Perspectives of Student Teacher Trainees' Preparedness and Adoption on Integration of ICT in Public Teacher Training Colleges in Kenya

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Abstract

This study was concerned with perspectives of student teacher trainees' preparedness and adoption on integration of ICTs in public teacher training colleges. Effective preparedness and adoption on integration of ICTs contributes greatly to the quality of education delivered in an instructional process. The rationale was conceptualized from the TPACK model that ICT use in the classroom is important for giving students opportunities to learn and apply the required 21st century skill, improves teaching and learning and important for teachers in performing their role as designers of pedagogical environments. The curriculum needs academic standards and the development of digital age skills for the 21st century learners to fit in the global job market. The literature review focused on the global overview on integration of ICT in education, status of integration of ICT in education in Africa, readiness in the integration of ICT in education in Kenya and challenges of integrating ICTs in the primary teacher curriculum. A descriptive survey research design was used in the study which was conducted in four (4) public primary teacher training colleges in Central region of Kenya. These provided an ideal population for the study. The target populations were second year student teacher trainees, College principals and Kenya Institute of Curriculum Development (KICD) e-learning Officers. The major research instruments were questionnaires for student teacher trainees, interview schedule for the principals and Kenya Institute of Curriculum Development e-learning developers, and observation schedule. The obtained data were analyzed systematically using descriptive statistics and presented with the help of frequency tables, figures and percentages. Findings of the study revealed that preparedness on integration of ICTs was at an infant stage. The study also revealed that the training was only offering pedagogy, content, knowledge but not the technology which make integration a reality in the classroom setting. There were inadequate infrastructure to enhance integration and student teacher trainees revealed lack policy that would help adoption on integration of ICTs in teaching learning process.

Key Words: Preparedness, Adoption, Integration, Information Communication Technology, Pre-service training institution

1. Introduction

ICT stands for "Information and communication technology". It refers to technologies that provide access to information through telecommunication. It is similar to Information Technology (IT) but focuses

primarily on communication technologies. This includes the internet, wireless networks, cell phones and other communication mediums. It means more opportunities to use ICT in teacher training programmes to improve quality of teachers for teach effectively. According to UNESCO "ICT is a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economic and cultural matters". Teaching is the main part of the educational field in the society. Teachers work more for the improvement level of our society in the every field and skilled teachers can make the creative students in form of the good social worker, politician, poet, philosopher etc. for the society. Teachers can play a friendly role with the learner. The rapid development in technology has made innovative changes in the way people live, as well as digital societies. Recognizing the impact of technologies in the workplace and everyday life, today's teacher education institutions try to streamline their education programs and classroom facilities in order to minimize the teaching and learning technology gap between today and the future (Ratheeswari, 2018).This study was concerned with perspectives of student teacher trainees' preparedness and adoption on integration of ICTs in public teacher training colleges. Effective preparedness and adoption on integration of ICTs contributes greatly to the quality of education delivered in an instructional process. The curriculum needs academic standards and the development of digital age skills for the 21st century learners to fit in the global job market.

1.1. Background to the Study

The development of skills and knowledge in the use of ICTs is increasingly deemed to be an important aspect of preparation for participation in an information society, as integration of ICTs enhances the quality of learning and teaching in classrooms. As a result, teachers and instructors need to be trained in basic ICT skills and ICT-based teaching methods to feel comfortable about integration (International Institute for Communication and Development, 2007). Despite significant political will and expenditure on equipment and training, levels of ICT integration in classrooms for teaching and learning are often low Taylor (2004). Further research shows that despite all these investments on ICT infrastructure, equipment and professional development to improve education in many countries, less developed world face more serious problems such as massive growth in enrolment and institutional development, bad governance, high costs, poor and uneven distribution of ICTs and infrastructure, incorrectly viewing ICTs as a problem for organizational transformation, not making ICT responsive to the organizational vision and mission, and developing a non-systemic method of implementing ICTs (Mbodila, Jones and Muhandji, 2013). Gulbahar (2007) claimed that huge educational investment has produced little evidence of ICT adoption and use in teaching and learning. Student teacher trainees should be prepared to integrate information and communication technologies (ICTs) into their future teaching and learning practices. iiCD (2007) observe that:

> *''…education enhanced by ICTs, not only sparks economic development by improving learners' skills, but it also enhances social development across the community by raising peoples' awareness of their ability to improve their health, their environment, and even the way they are governed'.*

Despite the increased availability and support for ICT integration, relatively few teachers integrate ICT into their teaching activities (Ertmer, 2005). One of the major problems of using Information Communication Technologies (ICTs) in education is to base choices on technological possibilities rather than educational needs. The educational effectiveness of ICTs
depends on how they are used and for what purpose, like any other educational tool or mode of education delivery, ICTs do not work for everyone, everywhere in the same way (Mbodila et al. 2013). The available research has thus far mainly focused on isolated teacher related variables to explain the weak level of ICT integration and results show that prospective ICT integration significantly correlates with all teacher related variables, except for gender. Building on the results of a path analysis model, prospective ICT integration could be directly predicted on the base of teacher thinking variables (constructivist teaching beliefs, teacher self-efficacy, computer self-efficacy and computer attitudes in education), and indirectly by the gender of the student teachers (Guoyuan, Martin, Johan & Tondeur, 2010) but not perspectives of student teacher trainees and adoption on integration of ICTs which this study sought to investigate.

