Relationship between Teacher-Educator Characteristics and the Integration of Information and Communication Technologies in Teaching and Learning in Teacher Education Institutions in Kenya

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Abstract

It is a government policy that all institutions of learning in Kenya, across the curricula embrace Information Communication Technology (ICT) as the world moves towards knowledge based economy. The evidence in literature reveals positive effects of information and communication technology in instruction. But teachers have a challenging task in integrating the tools of ICT in teaching especially those teacher educators not quite exposed to technology. This is because so many factors influence ICT integration. In this paper, we explore the the relationship between teacher-educators' age, gender, level of education, and teaching experience and the integration level of ICTs in teaching 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 who participated in the study. Data was collected using a questionnaire, an interview schedule and an observation schedule. The data collected was analyzed descriptively with the help of SPSS program version 17.0 for frequencies, means, standard deviation and percentages. The inferential statistics used to determine relationships among variables was the Pearson moment Correlation. Regression analysis was used to determine the best predictors of ICT integration among the independent variables. A p-value of less than 0.05 was interpreted as significant. Results indicated that there is a significant relationship between teacher-educators' level of ICT integration in teaching and their age. However, the findings showed no relationships between teacher educators' level of ICT integration in teaching and gender as well as their level of education. Teacher-educators' years of teaching are insignificant in explaining teacher-educators' integration ICT in teaching. Based on the findings, we recommended that information and communication integration be made part of undergraduate training in universities in order to equip future teacher educators with ICT skills; planning for the implementation of ICT integration into teaching in teachers' training programmes early would increase the pre-service teachers' expertise and lead to an increase in the level of ICT integration during the earlier years of their careers. There is also need to hire young teacher-educators to the field, especially female teachers. This would also increase the representation of the female perspective toward the improvement of the level of ICT integration into teaching.

Keywords: Teacher-Educators, Age, Gender, Level, Education, Teaching Experience, Integration Level, ICTs, Teaching, Public Primary School Teachers Colleges, Kenya

Introduction

Information and communication technology (ICT) refers to any technologies and tools that people use to share, distribute, gather information, and to communicate with one another through the use of computers and interconnected computer networks. ICT is considered an important teaching tool in all settings.

It is used for organizing, consolidating, storing and disseminating information. It is for this reason that the government has made it a policy that all institutions of learning in Kenya, across the curricula embrace Information Communication Technology (ICT) as the world moves towards knowledge based economy. The evidence in literature reveals positive effects of information and communication technology in instruction. But teachers have a challenging task in integrating the tools of ICT in teaching especially those teacher educators not quite exposed to technology. This is because so many factors influence ICT integration

Teachers are central to effective learning. They represent the most critical element and the biggest investment in the education enterprise. Consequently, their 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; Wabuyele, 2003). 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.

Research indicates that the level of integration of ICTs into teacher education can either be low, moderate or high depending on various factors (Tanius, 2009; Yidana, 2007). These factors, among others include: teachers' gender, age, their qualifications, as well as teaching experience. Gender differences, with regard to ICT integration, represent an important research area. This is considered so because the literature on educational computing abounds with conflicting findings about the relationship between teachers' gender and their integration of ICTs into teaching. Since the introduction of computers, ICT-related activities have been viewed as a male domain. There is significant of evidence supporting the notion that gender plays a significant role in ICT integration. For example, while some studies found no gender difference in ICT integration to teaching, the results of other studies found that male teachers manifested higher levels of integration (Woodrow, 1992).

Many studies have found that males are more inclined to use ICT, yet other research revealed that differences in technology use by gender is very small and neutral (Yaghi & Abu-saba, 1998). But later research indicated that women have more positive attitudes towards the use of ICTs than males (Ray, Sormunen & Harris, 1999). Others, such as Okinaka (1992) and Gordon (1993) found no gender difference the use ICTs in education while Lu (1995) found that a larger proportion of the female educators perceived ICT as an effective tool than the male educators. Ray *et al*. (1999) found that females have more positive attitudes concerning computers, reporting that women expressed greater comfort than men in using computers. However, Liaw's (2002) research on the relationship between computer studies and web attitudes of doctoral students in the school of education revealed significant gender differences. Findings indicated that male students had more positive attitudes towards ICT than the female students. North and Noyes (2002) have demonstrated that computing is widely perceived as a masculine activity, and their research provided evidence for a linkage between gender and technophobia. The tendency for males to dominate the fields of mathematics and computing, compared with male dominance in the computer industry, also suggest a technological gender gap. The contradictions in the findings of the aforementioned studies may be accounted for in biased sampling and inappropriate data analysis. The study, therefore, shed some light on the relationships between gender and ICTs integration, especially in Kenya.

