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Influence of Computer Expertise on Teacher-Educators' Integration Information and Communication Technology in Instruction

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Abstract
The integration of information and communication technology (ICT) into teaching and learning in tertiary institutions depends on many factors. Some of these factors are associated with teacher-educators. Teacher-educators play an important role in the integration of ICT in instruction. The purpose of this study was to establish the influence of computer expertise on teacher-educators' integration information and communication technology in instruction in primary teacher training colleges in Kenya. The simple random sampling technique was used to select six teacher training colleges in Kenya and 169 respondents to participate in the study. Data was collected using a questionnaire and an interview guide. The data collected was analysed descriptively with the help of SPSS program for frequencies, means, standard deviation and percentages. The Pearson Moment Correlation was used to determine relationship between teacher-educators' computer expertise and ICT integration while regression analysis was used to establish whether computer expertise is a good predictor of ICT integration among the teacher-educators. A p-value of less than 0.05 was interpreted as significant. The study results indicated a low level of ICT integration in instruction in all teacher training colleges. It also showed that there were significant relationships between teacher educators' level of ICT integration in instruction and their expertise. Provision of computers and other infrastructure in colleges may not automatically lead to integration of ICT in instruction unless the government addresses teacher-educators' ICT expertise. Thus, the researcher recommends that teacher training colleges should provide more in-service training on ICT integration in order to improve teacher-educators' skills so as to raise their level of ICT integration in instruction.
Key Words: Computer Expertise, Instruction, Teacher Educator, Integration and Teacher training

Introduction

It is the view of many people all over the world that teachers are central to effective teaching and training. They represent the most critical element and the biggest investment in the teacher education enterprise. Consequently, their preparedness and professional development is not only desirable but also necessary for the success of teacher training. However, teachers cannot be prepared at one go. Teacher-educators need to be effective instructors and good role models for teacher trainees 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 role models of good ICT practices in their own classes (Altun, 2007); UNESCO, 2007; Steketee, 2005). If teacher educators do not use ICT on consistent basis, they should not expect the teacher trainees to use ICT regularly. Thus, modelling the use of technology provides an effective method for exposing trainee teachers to the new strategies (Dawson & Rakes, 2003). Thus, if student-teachers are to become confident users of technology in their own classes, they need to see their trainers use them in instruction. However, teacher-educators cannot model the integration of technology in their teaching if their expertise in technology integration is low.

Afshari, Bakar, Luan, Samah, and Fooi (2009) further argued that if teachers do not have enough expertise in computer use, they may not integrate ICT tools in classroom instruction. This means that without the knowledge and skill of ICT, teachers might have high level of uncertainty that influence their opinions and beliefs. Felton

(2006) affirms that expertise in operating a computer and in utilizing software may improve the quality of teaching. But if training is inadequate or inappropriate, the teachers will not be sufficiently prepared and perhaps not sufficiently confident to make use of ICT in instruction. Thus, lack of teachers' expertise and lack of quality training for teachers can be barriers to their integration of ICT.

The basic tenet of teacher-educators is to prepare teachers to teach and to use current and emerging technology in their careers. Teacher-educators must also be constantly aware of technology changes and incorporate them in their instruction at all times. In addition, educators should adopt a philosophy of integrating technology into all courses rather than teaching technology concepts in an isolated course. When educators integrate technology into instruction, they reinforce the students' technology knowledge, prepare students with a broad background for their careers, and equip the students with lifelong skills (Mukhari, 2016).

Nevertheless, research evidence has consistently shown the limited use of ICT by teachers. For instance, a study carried out by Omariba, Ayot and Ondigi (2016) in teacher training colleges in Kenya shows that the integration of information and communication technologies (ICTs) in teacher education in Kenya has been slow in spite of government investing large sums of money in ICT infrastructure and tutor training with the purpose of improving teaching and learning. There is sufficient evidence showing that teacher training colleges have been great beneficiaries of donations and investments of ICT equipment. Public primary teacher training colleges in Kenya have an average of 60 computers each with Internet connectivity (Chemwei and Koech, 2014). This is an indication that a lot of effort has been put by the Government in improving teacher training institutions in order to equip teachers with relevant and appropriate skills in use of ICT in teaching and learning. But there is 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 (Abenga, 2005; Migwi, 2009). There are also fears that many teacher-educators in primary school teachers' training colleges are not yet incorporating these technologies into their instruction as teaching tools. Perhaps that is why most new teacher education graduates still have limited knowledge of how ICT can be used in their professional activities (Abenga, 2005; Kinuthia, 2009; Peralta & Adriano (2011). This is happening in spite of the belief of policy makers that integrating ICTs in the educational system will lead to improved outcomes for the students.