In some countries, notably the United States and Australia, there is evidence that sectors which have invested mostly in Information Communication and Technology (ICT) have experienced an increase in the overall efficiency of using labor and capital (Pilat, 2004).
Experience has proved that given proper infrastructure, ICT can be an enabler of socioeconomic development (Bhatnagar, 2005). ICTs have the potential to create job opportunities, improve delivery and access to health and education. They facilitate information sharing and knowledge creation. Education is one of the areas where integration of ICTs provides tangible benefits. Integration of ICTs in and for education is now seen worldwide both as a necessity and an opportunity (UNESCO, 2009). It plays a great role in the three fundamental aspects of education policy that is access, quality and cost. ICT increase access to education through distance learning. They provide new and innovative means to bring educational opportunities to a greater number of people of all ages, especially those who have historically been excluded such as the population living in rural areas, women facing social barriers and students with disabilities (UNESCO, 2009). Integration of ICTs in education promotes E-learning. E-learning is learning that is supported by electronic technology. It involves use of Interactive multimedia, Internet based learning (online), Computer mediated learning and campus portal access to institutional processes and resources (Taylor, 2001). However the question is; what is the perspective of student teacher trainees' preparedness and adoption on integration of ICTs?
To successfully initiate and implement integration of ICTs in Public Primary Teacher Training Colleges program depends strongly on the teachers' support and attitudes. It is believed that if teachers perceived technology programmes as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning. Among the factors that influence successful integration of ICTs into teaching are teachers' attitudes and beliefs towards integration of ICTs (Hew and Brush, 2007; Keengwe and Onchwari, 2008). If teachers' attitudes are positive toward integration of ICTs then they can easily provide useful insight about the adoption and integration of ICT into teaching and learning processes. Demici (2009) study revealed that though barriers such as lack of hardware and

software existed, teachers positive attitudes towards GIS was an important determinant to the successful integration of GIS into geography lessons.

Moreover, research has shown that teachers' attitudes towards technology influence their acceptance of the usefulness of technology and its integration into teaching, Huang & Liaw (2005). In European School net (2010) survey on teachers' use of Acer netbooks involving six European Union countries, many participants believed that the use of netbook had had positive impact on their learning, promoted individualized learning and helped to lengthen study beyond school day. However, evidence suggests that small number of teachers believe that the benefits of ICT are not clearly seen. The Empirical survey revealed that a fifth of European teachers believed that the use of ICT in teaching did not benefit their students' learning, Korte & Hüsing (2007). A survey of UK teachers also revealed that teachers' positivity about the possible contributions of ICT was moderated as they became 'rather more ambivalent and sometimes doubtful' about 'specific, current advantages', Becta (2008) whereas Mingaine (2013) study established that there was limited supply of qualified ICT teachers in Kenya and Mioduser, Turksapa and Leitner (2000) reported that demographic factors such as age, gender, teachers" experience and teachers" level of education greatly affected the speed at which ICT was conceived and implemented at Greece. Mbodila et al. (2013) argue that it is very important before implementing the integration and adoption of ICTs; to make sure that suitable levels of investment is in place, adequate training, good policy, careful planning, streamline the teaching process, and a systematic approach also are require when integrating ICTs in education in order to achieve maximum educational benefits. It is also vital to think carefully about purpose of education or the context in which the ICTs can be used before implementation. Grimus (2000) pointed out that "by teaching ICT skills students are prepared to face future development based on proper understanding". The above studies have been done in different contextual framework and not perspectives of student teacher trainees in preparedness and adoption in integrating ICTs in teaching and learning. The pertinent question one would ask is; what are the perspectives of student teacher trainees' preparedness on integration and adoption of ICTs in teaching and learning?

2. Findings of the study

The findings of the study were based on the objectives of the study.

2.1 Perspectives of teacher trainees' Preparedness in integrating ICT

The study sought to investigate the perspectives of student teacher trainees' preparedness in integrating ICT in teaching and learning process. According to the Ministry of Education Science and Technology (MoEST 2005) session paper No 1, teachers are an important resource in the teaching and learning process. Their preparedness therefore should enable them acquire sufficient subject mastery and pedagogy. Pearson moment Correlation analysis was conducted to establish the relationship between how student teacher trainees were being prepared to integrate ICT in their teaching career with how often they used internet in college to prepare for teaching especially during teaching practice. The result showed that there was a significant relationship ($r = 0.203$, P- value = 0.001). This implied that student teacher trainees who felt that they were prepared to integrate ICT in their teaching career often used internet in college especially

during teaching practice whereas those who felt that they were not prepared to integrate ICT in their teaching career especially in teaching practice never used internet in college for preparation for their teaching as shown on Table 1.

Table 1: Correlation results between student teacher trainees' preparation to integrate ICT with use of internet.

		Training preparation to integrate ICT in teaching career	Use of internet in college for preparation in teaching
Training preparation to integrate ICT in teaching career	Pearson Correlation	1	.203(**)
	Sig. (2-tailed)		.001
	N	295	290

** Correlation is significant at the 0.01 level (2-tailed).

Additionally, the study sought to find out why the correlation. An item in the student teacher trainees' questionnaire sought to find out if the training prepared them to integrate ICT in their teaching career. 70.4% felt that the training had prepared them to integrate ICT in teaching and learning process whereas 29.60% of the student teacher trainees felt that their training had not prepared them to integrate ICT in teaching and learning process as shown on Figure 1.