On the relationship between the years of teaching Experience and ICT Integration, a review of the literature revealed few studies on the years of teaching experience and the impact it has on educators' technology integration. Research shows that educators who have been in positions for a longer period of time appear to be less prone to integrate technology than those who had been in their position for a short period. A report by the National Centre for Education Statistics (2000) reveals that teachers with nine or fewer years of teaching experience were more likely to teach using computers than teachers with twenty or more years of experience. Adams (2002) found a significantly high level of computer integration by educators with up to three years if teaching experience.

The findings also revealed that educators with tenure and 10 to 19 years of teaching experience had the lowest level of computer integration in their teaching. Adams (2002) concluded that educators with less than ten years of teaching experience and those with 20 or more years of teaching demonstrated a large degree of technology integration into their teaching.

The findings also show that female educators with few years of teaching experience were more prone to integrate computers into their teaching than their older, male counterparts with more years of teaching experience.

Age difference and its relationship to ICT integration has been the focus of many research studies. Some studies have showed that age is not a significant factor in reference to teachers' integration of ICT to instruction (Woodrow, 1992; Ndawula, 2009). On the other hand, a number of studies have revealed that age plays a crucial role in relation to ICT integration and instruction (Blankenship, 1998). It was shown in Chio's (1992) study that older teachers had more positive attitudes towards integration of ICTs to instruction. However, young teachers demonstrated higher computer literacy than older ones. Similarly, Kendel (1995) found age as a statistically significant factor for teachers' attitudes towards computers and that younger teachers demonstrated more positive attitudes towards ICT integration than older teachers. It is generally believed that age difference impacts on teachers' use of technology. For instance, Siegel (2001) examined the correlation of age with the usage of computers in four public schools in Netherlands. He found that age was significantly related to some use of computers such as e-mails and web page development. However, the findings of the study revealed that age was not significantly correlated with attitudes towards computers. There seems to be conflicting results in the literature with respect to age as a factor related to ICT integration in instruction. Age was examined in this study to ascertain the extent of the impact of this teacher-educator characteristic and their ICT integration in teaching.

Statement of the Problem

There is increasing pressure from policy makers for educators in teacher education institutions to graduate teachers who are skilled, confident and competent in using information and communication technologies for their personal and professional lives (Abenga, 2005; Gakuu, 2006; MOE, 2005). This is due to the important role played by ICTs in enhancing teaching and learning. For this reason, teacher-educators in teacher training institutions are expected to model appropriate uses of ICTs in instruction in order to equip future teachers with the necessary knowledge, skills and attitudes to effectively use these skills in their working lives (Chemwei, Njagi & Koech, 2014). Despite some literature reporting the effectiveness of integrating ICTs as instructional tools in teacher education, it is not clear whether teacher-educators demographic chractersistics influence their integration in the curriculum, especially in primary teachers colleges in Kenya. Such evidence is necessary because the integration of ICT in teacher education has been slow, giving rise to the notion that there are critical factors that influence integration levels of ICT in teacher training colleges. Since there seems to be a link between the above factors and the level to which teacher-educators integrate ICT into teaching, the study was designed to investigate the influence of these factors the level of ICT integration by in teacher-educators in primary teacher training colleges.

Limitations of the Study

This kind of research would have covered all the primary school teachers' training colleges in Kenya, both private and public, but because of time and cost constraints, a sample of six colleges out of the total 18 TTCs was used. A broader survey would clarify the status of ICT integration in Kenyan teacher education institutions. As such, the findings of the study can only be applicable to teacher-educators in public primary teachers' colleges in Kenya.

