teachers make informed decisions on student learning, there is need for current knowledge of teachers' integration practices. Research findings from developed countries indicate that there has been considerable progress in this area in many teacher education institutions. But the status of the integration of ICT by teacher educators in Kenyan teacher training colleges is largely unknown. This study therefore was set to determine the level at which teacher educators in public primary teacher training colleges have integrated ICT in their instruction. The simple random sampling was used to select six teacher training colleges and 169 respondents who participated in the study. Data was collected using a questionnaire, an interview schedule and an observation schedule. The Data collected were analyzed descriptively with the help of SPSS program version 16.0 for frequencies, means, standard deviation and percentages. The results indicated that there is a low level of ICT integration into teaching in all teacher training colleges. Based on the findings, it is recommended that ICTs integration be made part of undergraduate training in universities in order to equip future teacher educators with ICT skills; that the government should equip teacher training colleges with sufficient and modern computers with internet connectivity to enhance access; colleges should provide in-service training on ICTs for teachers. Furthermore, colleges should hire technicians to maintain and service available ICTs. The ministry of education should also embrace ICT and demand professional documents from teacher educators be typed and send online. Additionally, college should not rely only on government funding but earn their own income by initiating ICT training centres to train outsiders in their colleges. Finally, it should be mandated that all college principals be knowledgeable in ICTs so as to support ICT initiatives in teacher education institutions.

**Key words:** ICT, Integration, Instruction and Teacher education

## **INTRODUCTION**

There is a general consensus among scholars and researchers that Information and Communication Technologies (ICT) are transforming various aspects of human activity (World Bank, 2004). Currently there is an explosion of interest in ICT throughout the world. This is because the effects of technology cannot be gainsaid. A new global economy powered by technology, fuelled by information, and driven by knowledge has been created (World Bank, 2004; Tinio, 2002). These technologies have changed the way people live, communicate, work, and play. Also, they have brought about highly important transformations in agriculture, medicine, engineering and other fields (UNESCO, 2007). Recently, there have been calls for education reform to improve the quality of education to adequately prepare students in the work place (Kafu, 2011). As a result, the ministry of education heeded the call for reform and developed the Sessional paper no 1. of 2005. In the Sessional paper, the Kenya government

appreciates and recognises the fact that ICT has a critical role to play in helping education deliver its mandate. Consequently, the availability of ICT facilities over the past few years have increased substantially in most learning institutions in Kenya (Kinuthia, 2009). Teacher training colleges have been great beneficiaries of donations and investments of ICT equipment. At the moment, it is estimated that teachers' colleges have an average of 60 computers each with Internet connectivity. Besides, most of the trainers in these colleges have been inducted on ICT integration in instruction (Nyaga & Getuno, 2005). In spite of these developments in teacher education, there is a growing concern among scholars and researchers that the rate at which these technologies are transferred and integrated into the teaching and learning process is slow (Migwi, 2009). Many teachers shy away from incorporating technology into their teaching and learning process despite the availability of computers in schools. There are also fears that many teacher-educators in primary school teacher training colleges are not yet incorporating these technologies into their instruction in ways that make a difference in student-teachers' learning. Perhaps

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that is why most new teacher education graduates still have limited knowledge of how ICT can be used in their professional activities (Kinuthia, 2009). This is happening notwithstanding the belief of policy makers that integrating ICT in the educational system will lead to improved outcomes for the students. It therefore follows that placement of ICTs in classrooms is not equal to the effective integration for teaching and learning (Earle, 2002). Teacher-training is one essential requirement for successful use of ICT in education. This means that teacher preparedness and professional development is not only desirable but also necessary for the success of learners, school and educational systems. It is obvious that teachers cannot be prepared at one go. Teacher-educators need to be effective teachers and good role models for teaching practices because it is not possible to prepare a new generation of teachers who can effectively use new tools for learning unless teacher-educators themselves are models for effective use of technology in their own classes (UNESCO, 2007; Steketee, 2005). Thus, if student-teachers are to become confident users of technology in their own classes, then they need to see their tutors use them in instruction.

This is because teacher-educators cannot model the use and integration of technology in their teaching if their knowledge, skills, and attitudes towards technology integration are low. While the potential benefits of ICT integration have been promoted by a number of international organizations such as IDCR, Intel, Nepad, UNDP, and USAid, research is needed to ensure that such organizations can benefit from practical information related to effective integration. Information on teacher-educators' levels of ICT integration in Kenya is scanty. Without such information, the Kenyan government may not develop a realistic plan to achieve its dream of having a technologically literate workforce and being industrialised by 2030 (Kinuthia, 2009). It is on the basis of this background that this study was designed to establish teacher-educators' level of ICT integration in public primary school teachers' colleges in Kenya.

