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Benedictus Mawusi Donkor
Tutor, Department of Mathematics & ICT, St. Teresa's College of Education, Box 129, Hohoe Volta Region, Ghana

Cynthia Adjartey
Tutor, Department of Mathematics & ICT, St. Teresa's College of Education, Box 129, Hohoe Volta Region, Ghana

Destiny Kobla Amenyedzi
Tutor, Department of Mathematics & ICT, St. Francis' College of Education, Box 100, Hohoe Volta Region, Ghana

Aloysius Donkor
Tutor, Department of Mathematics, St. Augustine's College, Box 89, Cape Coast Central Region, Ghana

Correspondence
Benedictus Mawusi Donkor
Tutor, Department of Mathematics & ICT, St. Teresa's College of Education, Box 129, Hohoe Volta Region, Ghana

Analysis of technology integration in teacher education in Ghana: A case study of St. Teresa's college of education, Hohoe, Ghana

Benedictus Mawusi Donkor, Cynthia Adjartey, Destiny Kobla Amenyedzi and Aloysius Donkor

Abstract
The study sought to investigate technology use among teachers and students of St. Teresa's College of Education to uncover factors influencing their technology use. Investigating technology use in teaching and learning was crucial because this knowledge could provide guidance for ways to enhance technology integration and encourage greater use of technology in teaching and learning. Besides, the study also investigated the factors that influence teachers and students' technology use and suggested effective ways of integrating technology in St. Teresa's College of Education.
A cross-sectional survey design with mixed (quantitative and qualitative) methodology was used for the study. The population of the study comprised all teachers and Diploma in Basic Education (DBE) 1 and 2 students of St. Teresa's College of Education. A stratified sampling method was used to select 40 teachers and 200 students. The study revealed that the extent to which St. Teresa's College of Education teachers and students use technology in teaching and learning was very low. The analysis revealed that the differences in the mean technology use between male and female teachers and self-perceived efficacy in technology use were statistically significant. Besides, students having access to high technology resources used more technology than those having low technology resources. The findings further revealed that the differences in the mean technology use between students with different ages and availability of technology resources were statistically significant. Evidence from the research suggests that the challenges of ICT use in education do not lie only in the lack of availability of technological resources, but also in the shortage of skilled human resources and other institutional factors. Implications that relate to teacher "readiness" to deliver 21st century education through the use of technology was discussed and analyzed.
The study recommended that, the Curriculum Research Development Division (CRDD) of the Ghana Education Service in collaboration with the related agencies in the Ministry of Education should carry out research to review critically the curriculum and revise the existing course outlines to explicitly state what ICT tools must be used and how it should be used in the teaching and learning process.
It is further recommended that, the Ministry of Education and for that matter the government of Ghana should endeavour to equip all colleges in the country with well-furnished computer laboratories to enable both the teachers and students to get high access to technology resources. The colleges of education must be provided and trained in software that will equip and help in imparting knowledge after their completion.

Keywords: Ghana, St. Teresa's college, integrating technology and technology use

Introduction
This chapter of the study introduces the general background of the study including; field and subject of the study, objectives of the study, statement of the problem, research questions, significance of the study, limitations and delimitations of the study and the organizational plan of the study.
According to the Ministry of Education, Youth and Sports (MOEYS) and Ghana Education Service (GES) (2002), integrating technology in classroom instruction ensures greater motivation, increases self-esteem and confidence, enhances good questioning skills, promotes initiative and independent learning, improves presentation of information/outputs, develops problem solving capabilities, promotes better information handling skills, increasing focus time on task, and improves social and communication skills.

In view of this, the World Links for Development (WorLD) programme introduced in Ghana, in 1997, was designed to use ICT to open a world of learning for teachers and students. The programme aims to assist teachers and students to integrate ICT into their curricula, to facilitate collaborative projects and distance learning among teachers and students, to assist students in using computers and the internet as communication and research tools, and to develop local educational content on the internet (Kwei, 2001) [15].

From the early 1990s, education stakeholders in Ghana have been concerned about how teachers and students use computers in schools and how their use supports learning (Boakye & Banini, 2008) [4]. At the beginning of the millennium, education authorities in Ghana embarked on a number of projects to introduce Information and Communication Technologies into Ghanaian education set up at the basic and secondary school levels. For instance, in the middle of the 1990s, educational providers realized that Ghanaian professionals could not compete on the global market for jobs, because they were limited in skill, especially in the area of Information Technology (Nyarko, 2007) [25].

Therefore, in implementing policies to achieving national development in Ghana, the ICT for Accelerated Development policy (ICT4AD) emphasized the need to transform Ghana into an information-rich, knowledge-based and technology-driven high income economy and society. The ICT4AD policy aims to achieve this mission by transforming educational system to provide requisite educational and training services and environment capable of producing the right types of skills and human resources required for developing and driving Ghana's information and knowledge-based economy and society. In view of this, the Ministry of Education Youth and Sports (MOEYS) and Ghana Education Service (GES) proposed that the use of ICT in schools must:

1) Ensure that students have ICT literacy skills before coming out of each level of education
2) Provide guidelines for integrating ICT tools at all levels of education
3) Provide means of standardizing ICT resources in all schools
4) Facilitate training of teachers and students in ICT
5) Determine type and level of ICT needed by schools for teaching and administration purposes.
6) Promote ICT as a learning tool in the school curriculum at all levels (MOEYS & GES, 2002).