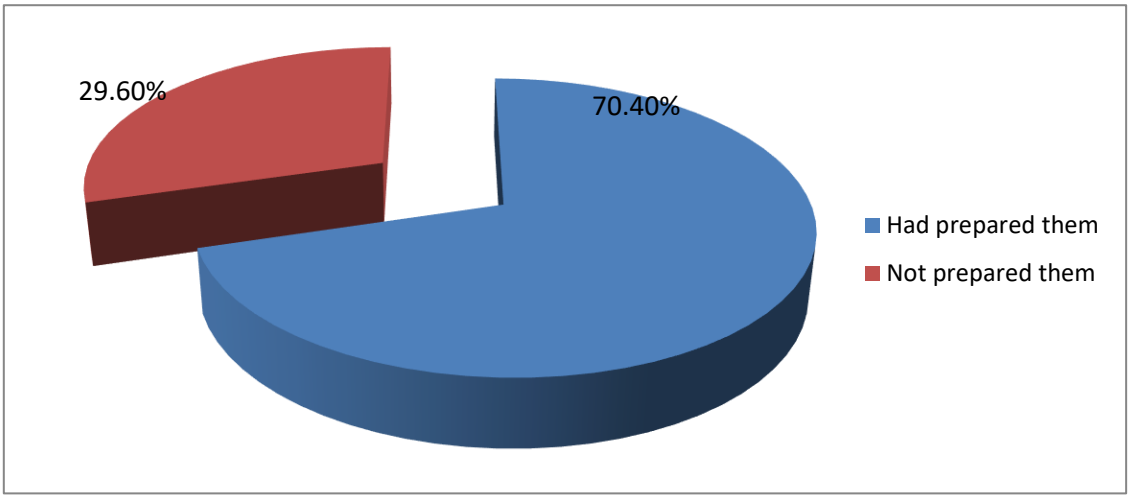

Figure 1: Student Teacher Trainees' opinion on trainings preparing them in integrating ICT.

Further, the study sought to establish reasons why student teacher trainees were for the opinion that they were adequately prepared. The student teacher trainees reported in a narrative form that they were adequately trained because they were able to use computers as they were taught basic skills in computer such as PowerPoint, access internet and get information, they were able to access teaching and learning materials and could make reference to textbooks comfortably, ICT was taught as a subject though not examinable, the Computer lessons were taught from first year up to 5th term of 2nd year. Moreover, at least

after training the student teacher trainee could try and operate computer programme but not competently, the knowledge student teacher trainees got in ICT was relevant in teaching and learning process and in the profession as a whole, the skills they had acquired in ICT would help in searching job opportunities and that the training allowed students teacher trainees to have knowledge on ICT and hence could teach the ICT subject easily or with easy in the teaching career.

The 29.60 % of the student teacher trainees felt that the training did not prepare them to integrate ICT in teaching and learning because they do not know how to operate a computer since the computers were very few for doing practical, there was limited time for practice, there was no training on integration during their ICT training programme, there were incomplete packages taught in college during the training, the teaching and learning resources needed to be equipped in the public teacher training colleges, student teacher trainees be trained on how to integrate, ICTs were inadequate, the student teacher trainees were being trained about basic skills on computer but not integration of ICTs.

Moreover, the research sought to find how student teacher trainees rated their skill level on integration of ICTs as they were being prepared as teacher professional. 47.5% of the student teacher trainees rated fair, 31.6% of the student teacher trainees rated good, 8.8% of the student teacher trainees rated excellent, 8.4% of the student teacher trainees rated very good whereas 3.0% of the student teacher trainees rated that they had no skill at all as shown on Table 2.

Table 2: Student Teacher Trainees' rating of the individual skill level on integration of ICT

Rating on the skill level	**Number of Student Teacher trainees (N = 297)**	**%**
No skill at all on integration	9	3.0
Good	94	31.6
Excellent	26	8.8
Fair	141	47.5
Very good	25	8.4
No answer	2	0.7

In addition, the study established why student teacher trainees rated their individual skills as good. They reported that they were good because they felt that they were able to access information using the available computers as they could operate them, able to use PowerPoint, access internet even by use of mobile phones, able to use text books, blackboards and could prepare and use charts in teaching. Those who felt their rating of the skills were low; were of the opinion that they had fair or no skills at all because accessibility to internet was low due to few computers compared to number of student teacher trainees as well as being irregularly taught computer lessons leave alone not well conversant with all the programs in the computer, fewer rooms for practical, ICTs were not enough for adequate preparation and negative attitude of some lecturers towards student teacher trainees' performance and progress. Further, observations from the observation scheduled showed that 60% of the tutors had negative attitude towards student teacher

trainees' performance and progress whereas 40% of the tutors had positive attitudes on student teacher trainees' performance and progress.

To confirm what had been reported by the student teacher trainees, the research used Pearson Moment Product correlation. The correlation results for the student teacher trainees' preparedness to integrate ICT in teaching and learning in their teaching career with their rating on skill level on integration of ICTs as they were being prepared as teacher professional showed that there was no significant relationship (r = 0.102, p -value = 0.082). This implied that student teacher trainees who had reported that they were prepared to integrate ICT in teaching and learning process in their teaching career still rated their skills to be fair or no skill at all as shown on Table 3.

Table 3: Correlation between student teacher trainee preparedness to integrate ICT and rating on skill level on integration of ICTs

		Training preparation to integrate ICT	Rating of skill level
Training preparation to integrate ICT	Pearson Correlation	1	.102
	Sig. (2- tailed)		.082
	N	295	293

The study drew a conclusion that that the training was only offering pedagogy, content, knowledge but not the technology which made integration a reality in the classroom setting.