One critical area that is likely to reinforce use of ICTs in teaching and learning in PTTCs is the ICT expertise of teacher-educators. The teacher-educators are expected to have expertise in use of ICTs in teaching, be prepared to utilize software to teach the curriculum, apply ICT appropriate teaching methodologies and ability to employ appropriate assessment practices when teaching with technologies. Undoubtedly, the preparation of teacher-educators on their roles in a fast-changing society becomes unavoidable (Muyaka & Gathara, 2013). This is because technology requires well trained personnel that can take advantage of what ICTs provide to ensure that learners are provided with relevant and adequate skills. Preparation of such personnel can only take place in institutions of higher learning with recognized standards.

However, it appears that teacher trainers who should be experts in the use of ICTs, and who are expected to prepare teacher trainees, lack the necessary expertise to integrate ICTs in education. The limited use of ICT by teacher educators as an educational tool for teaching the curriculum tend to have a negative impact on preparing teacher trainees for Vision 2030 that depends largely on ICTs. Teacher trainees who are to use ICT in later teaching must have observed their teachers using computers. The Kenya government in its "Vision 2030" envisages making the country middle level economy by using ICT, and therefore committed itself to providing computers to children in primary schools (Kenya Government, 2007). Mingaine (2013) demonstrated that secondary school teachers in Kenya did not have sufficient skills on how to integrate ICT in teaching and learning. Thus, lower primary school teachers in this study may need specific training on integrating ICT in teaching. The government expects teachers to integrate ICT in teaching from as early as primary standard one. It has undertaken an extensive electrification program to ensure consistent power supplies to previously unreached areas. Nevertheless, availability of infrastructure does not automatically ensure integration of ICT in schools.

The integration of ICT in classroom instruction is a complex matter in which many obstacles need to be overcome before it is possible to speak of a successful implementation (Castillo-Valenzuela, 2011). There are several deficiencies in the way teachers implement new teaching strategies, which lead them to recommend that more

training is needed. Mukuna (2013) observes that skilled personnel and opportunities for professional development especially pre-service training should have a component of integration of ICTs into the classroom practices. However, since technology keeps changing continuing staff development is an essential condition for effective technology integration. Schools must have a plan for continuous professional development for teachers not only to learn the latest technology, but more importantly the most effective pedagogy related to integrating the technology into the classroom.

Research indicates that the level to which teacher educators integrate ICTs in their teaching can be low, moderate or high, depending on various factors among which are: Teachers' computer expertise, computer access, attitude towards computer use, support for computer use, their motivation, and confidence (Chemwei, 2013). Teacher educators' expertise in the use of different forms of ICTs can support different levels of learning. The nature and the form of ICTs used are determined by the learning content, the goals and learners' different ways of learning (Mukhari, 2016). The low use of ICT in teacher training colleges can be attributed to inadequate ICT skills in the majority of teacher-educators at entry level.

Wambiri and Ndani (2017) note that teachers with high perceived computer knowledge and skills and who felt able to teach such did not necessarily feel capable of teaching using computers. This suggests that teachers felt less competent in teaching using computers than they did in teaching basic computer knowledge and skills. This calls for the need to provide ICT training to long serving teachers, especially those that went through training before ICT was integrated into the teacher education curriculum. This is also because even where teachers perceive themselves as knowledgeable in operating computers, they may not be able to integrate computers in teaching unless they receive specific training on how to teach using computers. Thus, such teachers may need specific training on integrating ICT in teaching.

In teacher education institutions, a research study carried out by Peralta and Adriano (2011) using 72 teacher-educators, found that there is a generally low level of ICT integration in instruction. They also observed that ICTs are commonly integrated by teachers in autonomous institutions. However, the frequency of their integration would still fall under 'low' level just like the teachers from state colleges and deregulated institutions. The reasons given for the low level include unavailability of infrastructure, lack of technical support, and time, school culture, poor leadership and lack of training. Thus, effective integration of ICT involves interplay of multiple factors besides provision of computers and infrastructure (Aktaruzzaman, Shamim and Clement, 2011). One critical factor that influences teacher educators to integrate ICT in teaching is their level of computer expertise (Castillo-Valenzuela, 2016). This paper reports the results obtained from an investigation of teacher-educators' perceptions about their expertise in using ICT with their teacher trainees for teaching and learning in teacher training colleges in Kenya schools.