## **STATEMENT OF THE PROBLEM**

Despite the Kenyan government, the private sector and nongovernmental organisations donating computers to teachers training colleges, it is not clear whether teacher-educators are integrating them as instructional tools in the teacher education curriculum. Besides, there is no documented evidence indicating the level of integration of ICTs in instruction, especially in primary teacher training colleges in Kenya. Such evidence is necessary for without the knowledge and experience of ICT within the teaching fraternity, it would be difficult to realize its impact on the pupil's learning. This study was designed to contribute in this regard by investigating the level of ICT integration by teacher-educators in primary teachers training colleges.

### **Research Objectives**

- To determine the frequency teacher-educators' integration of ICT resources in their classroom instruction
- To examine the teacher-educators' overall level of ICT integration into instruction
- To identify the teacher educators' characteristics in relation to their level of ICT integration

## **MATERIALS AND METHODS**

### **The Research Design**

The study employed the descriptive survey design. Descriptive survey focuses on determining the status of a defined population with respect to certain variables. Its primary advantage is that the researcher can gather a great amount of data in a short period of time (Borg & Gall 2007). The study therefore used a survey to obtain descriptive data on a variety of variables. According to Creswell (2003), a descriptive survey provides a quantitative description of people's trends, attitudes, or opinions of a population by studying a sample of that population. This study was predominantly quantitative with some qualitative techniques, providing an opportunity to corroborate findings across different approaches. Through using a survey, a careful investigation of the phenomena through collection of a large amount of data from teacher educators in different TTCs was possible in a relatively short period of time. From the sample results, the researcher can generalise the findings to the population especially if the population is too large. In this design it is easy to apply research instruments such as questionnaires.

### **The Study Location**

The study was carried out in six public primary teacher training colleges in Kenya. PTTCs were chosen because they represent the basic teacher education institutions in the country. Furthermore, PTTCs made a good research population because of the Government's commitment to improve PTE to make it more relevant to the needs of the country in tandem with international trends (MOE, 2005). These colleges which offer certificate in education are Eregi, Mosoriot, Kilimambogo, Muranga, Machakos, and Baringo TTCs. Primary TTCs were chosen because there have been initiatives by the Government to integrate ICTs in teaching in teacher education. The views of teacher-educators' from various departments were also captured.

### **The Study Population**

The target population for this study consisted of 18 fully operational primary teacher-training colleges and involved the entire teacher-educators in Kenya. All these colleges have computer laboratories and are making efforts to improve their ICT capacity. On average teacher training colleges admit 600 students annually for a two-year certificate course. These teacher educators in these colleges range from 29 to 90. At the time of this study there were 1,299 teacher-educators in the public TTCs. Teacher-educators were selected because they are directly involved in the training of primary school teachers in their respective institutions. They are thus, the actual implementers of ICT integration policies in teacher education programmes. Additionally, the heads of the various departments and principals in these TTCs were also interviewed as key informants and provided in-depth understanding of issues of concern to the study.

### **Sample and Sampling Techniques**

The study employed the simple random sampling to select the six colleges out of the eighteen fully operational colleges that offer certificate of primary education course. Simple random sampling was also used to select a sample of 204 tutors from the total 1299 tutors in all TTCs. This represented 16% of the study population. But the purposive sampling method was

used to select the 36 heads of departments and the 6 principals in each college to participate in the interviews.

### Data Collection Procedures

The researcher sought permission to carry out the research from the National Council for Science and Technology and the principals of the teacher training colleges. Afterwards, the researcher visited the various colleges and administered the questionnaire to teacher-educators and conducted the interviews with the heads of departments and the principals.

### Data Analysis

Data for the study was obtained from a questionnaire, interviews and an observation schedule. Data collected using the questionnaire was analysed using descriptive statistics viz. frequencies, means, standard deviations, tables and percentages. Information from interviews and observation were recorded and transcribed verbatim. A qualitative assessment procedure was applied to the respondents' answers. The text was read and an interpretive statement that captures the essence of the respondent's quote was written. Thus findings of the study were presented both qualitatively and quantitatively.

## RESEARCH FINDINGS

### Teacher-educators' Level of ICT Integration into Teaching

One of the objectives of this study was to determine the level at which teacher-educators in primary teachers training colleges in Kenya integrate ICTs into their instruction. This was done by asking teacher-educators to indicate how often they used the 14 selected computer applications as tools in the subjects they taught. Descriptive statistics using percentages were used to assess their frequency of use. The findings are illustrated in Table 1 below.