Furthermore, the study sought KICD e- officers 'opinion on whether the student teacher trainees in primary teacher training colleges were well prepared for the integration of ICTs in teaching and learning. The entire KICD e-officer reported that the student teacher trainees were not well prepared because more training and exposure was required to prepare tutors and student teacher trainees during the training of trainer of trainees in Public Primary Teacher Training colleges (PPTTCs). The e-officers reported that student teacher trainees were still using manila papers yet computers were in colleges, digital content for use in primary was also PPTTCs and; tutors and student teacher trainees required utilization of the infrastructure to benefit from ICT integration.

Moreover, KICD e-officers opinion as curriculum developers on integration of ICTs in PPTTCs to enhance the same at the primary schools in Kenya were that; It was necessary to involve and train tutors in colleges so as to fully participate in teaching while integrating ICTs and student teacher trainees needed to acquire ICT skills in PPTTCs which they could impart at the primary schools. ICT devices required more training and exposure for the successful implementation of projects integration ICTs in teaching and learning.

2.1.1 Training in the teaching career

To confirm what had been reported student teacher trainees, further the study sought to establish whether student teacher trainees used internet in college for their preparation in teaching and learning especially during teaching practice. 75.8% of the student teacher trainees never used internet in college, 7.4% of the student teacher trainees used every time, 9.4% of the student teacher trainees used once a week, 4.4% of the student teacher trainees used once a month whereas 1.3% of the student teacher trainees used it once a year as shown on Table 4.

Table 4: How often student teacher trainees used internet in college for preparation in teaching during teaching practice

Usage of internet in college	**No. of student teacher trainees (N = 297)**	**%**
Every time	22	7.4
Once a week	28	9.4
Once a month	13	4.4
Once a year	4	1.3
Never	225	75.8
No answer	5	1.7

2.1.2 Skills required by the Tutors to prepare student teacher trainees

Since the study was on student teacher trainees' preparedness and adoption of ICTs, through principals of PPTTCs the study explored whether there had been any ICT training for tutors in the last three years in colleges to impart tutors with skills to prepare student teacher trainees on integration of ICTs. The principals revealed that they had been some form of ICT trainings for tutors once every term, two times or three times respectively. Further, an item in the principals' interview schedule sought to find out the principals' opinion on the skills required by the tutors to prepare student teacher trainees. The college principals in verbatim revealed that, for the tutors to prepare student teacher trainees on integration and adoption of ICTs, they required to use ICT tools and facilities, prepare teaching and learning resources, good communication skills, ICT proficiency teaching skills, internet manipulation skills, basic cabling and safety skills, computer skills, educational technology and adequate skills in ICT by being trained regularly and by being provided with desktops/laptops. The findings revealed lack of proper training in the use of ICTs. This concurs with Selwyn (2007)'s study on factors influencing integration of ICT in higher education in Vietnam which revealed that there was a poor slow uptake of ICT in education despite heavy investments put in place on integration of ICTs in education which was a similar case in Kenya.

The findings revealed that there was no significant relationship between training on use of ICTs and teacher trainees' rating on skill level on integration of ICTs as they are being prepared for their teaching career.

The negative correlation implied that those who were trained on use of ICTs tended to rate their skill as fair compared to those who were not trained. The overall statistics showed that there was no significant difference between training and teacher trainees' rating on skill level on integration of ICTs. The study therefore views that computers have not transformed practice and that access to ICTs is the foremost and necessary step in the integration process even though mere access will not automatically lead to integration of ICT for teaching and learning. Additionally, there was lack of proper training in the use of ICTs and that preparedness on integration and adoption of ICTs is at an infant stage. The study concluded that teacher trainees were not prepared to benefit from integration and adoption of ICTs to harness quality learning. This concurred with Maruti (2010) study on e-readiness. Moreover, the training programme did not provide prospective student teacher trainees with the necessary skills, competencies and experiences to prepare them to integrate ICTs effectively in their teaching profession. The study concurred with Mukiri, (2012); Omariba, Ayot & Ondigi (2016) study which revealed that teachers lacked proper training in the use of ICTs as they were not exposed to the use of ICT as a teaching resource in teaching despite the fact they had ICT qualifications which does not help them in lesson delivery.

Further, the study concurs with Duran (2000) & Omariba (2016) study on preparing technology- proficient teachers and Maruti (2010) study which revealed that teacher trainees lacked an allocated time within the college timetable when they could freely access computer labs to enforce practice as they were expected to have free time when they could access the facilities and put to practice what they had learned if integration of ICTs has to be realized in Kenyan PTTCs whereas Sherry & Gibson (2002) claim that technological, individual, organizational, and institutional factors should be considered when examining ICT adoption and integration. According to Olaniyi (2006), lack of computers and other resources in educational institutions is one of the factors that hinder student teacher trainees' preparedness in integrating and adoption of ICTs. The same was observed in Nigeria schools where the population of students was enormous while ICT facilities were inadequate. Most of the computers in the colleges are of low speed with a clock speed of 0.733GHz, hard disk memory of less than 10GB and RAM of 256MB.The PPTTCs did not have software which were suited for integration development such Modular Object Oriented-Dynamic learning (MOODLE), Virtual Learning Environment (VLE), Blackboard and Shared Content Object Reference Model (SCORM). The colleges offered basic Microsoft office packages which gave student teacher trainees basic skills in computers but not integration and adoption of ICTs. Bowes (2003) notes that, to use these tools effectively and efficiently, teachers need visions of technologies' potential, opportunities to apply them, training, and just-in-time support and time to experiment only can then teachers be informed and confident in their use of ICTs whereas Collins and Jung (2003) observe that ICTs can be used as a core or complementary to the teacher training process if integration has to be realized.