Integration of Information and Communication Technology (ICT) is high on the education reform agenda worldwide particularly in developed countries (Tilya, 2008) [29]. Often ICT is seen as an indispensable tool to fully participate in the knowledge society (Peeraer & Van Petegem, 2011) [27]. ICTs are therefore perceived to provide a window of opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning process. Although a large body of research on factors determining the integration of ICT in education emerge from developed countries, recent research indicates that developing countries are finding means to participate effectively in the global information society and to address challenges regarding ICT in education (Tilya, 2008) [29].

Literature review

Background

ICT and Educational Change

The literature reviews the factors of ICT Integration that are related to technology use in the classroom and factors that influence it. In order to investigate teachers and students' technology use at St. Teresa's College of Education, Hohoe and other colleges in Ghana as a whole, there is the need to better understand the factors that influence it. Several studies on technology use by teachers have identified a range of factors influencing uptake and implementation. These factors include: skill and previous experience in using technology; sensitization of the teachers; time and opportunities to learn; access to hardware and software; availability of appropriate teaching materials; technical support; institutional culture; knowledge of how to integrate technology into teaching and beliefs about the role of technology in learning. (Fine & Fleener, 1994; Simonsen & Dick, 1997; Manoucherhri, 1999; Forgasz & Prince, 2001; Walen, Williams, & Garner, 2003) [9, 28, 17, 11, 39].

In this study, the researcher adapted Valsiner's (1997) zone theory as the theoretical framework to investigate teachers and students' technology use and factors influencing their use at St. Teresa's College of Education. Valsiner's (1997) zone theory was originally designed as an explanatory structure in the field of child development to apply to interactions between teachers, students, technology, and the teaching and learning environment.

Valsiner's (1997) zone theory extends Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) which is often defined as the gap between a learner's present capabilities and the higher level of performance that could be achieved with appropriate assistance to incorporate the social setting and the goals and actions of participants. Valsiner (1997) added two zones: the Zone of Free Movement (ZFM) and Zone of Promoted Action (ZPA) to Vygotsky's Zone of Proximal Development. The ZFM structures an individual's access to different areas of the environment, the availability of different objects within an accessible area, and the ways the individual is permitted or enabled to act with accessible objects in accessible areas.

The ZPA represents the efforts of a more experienced or knowledgeable person to promote the development of new skills. The ZPA describes the set of activities, objects, or areas in the environment, in which the person's actions are promoted. Goos and Bennison (2008) [12] argue that the ZFM can be interpreted as constraints within the school environment, such as participants' characteristics, access to resources and teaching materials, and curriculum and assessment requirements, while the ZPA represents opportunities to learn from pre-service teacher education, colleagues in the school setting, and professional development as indicated in Table 1

Table 1: Factors Affecting Technology Use

Valsiner's Zones	Elements of the Zones
Zone of Proximal Development	Skill/experience in working with technology, Pedagogical knowledge (technology integration). Pedagogical beliefs (technology)
Zone of Free Movement	Access to hardware, software, teaching materials, Support from colleagues (including technical support), Institutional culture, Curriculum & assessment requirements, Students (perceived abilities, motivation, behaviour)
Zone of Promoted Action	Pre-service education (Colleges of Education program), Practicum and beginning teaching experience, Professional development

Zone theory provides a framework for analysing the relationship between teachers and students' technology use and the factors influencing it at the colleges of education level. Zone theory was adapted as a framework for this study because it enabled the researcher to analyse the relationships between individual respondents' settings, actions, and beliefs, and how these changed across school contexts. Drawing on the zone theoretical framework, the researcher investigated possible relationships between St. Teresa's College of Education teachers and students' use of technology and factors known to affect this use:

1. Zone of Proximal Development – self-perceived efficacy in technology use;
2. Zone of Free Movement – availability of technology resources, age, gender, school location;
3. Zone of Promoted Action – teaching experience, number of years in school.

A Conceptual Framework for the Study

The purpose of the study was to provide bases to better understand teachers' readiness of pedagogical integration of ICT and to fuse and summarize findings from a body of research on trends in ways that ICT can be understood and used to improve the quality of teaching and learning in the educational system in St. Teresa's College of Education, Hohoe, Ghana. In the developed world, most theories or models has been implemented in evaluating factors that influence individual acceptance behaviour on information technology and information systems, the integration of ICT in education in general or the use of ICT in teaching practice in particular. Some of these models include the Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology, and Diffusion of Innovations, but TAM Model seem to be the most popular used to throw more light and explain information system usage.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is an information systems theory that models how users come to accept and use a technology. The model suggests that when users are presented with a new technology, a number of factors influence their decision about how and when they will use it, notably:

- **Perceived usefulness (PU):** This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance his or her job performance".
- **Perceived ease-of-use (PEOU):** Davis defined this as "the degree to which a person believes that using a particular system would be free from effort" (Davis 1989) [8].

Both perceived usefulness and perceived ease of use was influenced by external variables. The TAM has been continuously studied and expanded-the two major upgrades being the TAM 2 (Venkatesh & Davis 2000 & Venkatesh 2000) [35] and the Unified Theory of Acceptance and Use of Technology (or UTAUT, Venkatesh *et al.* 2003) [36]. A TAM 3 has also been proposed in the context of e-commerce with an inclusion of the effects of trust and perceived risk on system use (Venkatesh & Bala 2008) [37].