Materials and Methods

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 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 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 been elevated to university colleges. Thus the authors 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. They are thus 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 authors 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 were used in this study for complementary purposes: a questionnaire, two interview schedules and an observation schedule. The data collected was analysed using the Statistical Package for Social Sciences, SPSS version 17. Descriptive statistics using frequencies, means, standard deviations, tables and percentages were used for the data on the level of ICT integration into teaching by teacher-educators in TTCs.

Percentages were also used to answer one question that asked the levels of teacher-educators' confidence in using ICTs in TTCs. Correlation was used to determine if a significant relationship existed between the level of ICT integration and factors that influence teacher-educators' integration of ICTs. Regression analysis was used to determine variables that can be used to predict ICT integration in TTCs. In addition, the teacher-educators' demographic variables were designated as independent variables while their perceived level of ICT integration into teaching is the dependent variable in the analysis. 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

In this study, the teacher characteristics include gender, age, academic qualifications and teaching experience. A simultaneous regression analysis was conducted with all the four predictor variables with ICT integration serving as the criterion variable. In other words, the four variables were entered into the model as a block. The regression model (Table 1) was significant ($F = 5.264$, $R^2 = 0.12$, $p<0.05$). This means that the four factors together predicted 12% of variation in the criterion variable. However, age was the only factor which was a significant predictor of the ICT integration.

Table 1: Regression Analysis of Demographic Variables against ICT Integration for Teaching Model

	Sum of squares	**df**	**Mean square**	**F**	**Sig**
1					
Regression	3095.129	4	773.782	5.264	0.001
Residual	22637.475		154	146.997	
Total	25732.604		158		
Model	**Un-standardised coeff**	**Std coeff**	**T**	**Sig**	
B		**Std. Error**	**Beta**		
(Constant)	29.737	6.821	4.360	.000	
Gender	-1.681	1.959	-.065	-.858	.392
Age	-3.176	1.041	-.292	-3.050	.003
Education level	1.407	1.632	.069	.867	.387
Teaching experience	-.402	.980	-.041	-.411	.682

Relationship between Teacher-Educators' Gender and their Level of ICT Integration

The extent to which a teacher's gender is a predictor of ICT integration in higher education is an issue of concern. This is because some studies have found no gender differences in faculty adoption of ICTs (Woodrow, 1992) while the results of other studies have found that male faculty to have higher integration levels than females. For instance, North and Noyes (2002) assert that computing is a masculine activity and that men are better at computing. This argument echoes that of Menjo (2007) who postulates that male teachers tend to use computers more than their female counterparts. However, the findings of this study did not confirm either aspects of these studies because gender was found to not significantly correlate with teacher-educators' level of ICT integration.

As shown in Table 1, the results of the regression analysis indicates that there is an inverse relationship between teacher-educator's gender and ICT integration (b = -1.681, t = -0.858, p > .05). However, this relationship is not significant at 0.05 alpha level. Therefore, from the hypothesis test, the null hypothesis with regards to the characteristic of gender is accepted. Furthermore, interviews with principals and HODs indicated that gender did not influence integration of ICTs in TTCs. One reason is that both male and female teacher-educators in TTCs have similar opportunities to integrate ICTs in their lessons. The findings confirm those of Keengwe (2007) who found that gender does not affect ICT integration into teaching.

Relationship between Teacher-Educators' Age and their Level of ICT Integration

The relationship between a user's age and ICT integration has also been major concern of many research studies. Some studies showed that age was not a significant factor in reference to teacher-educators' ICT integration (Siegel, 2001; Woodrow, 1992). On the other hand, a number of studies revealed that age played a critical factor in relation to computer use (Blankenship, 1998; Kendel, 1995). For example, Blankenship (1998) found that age was the most significant factor that influenced teachers' use of computers while Na (1993) revealed a significant negative relationship between ICT integration and age. He also observes that ICT integration has the potential of intimidation to older users. Conversely, some findings have established that a user's age has no significant relationship on ICT integration to teaching (Balarabe, 2006).