2.2 The relationship between teacher trainees' training and their adoption on integrating ICTs.

The study sought to establish the relationship between student teacher trainees' training and their adoption on integrating ICTs into their instructional process. It is obvious that for teaching and learning to be efficient and effective, integration of ICTs is inevitable. The study explored student teacher trainees' opinion on the integration of ICTs. 77.8% of the student teacher trainees revealed that integration of ICTs

greatly enhanced content delivery, 75.4% of the student teacher trainees revealed that integration of ICTs influenced understanding of the content whereas 60.3% of the student teacher trainees disagreed that integration of ICTs in teaching was adding extra costs unnecessarily. When looking at the syllabus coverage, 59.6% of the student teacher trainees disagreed that integration of ICTs reduced syllabus coverage whereas 60.1% of the student teacher trainees reported that integration of ICTs in teaching was not adding extra costs unnecessarily as shown on Table 5.

Table 5: Student Teacher trainees' opinion on integration of ICT

	Student Teacher Trainees' opinion					
Statements on ICT(N = 297)	**SD**	**D**	**N**	**A**	**SA**	**Mean**
Integration of ICT in teaching is adding extra costs unnecessarily	112 (37.7%)	67 (22.6%)	34 (11.4%)	47 (15.8%)	26 (8.8%)	2.33
More time is spent when commuters are used	134 (45.1%)	89 (30.0%)	26 (8.8%)	32 (10.8%)	6 (2.0%)	1.91
Use of ICT reduces syllabus coverage	97 (32.7%)	80 (26.9%)	33 (11.1%)	49 (16.5%)	27 (9.1%)	2.40
Use of ICTs greatly enhances content delivery	15 (5.1%)	20 (6.7%)	19 (6.4%)	123 (41.4%)	108 (36.4%)	4.01
Use of ICTs in teaching influences understanding of the content	15 (5.1%)	18 (6.1%)	28 (9.4%)	120 (40.4%)	104 (35.0%)	3.98

Key: SD=strongly disagree, D=Disagree, N=Neutral, A= Agree, SA= strongly agree

Further, the study sought to establish how student teacher trainees expressed their opinion on integration ICTs in the training colleges. 24.2% of the student teacher trainees revealed there were ICTs in their colleges sometimes available whenever they needed them, 30.0% of the student teacher trainees revealed sometimes there was limited knowledge and skills on integration of computers in teaching, 25.9% of the student teacher trainees revealed they sometimes used computers to access specific education materials, 29.3% of the student teacher trainees liked browsing the internet to learn and get more information and 32.0% of the student teacher trainees had accessed the computers every time they were free. The result further showed that 35.0% of the student teacher trainees very rarely had enough time to use the ICTs whereas 31.3% of the student teacher trainees revealed computers in the colleges were very rarely used for teaching special subjects as shown on Table 6.

Table 6: Student Teacher trainee use of the ICTs

Statements on use of ICT (N = 297)	Student Teacher Trainees' Opinion				
	A	**O**	**S**	**R**	**VR**
ICTs are available whenever need arises	62 (20.9%)	53 (17.8%)	72 (24.2%)	67 (22.6%)	35 (11.8%)
There is limited knowledge and skills on integration of computers in teaching	63 (21.3%)	32 (10.8%)	89 (30.0%)	53 (17.8%)	34 (11.4%)
I use computers to access specific education materials	42 (14.1%)	48 (16.2%)	77 (25.9%)	47 (15.8%)	75 (25.3%)
I like browsing the internet to learn and get more information	87 (29.3%)	51 (17.2%)	67 (22.6%)	28 (9.4%)	56 (18.9%)
I have enough time to use computer	16 (5.4%)	29 (9.8%)	54 (18.2%)	86 (29.0%)	104 (35.0%)
I have access to computers every time I'm free	34 (11.4%)	33 (11.1%)	59 (19.9%)	60 (20.2%)	95 (32.0%)
Computers are used for teaching specific subjects	49 (16.5%)	39 (13.1%)	63 (21.2%)	39 (13.1%)	93 (31.3%)

A=Always, O=Occasionally, S=Sometimes, R=Rarely, VR=Very rarely

From the means shown on Table 6, the study concluded that the overall impression was that the integration and adoption of ICTs greatly enhanced content delivery (mean of 4.01 using the scale of 1-5).

In addition, the study sought to find out whether student teacher trainees were aware of an ICT policy in college. 59.6% of the student teacher trainees revealed colleges had an ICT policy, 38.7% of the student teacher trainees revealed colleges did not have any policy on ICT whereas 1.7% of the student teacher trainees had no answer. Moreover, the study established from student teacher trainees whether they were aware if the government had a policy on integration of ICT. 71.0% of the student teacher trainees reported they were aware of the government policy on integration of ICT, 27.9% of the student teacher trainees reported that they were not aware of the government policy on integration of ICT whereas 1.0% of the student teacher trainees had no answer as shown on Table 7.