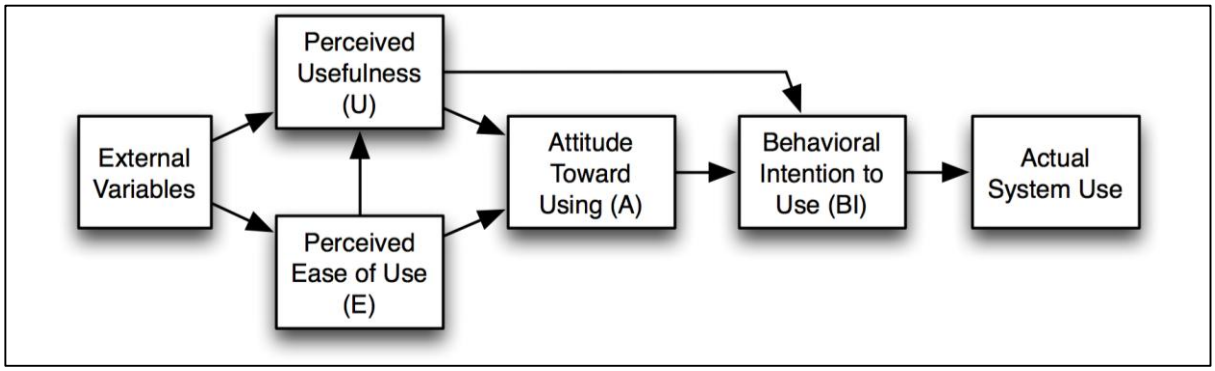

Fig 1: Technology Acceptance Model (TAM). Source: (Davis, Bagozzi and Warshaw 1989) [8]

It explains user behaviour across end-user computing technology and user population (Davis *et al*, 1989) [8]. Based on the assumption of TAM, the behavioural intention to use technology (BI) is determined by the person's attitude toward using the technology (A) and perceived usefulness (U), (BI = A + U) (Davis, 1986) [7]. A person's attitude toward a new technology (A) is viewed as an essential determinant in the users' acceptance of a system where individuals form intention to perform behaviour toward which he/she has a positive attitude (Davis, 1986) [7]. More so, the (A) in the theory is determined by perceived usefulness and perceived ease of use (U + EOU = A), and

finally, variables like training, user support, level of education, age, and system experience which are considered external variables influence user beliefs in using the system.
However, some researchers posited that the actual usage of a technology in TAM can be measured using both frequency of use and volume of use (Jones and Hubona, 2006; Turner, *et al.* 2010) [14, 32]. These two measures are based on the volume and frequency in which the technology is utilised. Frequency of use of the system refers to the number of times in which the user utilised a system over a period (e.g. use Jusur LMS twice per week) whereas, volume of use of the system refers to amount of time that the user used a system over the same period (e.g. use Jusur LMS four hours per set). As a result, it was difficult adopting a single existing overarching theory as a framework to guide the conduct of this study.
Therefore, the author identified critical success factors for ICT integration drawn from literature and used these critical success factors as the benchmark to analyze the current work. In this study, literature on factors driving integration of ICT in education is presented in fivefold:

i. Teacher Preparedness and Willingness
ii. Technology Use in Teaching and Learning in the Classroom
iii. Factors that Influence Technology Use in Teaching and Learning
iv. Resources for ICT Integration in Education
v. Limited number of Computers available in the Schools and Computer Laboratories

Teacher Preparedness and Willingness

The recent education reforms launched in June 2007 called for the introduction of information and communications technology (ICT) at the secondary institutions through:

- The introduction of ICT as a core subject;
- The introduction of ICT as an elective subject;
- The integration of ICT as a teaching tool for all subject areas; and
- The integration of ICT to support educational management and administrative functions.

As a result, evidence drawn from the literature showed that teachers had been trained and hired in schools to serve this purpose. In examining the data to determine schools with and without ICT teachers, the e-readiness survey (MOE, 2009) reported that 97.4% of the schools did have ICT teachers, with 2.6% of the schools not having ICT teachers.
Furthermore, the report indicated that 68.8% of the teachers were professional ICT teachers while the remaining 31.2% were not. They were trained teachers in other subject areas who were willing to help with ICT teaching because there were not enough ICT teachers in the school system. Such evidence suggests that some attempts have been made by the government, the ministry of education, and teachers to move the goal of transforming teaching and learning through ICT innovations beyond rhetoric.
Although this augers well for the nation, more needs to be done. The ICT teachers as reported had only basic ICT skills: basic knowledge in application software such as word processing, spreadsheet, internet, and a presentation application, and this is the focus of ICT courses they teach. The integration of ICT as a teaching tool for all subject areas is not a common practice because ICT teachers do not have the levels of competence (pedagogical combination with technological skills) to enable them to use ICT tools and equipment in the teaching and learning process.
This contention has been corroborated by a number of studies (Agyei, 2012; Agyei & Voogt, 2011a; Mereku *et al*, 2009; MOE, 2009; Ottevanger, van den Akker & de Feiter, 2007) [3, 1, 18, 26] conducted in Ghana to analyze the experiences of teachers to integrate ICT in teaching. This seems to suggest that most teachers' experience to integrate ICT in teaching is limited and the question of whether properly trained teachers are sufficiently prepared for new teaching methods which are flexible and involve appropriate use of technology remain.
For ICT to be used meaningfully in education, teachers are required to develop knowledge and skills that enables them to integrate ICT with a suitable pedagogical approach for teaching specific matter in a certain context. The findings reported here therefore highlight areas that require opportunities to develop pedagogical skills in integrating ICT to ensure that desired effects in the teaching and learning with ICT as well as administrative processes are achieved.
In spite of inadequacies in their preparedness to integrate ICT in teaching, it was however encouraging to note that contemporary teachers in Ghana appear generally supportive and willing to use ICT in their classrooms. The review of the literature provided evidence that both in- and pre-service teachers are prepared for the integration and infusion of ICT into and across the curriculum. More importantly, they show a lot of enthusiasm to be part of any professional development programme related to integrating ICT in teaching and learning (cf. Agyei & Voogt, 2011a, 2011b) [1, 2].
Agyei and Voogt (2011a, 2011b) [1, 2] reported that these teachers' positive attitudes and willingness to integrate ICT in teaching and learning is a necessary condition for them to participate in an ICT related programme and a predictor of their future classroom ICT integration. Of equal importance to ICT integration in the educational system is the role of teacher preparatory programs. Evidence from the review also showed that the teacher education programs just like secondary institutions are open to any such ICT innovation.