**Table 1. Frequency of Teacher-educators' usage of ICT in instruction**

Level of integration	Percentage %				
	Never	rarely	sometimes	often	quite often
1. Word Processing	16.9	21.7	23.5	19.9	18.1
2. Spreadsheets	33.9	24.2	20.6	12.7	8.5
3. Database management	36.2	25.8	26.4	6.7	4.9
4. Classroom management	32.1	21	23.5	14.8	8.6
5. Graphic images for learning	46.9	27.2	18.5	4.9	2.5
6. PowerPoint	44.7	22	17	6.9	9.4
7. Desktop publishing	46	28.8	16.6	6.7	1.8
8. Interactive multimedia materials	56.1	23.8	11.0	7.3	1.8
9. CD-ROMs and DVDs	25.3	19.3	29.5	15.1	10.8
10. Internet	25.1	11.4	29.3	19.8	14.4
11. E-mail for communication	38.8	20.0	22.4	9.1	9.7
12. Simulations for my teaching	64.2	17.3	11.7	5.6	1.2
13. Drill and Practice programs	64	23.8	5.5	4.3	2.4
14. Computer tutoring applications	47.9	20.6	16.4	9.1	6.1

As illustrated in Table 1, the most frequent use of ICTs for teaching purposes are word processing (37.2 % "often" or "very often"), Internet (34.2 % "often" or "very often"), CD ROMs or DVDs (25.9 % "often" or "very often"), and data bases for keeping records (25.4 % "often" or "very often"). On the other hand, the least use of computers for instructional purposes are computer simulations and games (64.2 % "never"), Drill and Practice programs (64 % "never") and interactive multimedia materials (56 % never). From the descriptive analysis above, it is apparent that teacher-educators have high levels of ICT integration for such ordinary applications as word processing, Internet, and CD or DVDs, but have low levels of ICT use for more specialised applications as computer assisted instruction such as drill and practice, tutorials as well as simulations and games.

This means that knowledge in advanced computer skills is quite low. Interviews with HODs and principals confirmed that Word Processors, PowerPoint presentations and CD-ROMs were frequently utilised by teacher-educators. Word processors were mostly used to type exams, to prepare teaching notes, schemes of work, and class assignments. They also agreed that typed lesson notes can easily be updated when stored in the computer. Some teacher-educators claimed that they asked students to present typed assignments for marking because they are easy to read and had better appearances than hand-written ones. In all the colleges also, the directors of studies used computers to produce transcripts for teacher trainees. But in the case of the Internet, it was noted that a few teacher-educators used it effectively. In reality, most of those who used the Internet were mainly from the ICT departments who contended that the wealth of information available was wonderful and could be used to supplement what was provided in course books. They agreed that the information in the web was quickly available and may not be found elsewhere. In college administration, the Internet is currently used for on-line registration of candidates. One notable hindrance to the integration of Internet in instruction is lack of adequate Internet connectivity in the colleges. They mostly use Modems which they claimed were quite unreliable and expensive to maintain.

An observation made by the researcher on the computer applications which were mostly utilized showed that Power Point Presentation software was used by a few teacher-educators, especially in the ICT departments. Teacher-educators argued that the process of creating a presentation was quite involving. That is why a few of them applied them in instruction. Nevertheless, they agreed that when provided with readymade slides they used them effectively in delivery of content to student-teachers because it saved class time and reduced the amount of text that is written on the chalkboard. Actually, a great proportion of the teacher-educators preferred using the chalkboard to computers. It was noted that most of the teacher-educators used video simulations during micro-teaching. For example, language teachers used them to correct errors in pronunciation and to model sounds to teacher trainees. Simulations usually allow students to play 'what if' with the computer using relevant scenarios. A few of teacher-educators used the spreadsheets software for keeping grades and students records. However, drill and practice software which allows students to repeat topics or units until mastery was gained, were not used by teacher-educators. They said it

was cumbersome to use it. On the other hand the e-mail which can be used to enhance communication or correspondence amongst teacher-educators was hardly used as a teaching tool. Perhaps it is because of lack of access to the Internet connectivity. A few teacher-educators, however, use it for personal purposes outside the classroom. From the foregoing discussion, there is a clear indication that teacher-educators have high levels of ICT integration in three mainstream applications: Word processing, Internet and CDs /DVDs, but have low levels of ICT integration for more specialized applications. This pattern of ICT integration validates Keengwe's (2007) findings which found that the use of more mainstream and personal computer applications was common among Faculty and teachers.