In this study, age was found to influence ICT integration into teaching. As shown in Table 1, the results of multiple regression analysis indicated that age is a negative predictor component to the level of ICT integration (b = –3.176, t = –3.050, p < .05). Therefore, in terms of hypothesis test, the null hypothesis with regards to the characteristic of age is therefore rejected. Above all, the standardized regression coefficient (b = –0.12) indicated decreased ICT integration as the age of the teacher-educator increases. The insinuation here is that age explains a negative effect of 12 % on teacher-educators' ICT integration into teaching. This means that older teacher-educators never integrated ICT in TTCs.

This was further corroborated by the interviews with principals and HODs who agreed that young teachers were quite passionate about computers and would use them most of the time. However, older teacher-educators were disinterested in ICTs and would prefer delivering their lessons using traditional methods of talk and chalk. This can be attributed to lack of training and other priorities which seem to discourage them from using computers in their instruction. One HOD claimed that:

> Some percentage of the younger generation uses these tools in instruction. But the older teachers see it as a burden. In fact age plays a part in ICT integration. The commitment of the older teacher-educators is quite low and rarely do they integrate them in their instruction.

The findings echo those found by Peralta and Adriano's (in press) and Chio's (1992) studies in that there is relationship between ICT integration and teacher-educator's age. Both studies agree that younger teachers utilise ICTs in their teaching practices more than the older teachers. A similar observation was made by Kendel (1995) who argues that age is a significant factor for teachers' attitudes towards computers and that younger teachers demonstrated more positive attitudes towards ICT integration than older teachers.

This scenario is explained by Rogers (2000) when he argues that older teacher-educators prefer to stick with pedagogies they are used to because learning to use ICT is cumbersome for them and, since ICT integration is a new movement for them, it might lead them to anxiety. Therefore, this finding agrees with earlier research that the older the users' age, the lower the integration.

Relationship between Teacher-Educators' Level of Education and their Integration of ICT into Teaching

An analysis of the multiple regression results, shown in Table 1, shows that there is insufficient evidence to consider the level of education a predictive component to the level of ICT integration (b = 1.407, t = 0.867, p > .05). Therefore, in terms of hypothesis test, the null hypothesis with regards to the characteristic of level of education is accepted.

SThis is in line with Agbatogun's (2010) study which found that teachers' ICT use was not academic-qualification-specific. The results also show no mutual supportive relationship between the ICT literacy level of teachers and the varying academic qualification attained or earned by the various teachers who participated in this study. One conclusion to be drawn from this finding is that teachers' responses to acquiring knowledge, skills and competence in the manipulation of Information and Communication Technology is on the high rise without the prejudice of academic qualification.

Relationship between Teacher-Educators' Level of ICT Integration and Teaching Experience

A perusal of the multiple regression analysis results, shown in Table 1, shows that teaching experience is negatively correlated with the level of ICT integration (b = -.402, t = .411, p < .05). However, this is not significant at 0.05 alpha level. As such, in terms of Hypothesis Ten, the null hypothesis with regards to the characteristic of teaching experience is accepted. It means that teacher-educators' years of teaching are insignificant in explaining teacher-educators' integration into teaching. This finding notwithstanding, interviews with HODs revealed that teaching experience does not influence integration. If anything, those teachers who have less experience in teaching tend to utilize ICTs more than the experienced teachers. This seems to agree with the finding that age is inversely correlated to ICT integration.

A review of the literature revealed few studies on the years of teaching experience and the impact it has on educators' technology integration. For instance, Tezci (2010) found that the less the years of experience, the higher their knowledge and ICT use. In addition, they have more positive attitudes, a finding which is, in fact, not surprising. Furthermore, openness of the youth to innovations may be another factor. Similarly, the National Centre for Educational Statistics (2006) found that teachers with less years of experience use ICT more for educational purposes. Related to the above argument is a report by the National Centre for Education Statistics (2000) which revealed that teachers with nine or fewer years of teaching experience are more likely to teach using computers than teachers with 20 or more years of experience. This study failed to confirm these findings implying that teacher-educators' years of teaching have equal chances of integrating ICTs into their daily teaching practice.