Technology Use in Teaching and Learning in the Classroom

Technology use in teaching and learning really has the potential to improve the way subjects should be taught and enhances students understanding of basic concepts (Ittigson and Zewe, 2003) [13]. Thomas, Tyrrell and Bullock (1996) [31] suggest that the introduction of technology requires a new mindset on the part of teachers, a shift of focus, to a broader perspective of the implications of the technology for learning. This means that teachers need to develop knowledge that is pedagogical technological content knowledge that will enable them to use technology in teaching.
Several studies have highlighted teachers' use of technology in the classroom. For instance, Loong (2003) [16] conducted a study to investigate teachers' use of the internet for teaching in Australia. Out of the 63 teachers surveyed, the findings indicated that the teachers use the Internet for

finding information such as articles about research or professional issues, or as a source of data for students to analyze during lessons. No statistically significant relationships were found between use and competency, professional development, or years of teaching experience.

Similarly, a study conducted by Mereku *et al.* (2009) [18] indicated that technology is used in typing examination questions in all institutions and in some cases educators use technology in processing students' examination results. Their findings further indicated that very few Ghanaian teachers use technology in their teaching.

Besides, Forgasz (2002) [10] surveyed Year 7 to 10 teachers in Victoria to find out how computers were being used in the classrooms and to identify factors that acted as facilitators or hindrances to use. Most teachers felt confident or at least willing to "have a go" at using computers for teaching and had used computers in their classes, but only infrequently. A large proportion of these teachers had participated in professional development in computer education, but most of them wanted more training.

Besides, Goos & Bennison (2008) [12] also conducted a survey to find out teachers' use of technology. Out of 485 teachers sampled, 26% indicated they had participated in professional development courses related to computers, the internet and graphics calculators while 16.7% stated they had undertaken no professional course in any of the three types of technology.

However, Boakye and Banini (2008) [4] also conducted a study to find out teachers' readiness for the use of technology in Ghanaian schools. Their findings indicated that out of 221 teachers surveyed, only 24% have received some form of training in the use of computers, with quite minimal training in the pedagogical integration of technology. This indicates that although teachers have realized the impact of technology in teaching, they still need professional training on how to integrate it in their teaching.

Although, technology use in teaching enhances teaching and learning, the level of technology use falls below average. A report by the National Center for Education Statistics (2005) indicated that 44% of the American teachers used technology for classroom instruction, 42% for computer applications, 12% for practice drills, 41% required research using the Internet, 27% had students conduct research using CD-ROMs, 27% assigned multi-media projects, 23% assigned graphical presentations of materials, 21% assigned demonstrations, 20% required students to use technology to solve problems and analyze data, and 7% assigned students to correspond with others using the Internet. Besides, Bukaliya and Mubika (2011) [5] surveyed 320 teachers to find out their competence in ICT. Their findings indicated that only 7.5% of the teachers were knowledgeable and skilled in computer aided instruction. Their findings also revealed that 43% of the teachers used spreadsheet, 37.5% used internet and 46% used email.

Thomas, Bosley, Santos, Gray, Hong, and Loh (2006) [30] also conducted a study to investigate technology use in teaching in the classroom. Their findings revealed that a whopping 68.4% of teachers had used computers in their lessons, 31.6% had not. However, 75% of teachers would like to use the computer more often, with availability of computers the primary obstacle, and lack of teacher training and confidence also important. This indicates that the level of technology use among teachers is still low.

Factors that Influence Technology Use in Teaching and Learning

Technology use in teaching and learning has become a major concern to stakeholders and policy makers in education throughout the world. Technology use in teaching is influenced by several factors.

Nor (2004) [23] used a qualitative methodology to study conditions that facilitated the implementation of information and communication technology integration in the Malaysian school curriculum. The findings revealed that two sets of conditions: (i) essential conditions (such as availability of technology resources and acquisition of technology knowledge), and (ii) supporting conditions (such as accessibility of technology resources, presence of support, desire to change among teachers, school practices, influence of external forces and teachers' commitment to the innovation) significantly influence the teachers technology use.