Methodology

Maithya, Mukolwe and Waka (2019) describes a research design as a plan for collecting and organising data relevant in addressing the research questions and control variance. It contains a data collecting plan, which defines instruments and modes of data collection. This study employed a descriptive survey. Descriptive survey focuses on determining the status of a defined population with respect to certain variables. They are flexible in tackling a range of problems related to attitudes, perspectives and beliefs of participants and can employ written questionnaires or interviews (McMillan, 2004). 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 primary teacher education to make it more relevant to the needs of the country in tandem with international trends (MOE, 2005). These colleges which offer certificate in primary teacher 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 target population for the study consisted of the entire teacher-educators in Kenya. At the time of this study, there were 21 teachers' colleges in the country. However, three have since been elevated to university colleges. Thus, the researcher chose to omit them and utilized the 18 fully operational primary school teacher training colleges as the population of the study. All these colleges have computer laboratories and are making efforts to improve their ICT capacity. On average, teachers' colleges admit 600 students annually for a two-year certificate in primary teacher education. 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 (ROK, 2005b). Teacher-

educators were selected because they are directly involved in the training of primary school teachers in their respective institutions. Therefore, they are the actual implementers of ICT integration policies in teacher education programmes. Additionally, 36 heads of the various departments and 6 principals, one from each TTC were also interviewed as key informants and provided in-depth understanding of issues of concern to the study.

The researcher decided to use the simple random sampling technique since the population was within the reach of statistical evaluation. First, a sample of six teachers' colleges was picked from the 18 colleges forming the research population. This was 30% of the total number of the primary teachers' colleges in the country. The six colleges were picked at random using the balloting method. In these colleges, the total number of teacher-educators was 418. From this total population, the study used Slovin's formula to determine the sample size. It was found that a sample of 204 teacher-educators would be needed to accurately represent the population in question. The proportionate sampling technique was then use to select two hundred and four participants who served as respondents chosen from the teacher-educators across the colleges to constitute the sample.

Researchers prefer using methods that provide high accuracy, generalisability and explanatory power, with low cost, rapid speed and maximum management and administrative convenience. Basing on this fact, a combination of the following research instruments was used in this study for complementary purposes: a questionnaire and an interview schedule. The data collected was analysed using the Statistical Package for Social Sciences, SPSS version 22. Descriptive statistics using frequencies, means, standard deviations, tables and percentages were used for the data on the level of ICT integration in teaching by teacher-educators in TTCs.

Percentages were also used to answer the question that asked the levels of teacher-educators' expertise in using computers in TTCs. Correlation was used to determine if a significant relationship existed between the level of ICT integration and teacher-educators' expertise in integrating computers in instruction. Regression analysis was used to determine whether teacher educators' expertise can be used to predict ICT integration in TTCs. The significance level was set at 0.05. All statistical analyses were computed using the statistical packages for social sciences. Information from interviews 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.

Results and Discussion

The descriptive statistics relating to teacher educators' expertise in ICT integration are presented in Table 1.

Table 1: ***Frequency Percentages of Teachers' Expertise in ICT Integration*** **Frequency (%)**

Teacher-Educators' Expertise	Beginner	Average	Advanced	Expert
Word processing	29.0	41.9	16.2	12.6
Spreadsheets	45.2	41.0	6.6	7.2
Database management	56.6	29.5	7.8	6.0
Classroom management	58.9	24.1	10.8	6.3
Graphics	57.3	23.6	14.6	4.5
Presentation	41.8	32.7	14.4	11.1
Desktop publishing	53.9	25	14.5	6.6
Authoring	65.6	23.2	7.9	3.3
Multimedia	51.0	27.2	14.6	7.3
Internet	24.7	35.1	23.4	16.9
e-mail	29.6	30.3	27.0	13.2
Simulations and games	64.1	24.2	7.8	3.9
Drill and practice	64.7	22.9	7.8	4.6
Tutorials	63.8	24.3	5.3	6.6

The most frequent perceptions of expertise in ICT use were Internet (40.3% "advanced" and "expert"), e-mail (40.2% "advanced" and "expert"), word processing (28.8% "advanced" and "expert"), and PowerPoint (25.5% "advanced" or "expert"). While these are the most frequent perceptions of integration, the frequency of integration is evidentially still very low. On the other hand, the most frequent perception of absence of expertise in ICT

integration were multimedia authoring (65.6% "beginner"), drill and practice (64.7% "beginner"), simulations (64.1% "beginner") and tutorials (63.8% "beginner"). This descriptive analysis seems to suggest that teachers have advanced expertise for such mainstream applications as e-mail, word processing, Internet, and PowerPoint, but have little knowledge about the specialised applications as multimedia authoring, drill and practice, simulations and games, and tutorials. These items are the same ones that defined the spectrum of the level of ICT integration.