Table 7: Presence of ICT policy

Policy on integration of ICT (N = 297)		**f(N = 297)**	**%**
College	Yes	177	59.6
	No	115	38.7
	No answer	5	1.7
Government policy on integration	Yes	211	71.0
	No	83	27.9
	No answer	3	1.0

Further, the study wanted to find out why student teacher trainees embraced the presence of a policy on integration of ICTs. The student teacher trainees gave various responses such as; all of the student teacher trainees in teacher's training colleges were entitled to learn ICTs, the government was providing computers to schools and colleges because it was aiming at transforming the analog era to digital era, the government policy on e-learning and the determination to make education more digital. All teachers had to be computer literate since the government wanted to introduce the issue of laptops in primary schools, ICT as a subject was timetabled and tested in the PPTTCs mock exams, certificates awarded and it was a must that all student teacher trainees had to pass all subjects including computer as a subject, and on buying computers the government had set the policy on the ratio of computer to the number of students going to use them.

However, student teacher trainees felt there was no policy on integration of ICT in colleges because the tutors were not always in a mood to help student teacher trainees to learn more on ICT, student teacher trainees had never seen any policy, the government was full of corruption and it was not easy to implement the policy and that the government had promised about the implementation of the laptop project but still there were no positive results seen concerning that project.

2.2.1 Conversance with ICT systems being propagated by Kenya Institute of Curriculum Development

Furthermore, the study sought to explore if student teacher trainees were conversant with ICT systems being propagated by Kenya Institute of Curriculum Development (KICD). An item in the student teacher trainees' questionnaire sought to find out if they were conversant with the ICT system being propagated by Kenya Institute of Curriculum Development (KICD). 56.20% of the student teacher trainees reported they were not conversant, 37.70% of the student teacher trainees reported they were conversant whereas 6.10% of the student teacher trainees had no answer as shown on figure 2.

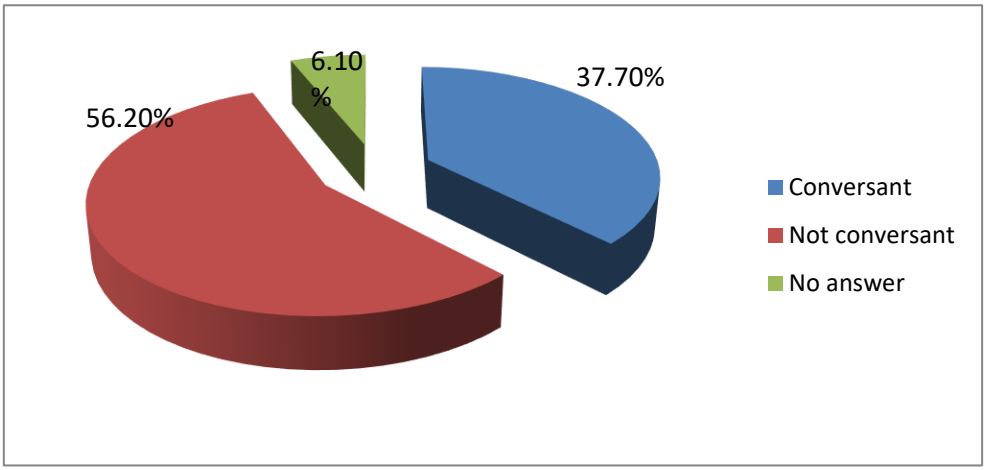

Figure 2: Student Teacher Trainee conversance with the ICT system being propagated by KICD

Moreover, the researcher wanted to know if the college principals were conversant with the systems propagated by KICD since they were the managers of colleges. The principals from the sampled colleges also confirmed that they were conversant with the ICT system being propagated by KICD. However, they revealed that these ICT systems were meant to help in preparation of content to be used in secondary schools. The principals' revelation concurs with Jesse, Jesse and Omariba (2016) study on the effect and user interface on the utilization and efficacy of educational digital content among secondary school in Kenya.

The study concluded therefore that the influence was both positive and negative. A crucial barrier to the integration of ICTs was ICT competence or skills and ICT confidence. A very significant determinant of teachers' levels of engagement in ICTs is their level of confidence in using technologies (Ratheeswari, 2018). Jones (2004) observes that age can influence the uptake of ICT for teaching whereas Cox et al. (2003) argues that the way ICTs were used in lessons was influenced by teachers' knowledge about their subject and how ICT was related to it. The findings revealed that there was no ICT policy in colleges to give guidelines on the integration of ICTs. Further, the government has not given clear guidelines on integration of ICTs especially in PTTCs. Student teacher trainees were not conversant with ICT systems being propagated by KICD. The concurred with Gode (2013) study on factors influencing integration of ICT in teacher training colleges. Prensky (2001) distinguishes between ICT natives who are born in a digital world and digital immigrants who must learn the digital language and for whom ICT will always be the second language. Further, he notes that the tutors' subject domain may influence the use of ICT.

2.3 Teacher trainees' attitude towards integration of ICTs

Furthermore, the study sought to find out teacher trainees' attitude towards integration of ICT. Ratings of student teacher trainees' attitude were done based on their responses towards the questionnaire variable items asked. In questionnaire item 1 and 2 which inquired; if integration of ICT added extra costs unnecessarily and if more time was spent for extra training for ICT respectively, all the student teacher trainees who accepted these items were taken to have a negative attitude and were coded 1. In questionnaire item 3, 4 and 5 (Use of ICTs greatly enhances content delivery, Use of ICT reduces syllabus coverage time and if use of ICTs in teaching influences understanding of the content), all student teacher trainees who

consented were taken to have positive attitude towards integrating ICT were coded 2. Further, a variable developed to establish the individual teacher trainees' attitudes based on the mean responses on the five items showed that; 75 (25.3%) of the student teacher trainees had negative attitude towards integrating ICTs whereas 222 (74.7%) of the student teacher trainees positive attitude.