Besides, Norris *et al.* (2003) [24] surveyed rural and urban respondents in California, Florida, Nebraska, and New York to investigate the extent of technology use in K-12 in U.S. Out of the 3,665 teachers surveyed; the analysis revealed that appropriate access to technology infrastructure is a key factor in the effective technology integration process. The study revealed substantive correlation between technology access and use.

Similarly, Varden (2002) [34] used Ely's conditions as a framework to identify conditions that influence the adoption and integration of laptop computers by teachers in United States high schools. His results indicated that the conditions of "dissatisfaction with status quo," "presence of knowledge and skills," "participation," "commitment" and "leadership," were more prevalent among teachers who were early adopters than late adopters. In addition, the study found that teachers who had a higher degree of technology integration reported greater adherence to all of Ely's conditions than those with a lower degree of technology integration.

Research conducted by Crisan (2004) [6] categorized variety of factors that influence technology use into contextual factors and the personal factors. He argued that contextual factors encompass the school context, the availability of and access to technology facilities and resources, teachers' technology skills, teachers' technology professional development, departmental ethos and key persons in promoting the use of technology and the departmental policy with regard to integrating technology into the scheme of work.

Besides, Goos and Bennison (2008) [12] surveyed 485 teachers in Australia to investigate the factors influencing technology use in teaching. Their findings revealed that pedagogical knowledge and beliefs, access to hardware and software and participation in professional development course were factors influencing technology use in teaching and learning.

Similarly, Mereku, *et al.* (2009) [18] conducted a study to investigate pedagogical integration of ICT. Their findings revealed that availability of ICT syllabuses, computers and computer laboratories that can be accessed periodically were

factors that influence technology use at the colleges of education in Ghana.

In order for the schools to be proactive regarding technology in the classroom, Williams (1998) [40] argues that the schools should have a technology plan, reviewing the curriculum to fit the technology needs in instruction and ensuring that the staff has skills. He argues for tapping school and community resources to ensure sustainable funding mechanisms.

Resources for ICT Integration in Education

Ghana, like most sub-Saharan countries confront challenges regarding inadequate ICT infrastructure, including computer hardware and software, and communication network (bandwith/access); however, some studies conducted in Ghana have shown that some opportunities exist regarding ICT infrastructure and accessibility in educational institutions (namely secondary schools and teacher education institutions), to enhance teaching and learning.

For example, Agyei and Voogt (2011a, 2011b) [1, 2] reported that the government of Ghana and other institutions have invested huge sums of money in procurements of computers and establishment of computer labs in most secondary institutions following the introduction of ICT into the school curriculum in September 2007.

In 2009, a baseline survey covering 501 secondary institutions (representing 97.6% of all secondary institutions in Ghana) was conducted to assess the ability of educational institutions to effectively use ICTs in fostering the achievement of educational and management objectives through the use of appropriate tools, processes, and skilled human resources.

The e-readiness survey conducted by the Ministry of Education sought to provide validated data that informs on the categorization of secondary schools, and on issues that need to be addressed in planning for the deployment of ICTs to schools (MOE, 2009). The report showed that 87% of all secondary institutions are reported as having at least one computer laboratory. A study of the e-readiness survey report and other relevant documents on the status of availability of ICT resources in education in Ghana provide the following as obstacles in achieving excellent ICT integration into curriculum:

a) Limited number of Computers available in the Schools and Computer Laboratories
b) Lack of Connectivity and Accessibility
c) Unavailability of Power Supply/Maintenance
d) Lack of resources like LCD projectors and specialized computer software for teaching various subjects prevail in both teacher and secondary institutions.

Mireku *et al.* (2009) [20] also reported that, an average of 30 students to a computer at the senior high school level. A similar trend has been observed at the pre-service teacher training level. Pre-service teacher training in Ghana is offered at two levels: one is the teacher education at the university level (which focuses mainly on training teachers to teach in senior high schools and colleges of education) and the other is the college of education (formerly referred to as teacher training college which focuses on training teachers for primary and junior high schools) level.

Mireku *et al.* (2009) [20] reported a ratio of 50 students to a computer at the tertiary level, while Agyei and Voogt (2011a) [1] in their study conducted among pre-service teachers from a teacher education university, reiterated that lack of ICT infrastructure among others was a major barrier of ICT integration in Ghana. While Agyei and Voogt (2011a) [1] further reported that Computer Laboratories where teaching of ICT takes place exist in most faculties/departments of the training institutions, these labs could only be accessed periodically and only a small proportion of the educators in these institutions use ICT in teaching/training their students.

The analysis here seems to show at a first glance, that Ghanaian educational institutions are well equipped, however closer observation reveals that the majority of such facilities fall way below an acceptable standard that could be used to support teaching and learning objectives. Existing facilities especially in the training institutions however provide a window and necessary first step to use existing hardware and software in creative and situation specific ways to enhance teaching and learning with ICT (Agyei, 2012) [3].

Methodology

Area of study

Hohoe is a commercial town and a Municipal Capital of the Hohoe municipality. It is blessed with a lot of tourist attraction sites such as the famous Wli water falls, arguably the highest water falls in West Africa and Mount Afadja, the tallest mountain in West Africa, just to mention a few. The Hohoe Municipality is situated close to the Northern part of the Volta Region. The municipality shares boundaries with Afadjato South District, Jasikan District and the other part of the municipality shares borders with the Republic of Togo. Volta Region is blessed with seven (7) Colleges of Education and Hohoe happens to host two colleges of education namely: St. Teresa's College of Education which is all female College and St. Francis' College of Education (a mixed college). These two colleges are both catholic colleges which the Catholic Church is a major stakeholder.