Discussion

The respondents were asked to identify a number of demographic characteristics which would help decision makers understand the population of teachers. These included their gender, age, educational qualifications, and teaching experience. The findings indicated that a majority of teacher-educators were male.

In addition, the majority hold Bachelor's degrees. Those with Master's degrees came second. Based on the findings, the study shows a noticeably higher percentage of teacher-educators teaching for over 10 years as well as a reduced percentage of teacher-educators' whose teaching experience is less than five years.

The findings indicate that there is no significant relationship between teacher-educators' gender and the level to which they integrate ICTs into their teaching. This indicates that there were minimal gender differences in terms of ICT integration. It also implies that both male and female teachers can integrate ICTs in their every day teaching practice. Thus, with the increasing diffusion of technology, some of the differences between genders can disappear.

A significant negative relationship exists between the level of ICT integration and age. The findings demonstrated that, as the age of the teachers decreased, their ICT level's integration increased. In other words, younger teacher-educators utilized ICTs in their teaching more than older teachers. This finding confirms the results of Na (1993), who found that age correlates negatively with computers use. One probable reason for this scenario might be because older teachers tend to stick with the pedagogies they are used to. To them, learning a new way of teaching might be too cumbersome.

It was found that teaching experience correlated negatively with the teacher-educators' levels of ICTs integration. But this relationship is not significant at 0.05 alpha level. From this finding it can be concluded that teacher-educator's experience in teaching does not significantly influence one's integration of ICT. As such, both experienced and non-experienced teachers can comfortably integrate ICTs in their teaching practice.

Regarding the level of education of the respondents, this study revealed that a majority of the teacher-educators had Bachelors and Masters degrees. Few have diploma in education certificates. This means that that teacher-educators in TTCs have high education achievement and are professionally-trained hence can understand the need for integrating ICT into their teaching.

The relationship between teacher-educators' level of education and their ICT integration was studied, it was shown that teacher-educators' educational qualifications had a positive relationship with their level of ICT integration. However, this characteristic was not found to be statistically significant. There is insufficient evidence to consider the level of education as a predictive component to the level of ICT integration.

Conclusion and Recommendations

From the findings of the study, both male and female teachers were found to have low levels of ICT integration in instruction. But as for age, the younger teacher-educators had higher integration levels than the older teacher-educators. At the same time, higher levels of ICT integration were seen in the ICT, Science, and Mathematics departments. Teacher-educators with Diplomas in education 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.

A hypothesis test was concerned with the relationship between teacher-educators' gender and their ICT integration. The results provide insufficient evidence to consider gender a predictive component to the level of ICT integration. It can thus be concluded that both male and female teachers can have equal abilities to integrate ICTs into their teaching subjects.

The findings of the hypothesis tests further indicate that age is a negative predictor component to the level of ICT integration. The conclusion reached here is that there is a decreased ICT integration as the age of the teacher-educator increases. In view of that, age as a predictor of ICTs integration in teaching, provides advantages for younger teacher-educators than to older ones. As such, the decrease in ICTs integration between teachers in their 30s and 40s suggests that the younger a teacher-educator is, the higher the level of ICT integration to instruction.

A test of hypothesis showed that there is insufficient evidence to consider the level of education a predictive component to the level of ICT integration. This implies that education does not influence ICT integration in teaching. Teacher-educators, of all academic qualifications, have equal opportunities of integrating ICTs into their teaching practice.

Another hypothesis tested the relationship between teacher-educators' teaching experience and their level of ICTs integration. The results provided insufficient evidence to prove that teaching experience is a predictive component to the level of ICT integration into teaching. It can, therefore, be concluded that both experienced and non-experienced teacher-educators can comfortably integrate ICTs in their teaching.

Older teacher-educators, and those with more teaching experience, seem to have lower levels of ICT integration while younger teacher-educators with less experience have higher levels of ICT integration. For that reason, planning for the implementation of ICT integration into teaching in teachers' training programmes early would increase the pre-service teachers' expertise and lead to an increase in the level of ICT integration during the earlier years of their careers. There is also need to hire young teacher-educators to the field, especially female teachers. This would also increase the representation of the female perspective toward the improvement of the level of ICT integration into teaching.

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