But the level of ICT integration in general by teacher-educators remained very low. One probable reason for this reality is the fact that specialized applications increase the complexity of an innovation. This also echoes Rogers' (2003) theory of diffusion of innovations which states that the complexity of an innovation is a hindrance to integration. In most cases, mainstream applications are believed to be compatible with the adopter's existing values. Other studies whose findings concur with these findings include that of Sahin and Thomson (2006) which found that Turkish Faculty members use traditional technologies more often because they lacked the experience in the use of more complex computer related technologies. They also found the word processor is the most frequently used computer application among the Faculty members. From the interviews conducted with the HODs and principals, several reasons can be attributed to the low level of ICT integration in TTCs. These include: lack of working computers among teacher-educators; lack of experience in ICT use; low levels of access to ICT resources, lack of technical support from the college administration, age of tutors, and low ICT skills.

#### Overall teacher- Educators' Level of ICT integration into instruction

To gain more insight into the extent of integration, an attempt was made at calculating an overall mean score of the level of ICT integration into teaching. This was done by developing and index for determining the teacher-educators' integration. It was established that the highest score that the respondents attained in all the 14 computer applications was 64. Hence the range was set between 0-64. This was divided against the three levels of ICT integration. That is; low, moderate and high integration levels. Therefore those who scored 21 and below fell in the low level of integration; between 22 and 42 fell in the moderate level; and those scoring between 43 and 64 were in the high level of ICT integration. The descriptive statistics related to the level of ICT integration for teaching by the teacher-educators in primary school teachers' colleges in Kenya are represented in Table 2.

Level of integration	Responses	%
Low integration	106	62.7
Moderate integration	51	30.5
High integration	10	5.9
Others	2	1.2
<b>Total</b>	<b>169</b>	<b>100</b>

The results from Table 2 show that the teacher-educators' overall level of ICT integration in teaching is very low. It is evident that majority of the teacher-educators 106 (63.5 %) fall in the category of low integration while 51 (30.5%) are in the moderate integration level and only 10 (5.9 %) have high integration levels. In general there is a low level of integration in all teacher training colleges.

#### Teacher characteristics in relation to their level of ICT integration

To get a deeper insight into the question of ICT integration, it was necessary to compare the level of ICT integration into teaching in relation to teacher-educators characteristics. Table 3 below gives a summary of the analysis.

Characteristics	ICT integration level %		
	Low	moderate	High
<b>1. Gender</b>			
Male	58.3	36.5	5.2
Female	71.1	23.2	5.8
<b>2. Age</b>			
25-30 years	28.6	42.9	28.6
31-35 years	26.1	43.5	30.4
36-40 years	71.2	28.8	0
41-45 years	73.3	24.4	2.3
46-50 years	66.7	33.3	0
51 years and above	75.0	25.0	0
<b>3. Departments</b>			
Creative arts	65.2	34.8	0
Education	88.9	11.1	0
ICT	0	53.8	46.2
Integrated science	57.1	42.9	0
Mathematics	60.0	26.7	13.3
Sciences	68.8	25.0	6.3
Social sciences	57.1	42.9	0
Languages	75.0	22.7	2.3
<b>4. Level of education</b>			
Doctorate	0	0	100
Masters	63.1	35.4	1.5
Bachelors	72.1	24.4	3.5
Diploma	21.4	42.9	35.7
<b>5. Teaching experience</b>			
1-5 years	15.4	61.5	23.1
6-10 years	47.4	26.3	26.3
11-15 years	75.5	22.4	2
16-20 years	72.7	27.3	0
21-25 years	53.6	42.9	3.6
26-30 years	80	20	0

The results shown in table 3 above reveal that a majority of the female respondents (71 %) were in the low level of ICT integration as compared to (58.3 %) males. Furthermore, 36.5 % of the males were in the moderate level as compared to 23.2

% females. 5.2 % of the males were in the high level of integration compared to 5.8 %. The implication here is that female teacher-educators are slightly behind their male counterparts in their levels of ICT integration into instruction. In terms of age, it is evident from the findings that the younger teachers in the age bracket of 25-30 years seem to have higher integration levels with 42.9 % and 28.6 % in the moderate and high levels respectively. A similar scenario is depicted in the case of those in the age bracket of 31-35 years with 43.5 % and 30.4 % of the respondents in the moderate and high levels respectively. Conversely, the older teacher-educators in the age bracket of 46-50 years and over 51 years have very low levels of ICT integration with 66.7 % and 75 % respectively in the low bracket of integration. None of them was in the high level of integration. This means that age is an important factor in ICT integration. In effect, this observation agrees with earlier research findings indicating that age has a negative relationship with ICT integration (Na, 1993). Perhaps this could be because of the acknowledged fact that ICT has a potential to intimidate older teachers.