Study design

The study is a case study which utilised a survey research design with mixed-method approach.

Data collection techniques

This research was conducted between January and June, 2016 using data from teachers, and Diploma in Basic Education (DBE) 1 and 2 students of St. Teresa's College of Education, Hohoe within the Hohoe Municipality. Both cross-sectional surveys and longitudinal surveys were adapted. Cross-sectional surveys gathered information on a particular group of population at a distinct time whiles longitudinal surveys on the other hand, collected information over a period of time.

Population

The study conducted cut across the teachers, DBE 1 and 2 students of St. Teresa's College of Education. The total population that the study used is four hundred and seventy nine (479) respondents. All subject area teachers were used in the study because the curriculum of the various subject areas emphasizes the use of technology in the teaching and learning process to enhance teaching and learning.

Sampling Technique and Size

Stratified sampling technique was used to select 40 teachers and 200 first and second year students of St. Teresa's College of Education, Hohoe. Stratified sampling method was adopted to group the school population into two (2) main categories: teaching staff and students. This technique was more efficient and reliable because it improved accuracy of estimates.

Purposive sampling technique was also used for the selection of the teachers and students. Purposive sampling was widely adopted because it is a non-random technique that does not need underlying theories or a set number of informants. The purposive sampling gave the researcher the people who gave the researcher the necessary information on the ground. In the simplest terms, the researcher decided what needs to be known and set out to find people who can and are willing to provide the information by virtue of knowledge or experience.

Table 2: Total Number of Population of the study

Respondents	No. of Respondents	Percentage (%)
DBE 1 students	184	38.4
DBE 2 students	235	49.1
Teachers	60	12.5
Total	479	100

From table 2 above, it would be deduced that the total population is 479 and thus the need for the researcher to use a sample size of forty (40) teachers and two hundred (200) students for the study. This implies that, the total sample size for the research is two hundred and forty (240) respondents.

Research Instruments

After a careful review of appropriate literature, questionnaire and interview was chosen as the instruments used to collect data to answer the questions set for this study.

Data Analysis

The data gathered were analysed by the use of SPSS and the results interpreted and presented using simple descriptive statistics in the form of frequency tables, bar chart, histogram and pie chart.

Demographic Information of Participants

Forty (40) teachers and two hundred students were sampled for the study. Questionnaires were given to all the 40 tutors and 200 students sampled. Out of the 40 teachers sampled, 65% were male and 35% were female while all the two hundred students were female. Out of the total of 240 questionnaires administered to both tutors and students, I was able to retrieve all due to the fact that I teach at the College and therefore was able to even go to their various halls of residence for the questionnaires even though cumbersome. I can therefore say with boldness that, the return rate was 100% for both students and tutors. The gender distribution of the teachers is presented in Table 3.

Table 3

Gender	Number of Respondents	Percentage (100%)
Female	14	35.0
Male	26	65.0
Total	40	100%

The gender distribution of teachers shows that, out of the total of forty (40) teachers selected, fourteen (14), which is 35% are females while the rest twenty six (26) which also accounts for 65% are males.

Thirty nine (39) teachers of St. Teresa's College of Education who reported their age were within the age range of 25–60 years. The average age of the teachers was 38 years. The age distribution of the teachers is presented in Table 4.

Table 4: Frequency Distribution of Teachers' Age

Age	Number of Respondents	Percentage (100%)
25-30	1	2.5
31-40	17	42.5
41-50	14	35.0
Above 50	7	17.5
Total	39	97.5%

The age distribution of the teachers shows that majority of the teachers (42.5%, n=17) were within the age range of 31-40 years followed by the range of 41–50 (35%) years. This suggests that as a whole, about 77.5% of the respondents that participated in this study were in their 30s and 40s. 17.5% of the respondents representing seven (7) teachers were above fifty (50), while only one (1) respondent representing 2.5% was within the age range 25-30 years.

Participants' teaching experience ranged from 2 to 32 years. The distribution of the teachers teaching experience is presented in table 5.

Table 5: Frequency Distribution of Participant Teaching Experience

Teaching Experience	Number of Respondents	Percentage (100%)
1 – 10	7	17.5
11 – 20	26	65.0
21 – 30	6	15.0
Above 30	1	2.5
Total	40	100%

The results in Table 5 show that, 17.5% (n=7) of the teachers had teaching experience ranging from 1–10 years and 65.0% (n=26) also had their experience ranging between 11–20 years. It also pans out from the table that, 15.0% (n=6) of the respondents have teaching experience ranging from 21–30 years while only one (1) teacher representing 2.5% has taught for over thirty (30) years.

All the teachers sampled indicated that they have computer laboratory in St. Teresa's College of Education and about 80% indicated that they have their personal computers. The remaining 20% who does not own a personal computer were those teachers who were above 50 and do not see the importance of computer in teaching because they lack the technical knowhow. The frequency distribution of technology resources available for teachers is represented with a pie chart (fig 2).