Hypothesis Test Results

The calculated Pearson Moment Correlation Coefficient between teacher-educators' level of ICT integration into teaching and their expertise in ICTs was 0.715**, indicating a strong positive relationship between the sets of variables. Moreover, the results of regression analysis are consistent with the results of the Pearson moment correlation, indicating a significant standardized regression coefficient ($b = 0.292$ $t = 4.346$, $p < .05$) between the level of ICT integration by teacher-educators and their expertise in computer use. In terms of the hypothesis of the study, there is a significant correlation between the level of ICT integration and teacher-educators' expertise and, thus, the null hypothesis was rejected. This implies that teacher-educators' computer expertise explains 29.9% of the difference in ICT integration in instruction. This is one notable influence of ICT integration in TTCs. As such, college administrators should strive to improve teacher-educators' computer expertise by exposing to more training sessions on integration of ICTs.

Interviews with principals and HODs showed that expertise plays a big role in integration. Teacher-educators in ICT department have the expertise in ICT integration. It is the only department that consistently uses ICT in almost all the lessons. The researcher's observation confirmed that ICT departments across the colleges presented their lessons through PowerPoint and in the computer lab but teacher-educators in other departments seems to have low expertise in ICTs.

It is without doubt that teacher-educators' expertise is significantly correlated with the level of ICT integration. Keengwe (2007) confirms these findings, stating that educators who do not have enough knowledge and skills will not integrate and model the integration of technology into instruction. Therefore, the lack of technical expertise in Kenya is a critical challenge to integration of ICT in institutions of learning. According to Omwenga (2004), the country having limited resources means that the country usually has neither the local capacity to develop the necessary human resources in the field nor the means to attract highly skilled experts from abroad.

The findings of this study also indicate that the teacher-educators' expertise is the most important factor influencing them to integrate ICT into teaching. It is of paramount importance that colleges should give more priority to the development of their expertise. This is because knowledge is usually the first stage for successful integration of instructional computer technologies (Sahin & Thomson, 2006). Consequently, if teacher-educators do not have sufficient expertise in computer integration, they may not be able to integrate ICTs in their teaching while teacher-educators who have expertise in a computer application will be able to identify when it is advantageous to integrate the computer for instructional purposes. Additionally, because of their expertise, teachers may feel that computer integration for instructional purposes is compatible with their existing values about instruction. Thus, computer expertise is a good predictor of ICT integration. This finding concurs with that of Sahin and Thomson's (2006) study in which expertise was the most influential factor related to computer use.

In summary, the questionnaire asked the teacher-educators to rate their ability level for each of the same 14 items defining ICT integration. The items ranged from word processing to Internet content to multimedia authoring. The findings indicate a similar pattern of expertise to that of ICTs integration with teacher-educators having high expertise in basic computer operations such as word processing, Internet, and CDs/DVDs and low expertise in the more complex applications of drill and practice, graphic applications, Desktop Publisher applications, and simulations and games. This is an indication that teacher-educators' expertise in computer applications was very low.

However, findings based on hypothesis tests indicate that there is a significant relationship between teacher-educators' computer expertise and the level to which they integrate ICTs in instruction. The findings of the study indicate that teacher-educators' expertise is one of the most important factors influencing them to integrate ICT in their teaching. Thus, in the study, computer expertise is a good predictor of ICT integration. This finding concurs

with those of Sahin and Thomson (2006) where expertise was the most influential factor related to computer integration.

Conclusion

This study sought to establish the influence of teacher-educators' computer expertise and the level to which they integrate ICTs into teaching. There was a significant relationship between the teacher-educators' expertise and their level of ICT integration into teaching. Thus, it can be concluded that teacher-educators' computer expertise influence ICT integration in teacher education. While it was obvious that teacher-educators in ICT and Science departments had the expertise in ICT integration, there is need for teacher-educators in other departments to improve their computer expertise.

Recommendations

There is a strong, positive relationship between teacher-educators' computer expertise and their level of ICT integration in instruction. However, the descriptive statistics indicate that teacher-educators have high expertise in mainstream computer applications such as Microsoft Word but low expertise in more specialized ICT applications such as computer simulations, drill and practice, and tutorial programs. It is recommended that teacher education institutions should provide more on-the-job training on educational technology and ICT integration in order to improve teacher-educators' knowledge and skills in more specialized applications, and subsequently their level of ICT integration in teaching.

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