It also means that younger teacher-educators utilized ICT in their teaching better than older teachers. Possibly, this is because older teacher-educators have low computer literacy levels and at the same time prefer using traditional method of talk and chalk. In the departments, it can be observed that teacher-educators in the departments of education (88.9 %), languages (75 %) and creative arts (65.5%) are in the low level of integration. But teacher-educators in ICT (46.2 %), mathematics (13.3 %) and sciences (6.3 %) seem to have relatively higher levels of ICT integration. These differences are as a result of ICT access and training. Teacher-educators in the ICT department have higher access to computer facilities and better training and hence use them in teaching about the subject as well as in teaching other subjects. Similarly, the relatively high use in Science and Mathematics departments could be as a result of SMASSE influence. The SMASSE program which is sponsored by JICA has trained tutors on ICT integration on some occasions. On the other hand, teacher-educators' level of education does not seem to influence ICT integration a lot. This is because as shown in Table 4.9 above, teacher-educators with Bachelor's degrees and Master's degrees are in the low level of integration 72.1 % and 63.1 % as compared to their Diploma counterparts who have a high number in the high level of integration (35.7 %).

The teacher-educators holding Diploma certificates seem to have higher integration levels perhaps because computer education was initially offered in Diploma colleges at the Kenya Science Teachers College and the Kenya Technical Teachers Training College. It can therefore be concluded that teacher-educator's ICT integration is not academic qualification specific. In terms of their teaching experience, teacher-educators with many years of teaching have very low levels of integration. For instance eight out of 10 of those with 26-30 years of teaching and about half of those with 21-25 years of teaching are in the low level of ICT integration. On the contrary, teachers with few years of teaching have high levels of integration. This is because those who fall in the age bracket of 1-5 years had about a quarter of teacher-educators in the high level of integration while those in the age bracket of 6-10 years had 26.3 % of the teacher-educators in the high level of integration. This finding is similar to that of the

relationship of ICT integration and teacher's age, where the younger generation of teachers whose teaching experience is low have a higher passion for technology and prefer using them better than the traditional methods of teaching. This also corroborates recent findings showing that the fewer the years of teaching, the higher the knowledge and ICT use for instruction. Perhaps this is because of the openness of the youth to innovations (Teczi, 2010).

## CONCLUSION AND RECOMMENDATIONS

This study was conducted to assess teacher-educators' level of ICTs integration into teaching. The results of the study have shown that there is minimal integration of ICTs by teacher-educators in primary teacher training colleges despite the promise that information and communication technologies have to enhance teaching and learning. Thus, the research concludes that while ICTs are integrated in teaching in primary school teacher training colleges in Kenya, their level of integration is quite low. There is a moderate integration in use of such typical computer applications such as word processing, Internet, and CDs/DVDs, but have low levels of ICT integration for more specialized applications as drill and practice, tutorials, and simulations and games. Both male and female teachers were found to be in the low level of integration. But as for age, the younger teacher-educators had higher integration levels than the older teacher-educators. Higher levels of ICT integration were seen in the ICT, Science, and Mathematics departments. Teacher-educators with Diploma in Education certificates had higher integration levels than those with degrees. Moreover, in terms of teaching experience, those respondents with less teaching experience integrated ICTs better than those with many years of teaching. Several factors contribute to the low level of ICT integration in teacher preparation. These include: teacher-educator's age; availability of ICTs resources; lack of ICT skills to integrate ICTs in teaching, appropriate software, lack of prior experience to use it, and lack of Internet facilities, low motivation, lack of time to prepare ICT media, and lack of confidence among teacher-educators.

Besides, it was evident from the findings that some teacher-educators' consider ICT as a separate subject and not as a medium of instruction. It is imperative for all subject tutors to learn how to use ICTs in their daily teaching practices. This study is considered an important contribution because it provides baseline evidence on the level of ICTs integration and factors related to ICT integration in primary school teachers' colleges in Kenya. Basing on the findings and conclusions of this study, the study recommends the retraining of teacher-educators to ensure that they have sufficient skills to integrate ICT in teaching their specific subjects. The ministry of education should make ICT part and parcel of the undergraduate degree courses in universities where teacher-educators are trained. This will equip all graduates who get to teach in TTCs with ICT skills so that they can model and integrate ICTs into teaching to serve as models to teacher trainees who would probably adopt their pedagogies in their future classrooms. On the other hand, colleges can use tutors experienced in ICT integration to train those whose skills are low. Their efforts can then be rewarded through small tokens. Furthermore, college principals should be trained on ICT integration and strategic planning for effective integration of

ICT in colleges. This will enable them to provide guidance and support to teacher-educators.

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