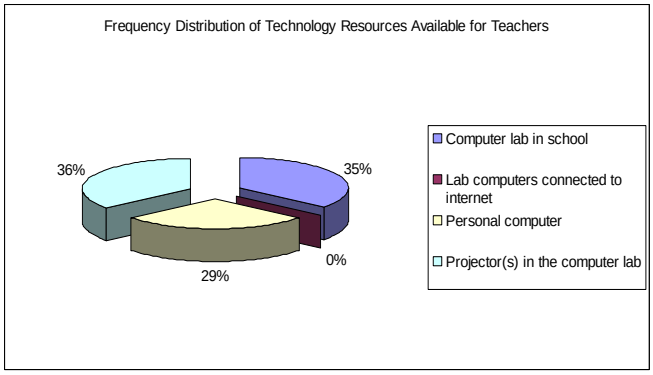

Fig 2

The frequency distribution of technology resources available for teachers in fig 2 shows that none of the laboratory computers is connected to the internet. The graph also shows that, projectors and computers are available at the laboratory for both teachers and students use to enhance teaching and learning.

The part 'B' of the questionnaire items were summed up and re-coded into teachers' High perceived-efficacy and Low perceived-efficacy in technology use. Table 6 shows the frequency distribution of teachers' self-perceived efficacy in technology use.

Table 6: Frequency Distribution of Teachers' Self-Perceived Efficacy in Technology Use

Level of efficacy	Frequency	Percentage (100%)
Low perceived-efficacy	14	35.0
High perceived-efficacy	26	65.0
Total	40	100%

The frequency distribution of teachers' self-perceived efficacy in technology use shows that majority of the teachers (65%) i.e. n=26 have a High-perceived efficacy in technology use while only 35% (n=14) have a Low perceived-efficacy in technology use.

Students Data Analysis

Two hundred (200) students were sampled for the study and all the 200 students sampled were female. This is due to the fact that, St. Teresa's College of Education is all female institution.

Ninety point five percent (90.5%) representing one hundred and eighty one (181) out of the two hundred (200) students who reported their age were within the age range of 17-25 years. The average age of the students was 22 years. The age distribution of students is presented in Table 7.

Table 7: Frequency Distribution of Students' Age

Age	Frequency	Percentage (100%)
17 – 20	35	17.5
21 – 25	146	73.0
Above 25	19	9.5
Total	200	100%

The age distribution of the students shows that majority (73%, n=146) of the students were within the age range of 21–25 years. It also indicated that, only 9.5% (n=19) of the students were above 25 years.

Out of the 200 students who reported their level, both level 100 and 200 were evenly chosen, i.e. hundred students from each level. It can also be noticed that, there was no level 300 student used because they were out of campus for their out program course on the field at the time the questionnaire was administered. The frequency distribution of students' level is presented in Table 8.

Table 8: Frequency Distribution of Students' Level of Academic standing

Level	Frequency	Percentage (100%)
DBE 1	100	50.0
DBE 2	100	50.0
Total	200	100%

Moreover, out of the 200 students sampled, 92% indicated they have mobile phones and 43% representing 86 students have computer at home while a whopping 57% (n=114) does not. Out of 43% of the students who have computer at home, 58.1% (n=50) indicated they have their computers connected to the internet. The distribution of the availability of technology resources for students is presented in the bar chart (fig 3) below:

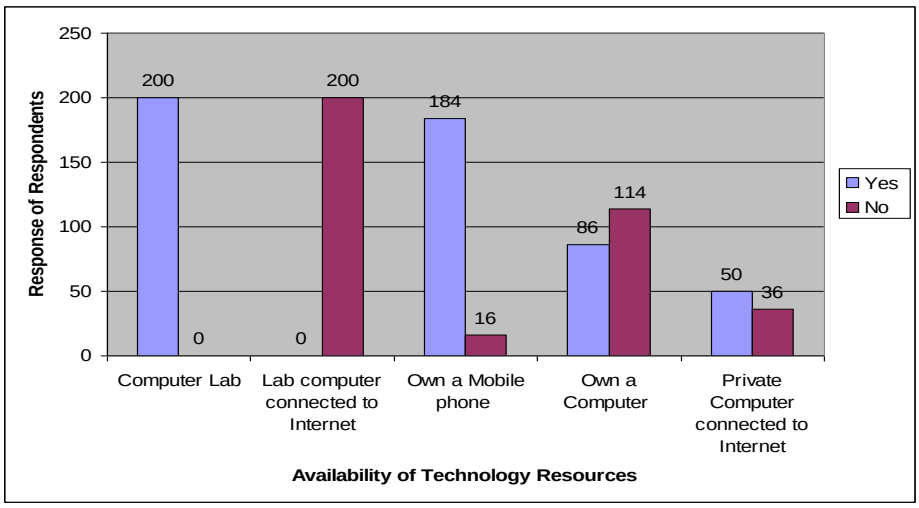

Fig 3: Availability of Technology Resources for Students

The frequency distribution of technology resources available for students shows that, St. Teresa's College of Education have computer laboratory but none of the computers in the laboratory has been connected to the internet. Also, about 184 of the students own a mobile phone while only 16 do not. Furthermore, only 41.9% of those who own a computer do not have their computer connected to the internet.

St. Teresa's College of Education Teachers' Use of Technology in Teaching

The first research question raised in this study was to bring out the extent to which teachers at St. Teresa's College of Education use technology in teaching and the response is vividly displayed in table 9 below.