The average attitude of the student teacher trainees in the study was calculated to be 1.63 with a standard deviation of 0.24 in the scale of 1 – 2 (1= negative, 2=positive). Using this scale, Analysis of variance (ANOVA) was conducted on the attitude of the student teacher trainees as determined by their skill levels on integration of ICTs as they are being prepared in the teaching profession. The results of the study showed that there was a significant relationship in the skill level on integration of ICTs by teacher trainees as they were being prepared as teacher professional (F = 2.690, P value = 0.031) as shown on Table 8.

Table 8: ANOVA table for the student teacher trainees' attitude towards integration of ICT and their skill level (N = 297)

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	.611	4	.153	2.690	.031
Within Groups	16.459	290	.057		
Total	17.069	294			

In addition, the study revealed that student teacher trainees who had negative attitude towards integration of ICTs had no skill at all with a mean of 1.49 whereas those who had positive attitudes towards integration of ICTs rated their skill levels to be good with a mean of 1.66. According to Judson (2006), there was little correlation between stated beliefs and the actual practice whereas Ertmer (in Hermans et al.; 2008) observe that teachers' educational beliefs can be barriers to the integration and adoption of ICT. One key area of teachers' attitudes towards ICT is their understanding of how it will benefit their work and their students' learning (Ratheeswari, 2018).

According to Almekhlafi (2016), positive attitudes encourage less technologically capable teachers to learn the skill necessary for the implementation of technology-based activities in the classroom. Teachers' perception of technology use also is affected by their belief about the way the subject content should be taught. However, Mueller et al. (2008) observe that positive attitudes towards ICT on learning will not automatically lead to the uptake of ICT integration in teaching and learning. Further, the results of the study showed that there was a significant relationship in the skill level on integration of ICTs by teacher trainees as they were being prepared as teacher professional. It further revealed that teacher trainees who had negative attitude towards integration of ICTs had no skill at all even though Judson (2006) observed that there was little correlation between stated beliefs and the actual practice.

2.4 Challenges faced by student teacher trainees' in an attempt to integrate ICT

The study sought to explore the challenges faced by student teacher trainees in an attempt to integrate of ICTs in teaching and learning problem. 19.4% of the student teacher trainees reported inadequate knowledge and skills on integration, 16.4% of the student teacher trainees reported lack of ICT materials or limited number of ICT materials, 14.4% of the student teacher trainees lack of inadequate time, 12.9% of the student teacher trainees reported inadequate power supplies which sometimes break connections and 10.9% of the student teacher trainees reported lack of facilities such as computer labs while others were in minimal percentages as shown in Table 9.

Table 9: Challenges faced by the student teacher trainees in an attempt to integrate ICT in teaching and learning

Challenges	**Number of teacher trainees (N = 201)**	**%**
Inadequate knowledge and skills on integration	39	19.4
Lack of ICT materials or Limited number of ICT materials	33	16.4
Lack of enough facilities such as computer labs.	22	10.9
Lack of funds and high costs of ICTs	8	4.0
Lack or inadequate time	29	14.4
Lack of computers or inadequate computers in colleges	21	10.4
High number of students in the lab during teaching	3	1.5
Inadequate power supply which sometimes break connections	26	12.9
Lack of security	2	1.0
Negative attitudes	4	2.0
Lack of enough teachers	5	2.5
Poor role model by lecturers	3	1.5

Unavailability of teachers	2	1.0
Bulky curriculum and it might be difficult to draw all required pictures	4	2.0
No training on integration of ICT	11	5.5
Expensive ICT materials	7	3.5
Inaccessibility to internet	3	1.5

To confirm what was established from student teacher trainees, the study found out from the principals the challenges of integrating ICTs in teaching in public primary teacher training colleges in Kenya. The principals revealed challenges such as inadequate ICT facilities in colleges, low levels of ICT literacy among tutors especially on use of modern ICTs, lack of appropriate and relevant content from publishers and the ministry, a pathy on usage of ICT in teaching learning process, some tutors ignore using the ICT facilities available and lack of ICT proficiency skills.

Moreover, principals were further asked to give suggestions regarding the challenges on integration of ICT in public primary teacher training colleges. The principals proposed the need to enhanced budgetary allocation for equipment and materials, have regular capacity building of staff and conduct in-service training of tutors on integration of ICT, enhance time tabling whereby ICT should be taken seriously and be incorporated in the curriculum and ICT as a subject to be examinable at Primary Teacher Education level.

The findings of the study therefore revealed numerous challenges such as; inadequate facilities, lack of competence, knowledge and skills in ICT integrations, limited time for accessing the computer in the college , power blackout, lack of support from college administration and government, college systems did not embrace integration of ICTs in all subjects, inadequate training, lack of enough ICTs and negative attitude of students, low levels of ICT literacy among tutors especially on use of modern ICTs, lack of appropriate and relevant content from publishers and the ministry, apathy on usage of ICT in teaching learning process, some tutors ignored using the ICT facilities available and initial preparation time is too long. These findings concurred earlier studies on ICT infrastructure in PPTTCs (Farrell, 2007 and Hennessy et al.2010). Maruti (2010) observed that it was evident that the presence or absence of ICT infrastructure was becoming a crucial factor in teachers' decision to use ICT in teaching. According to Gomes (2005), lack of technical support on integration affects the use of ICTs in teaching whereas Gutterman et al. (2009) notes that lack of quality teachers to apply ICT to the existing education systems to poor policy framework for integration of ICT. Tong and Trinidad (2010) observes that without technical support for teachers, they become frustrated resulting in their unwillingness to integrate ICT to teach.

3. Conclusion

The main question that this study endeavored to find was an answer to the student teacher trainees' preparedness to integrate information communication technology in teaching and learning. Based on the findings of the study, this study resulted in the following main conclusions:

a) Teacher trainees did not access computers during free time and other ICTs to enable them to integrate in teaching and learning process. This implied that student teacher trainees did not have access to the internet which meant that rolling out on integration was impeded to a large extent by inadequate infrastructure.
b) The researcher viewed that student teacher trainees were not prepared to benefit from integration of ICT to harness quality learning given that curriculum delivery was done in classrooms which were not ICT friendly. Further, the study viewed that ICTs were to a large extent not aiding curriculum delivery in PPTTCs and therefore the student teacher trainees lacked exposure on integration as they were being prepared in their teaching career.
c) Adequacy of ICTs influences adoption of ICT in the process of teaching and learning. Integration therefore should go beyond the use of basic computer packages and textbooks for delivering subject specific content if integration has to be rolled out.

Bereiter (2002) observes that; ''Learning is facilitated when new knowledge is integrated into the learners' world…" This study will give educators a better understanding of the importance of integrating ICT in the process of teaching and learning especially in PTTCs.

4. Recommendations

The following recommendations were made based on the findings of the study.

a) Teachers must have the knowledge and skills to use the ICTs and resources to help all students achieve high academic standards. Therefore, the curriculum in PPTTCs should be revised to include integration of ICTs as a subject in the syllabus which should be examinable at primary teacher examination. This will enhance the development of integration of ICTs, design and development skills, and pedagogical strategies.
b) Kenyan PPTTCs curriculum should train student teacher trainees on how to integrate ICTs in their classrooms by being engaged in the process of ICT-integrated training. Further, promote ICT-pedagogy integration in their teaching by providing ICT-based training environments where on-demand access to materials; peers, and networks of experts where expertise and advices can be obtained and active discussion can take place in relation to technology and pedagogy. (This approach of using ICTs to support teachers' on-going professional development and networking can be very effective as long as organized support is provided, Pace, 1999).
c) High quality, meaningful, and culturally responsive digital content must be generated and be available for student teachers trainees in their teaching practices. For many teacher education programmes, this formidable task requires the acquisition of new resources, expertise and careful planning. PPTTCs should hence establish strategies in integration of various ICTs with a view to adapt and embrace them in the process of teaching and learning.

d) There is a critical need of context, culture, leadership and vision, lifelong learning, and the change process in planning for the integration of ICTs into teacher education; PPTCs administration should therefore develop ICTs policy to guide student teacher trainees on integration, embrace and support integration of ICTs in teaching and learning.

e) The ICT competencies required of student teacher trainees relate to content, pedagogy, technical issues, collaboration, and networking. PPTTCs should therefore adopt policies that guide them on integration of ICTs in the process of teaching and learning and one of the mandatory policies to be adopted is to ensure online ICT competency for both tutors and student teacher trainees.

f) There is need to develop standards to guide implementation of ICTs in teacher education. Kenya Institute of Curriculum Development (KICD) should therefore develop and supply the public primary teacher training colleges with relevant e-content in all subject areas to ensure delivery of the curriculum is integrated with ICTs. Further, The KICD should come up with clear guidelines on integration of ICTs in PPTTCs if Kenyan outputs from PPTTCs have to be relevant with the demands of the global job market.

g) The study established inadequate facilities in the colleges. There is need for essential conditions for successful integration of ICTs into teacher education. Thus, important strategies need to be considered in planning for the integration and adoption of ICTs in teacher education and managing the change process. Further, the study recommends the MoEST to initiate partnership with private sectors to equip PPTTCs with infrastructure to enhance ICT friendly classrooms and install internet in PPTTCs through partnership with private sectors to pay for the substantial costs to ensure secure and continual internet connectivity. Moreover, the Ministry of Education should develop an ICT policy on integration of ICTs in teaching and learning for PTTCs and ensure it is implemented to the later.

4.1 Future Research Directions

A study on guidelines on student teacher trainees' training in tertiary institutions.

Realizing the effect of ICT on the workplace and everyday life, today's tertiary institutions need guidelines to restructure their educational curricula and classroom facilities in order to bridge the existing technology gap in teaching and learning. Restructuring requires effective integration of technologies into the existing environment to promote meaningful learning and enhance productivity.

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Appendix

Key terms and Definitions

Adoption- Is the decision of an individual to make use of technology as the best course of action available.

Information Communication Technologies- Encompasses the range of hardware (desktop and portable computers, projection technology, calculators, data-logging, and digital-recording equipment), software applications (generic software, multimedia resources), and information systems (Intranet, Internet) available in colleges.

Integration- Is the adoption, inclusion and use of resource materials/equipment to aid the process of teaching and learning.

Preparedness: Training in readiness to fully integrate technology in teaching and learning.

Pre-service training institution: Institutions for students' training to be professional teachers.