Table 9: Proportion of Teachers' Ratings on their use of computer in teaching; Often (2), Rarely (1) or Never (0)

Item	Teachers' ratings of their use of computer in teaching					
	Often		Rarely		Never	
	N	%	N	%	N	%
1. Using spreadsheet (MS Excel) for preparing continuous assessment	5	12.5	17	17.5	28	70.0
2. Creating slides for presentations in class using PowerPoint	8	20.0	14	35.0	18	45.0
3. Sending and receiving assignments to and from students through the internet	7	17.5	2	5.0	31	77.5
4. Posting teaching notes/materials on the internet for students' assessment	3	7.5	0	0.0	37	92.5
5. Evaluating subject-based instructional software using computer	4	10.0	1	2.5	35	87.5
6. Using computer in preparing class activity	12	30.0	3	7.5	25	62.5
7. Preparing lesson notes/course outline for lesson delivery	27	67.5	6	15.0	7	17.5

Table 9 show that, majority of the teachers (67.5%) use computer in preparing lesson notes/course outline for lesson delivery while only 12.5% use spreadsheet in preparing their continuous assessment. 20% of the respondents use PowerPoint slides in teaching while 12% use computer in preparing class activity.

The analysis also indicates that, a meagre number of 17.5% sends assignments through the internet for students' assessment while only 7.5% post learning material on the internet for students' use. This is due to the fact that, the college laboratory computers are not connected to the internet making their usage difficult for both teachers and students to assess the internet for any academic work.

St. Teresa's College of Education Students' Use of Technology in Learning

The second question raised in this study was to find out the extent to which St. Teresa's College of Education students use technology in learning. To answer this question, the students' general use of technology and their use of computer in learning was examined. Table 10 shows the percentage of usage by students in the various ICT applications.

Table 10: Proportion of Students' Ratings on their General Use of Technology as Often, Rarely or Never

Item	Students' ratings of their general use of technology					
	Often		Rarely		Never	
	N	%	N	%	N	%
1. Communicating with colleagues and friends using facebook, whatsapp, skype, etc	156	78.0	16	8.0	28	14.0
2. Finding information on the internet (research) to do assignments	84	42.0	62	31.0	54	27.0
3. Sending email	48	24.0	25	12.5	127	63.5
4. Attaching files to email message	23	11.5	19	9.5	158	79.0
5. Preparing assignments using MS word	27	13.5	17	8.5	156	78.0
6. Creating spreadsheet (MS Excel)	24	12.0	16	8.0	160	80.0
7. Making presentations (PowerPoint)	17	8.5	11	5.5	172	86.0
8. Creating database (MS Access)	6	3.0	3	1.5	191	95.5

Table 10 shows that more than half of the students of St. Teresa's College of Education use technology to communicate with friends via Facebook, Whatsapp, Yahoo Messenger, Skype (78.0%), 42% (n = 84) use the technology to find information on the internet to do their assignments, while only 24% send email and a meagre of 11.5% attach files to email messages. About 8.5% of them use it to create presentation (PowerPoint) and 3.0% use it in creating database (MS Access). This indicates that St. Teresa's College of Education students' use of technology in general computer application is very low.

Conclusion and recommendations

Conclusion

The study revealed that the extent to which St. Teresa's College of Education teachers use technology in teaching was very low even though majority of the teachers believe that technology plays important role in teaching and learning. This was found to be due to the fact that the teachers lack the skills to integrate technology in their teaching since they have had little opportunity to participate in professional development courses related to ICT integration.

The study also revealed that the extent to which St. Teresa's College of Education students use technology in learning was very low. This was also found to be due to the fact that majority of the students do not visit the computer laboratory even though they are allowed to use the Laboratory after classes and during weekends. Students stick to only once every week visit to the laboratory which is not enough for academic work. It was also attributed to the low technology

use in teaching among teachers which consequently affects the students' use of technology in learning.

The extent to which the teachers and students use technology in teaching and learning was crucial because the knowledge gained could provide insights into teachers and students technology use at St. Teresa's College of Education that could be sustainable and transferable to other educational institutions and the young ones they are going to impart knowledge to after completion.

Besides, the study also provided empirical evidence on the factors that influence technology use in teaching and learning at St. Teresa's College of Education. This knowledge gained could provide guidance for policy makers and stakeholders in education when structuring and introducing ICT integration policies in all Colleges of Education in Ghana.

It was also found out that, St. Teresa's College of Education teachers technology use in teaching is statistically influenced by gender and self-perceived efficacy in technology use. However, age, teaching experience and availability of technology resources did not statistically influence the teachers' technology use in teaching. The study further revealed that age and availability of technology resources statistically influence St. Teresa's College of Education students' technology use in learning, whereas gender and number of years in school did not statistically influence their technology use. In view of this, the researcher has made the following recommendations.

Recommendations

From the summary of the major findings of this study, it is recommended that:

- The Principals of the various Colleges of Education in Ghana should organize in-service training and seminars in professional development courses related to the integration of ICT in teaching and learning for their teachers.
- The Curriculum Research Development Division (CRDD) of the Ghana Education Service in collaboration with the related agencies in the Ministry of Education should carry out research to review critically the curriculum and revise the existing course outlines to explicitly state what ICT tools must be used and how it should be used in the teaching and learning process.
- The Heads of the institutions should make budgetary allocations annually to maintain, replace and expand ICT facilities and resources in the schools in order to promote effective integration in the teaching and learning process.
- The Ministry of Education and for that matter the government of Ghana should endeavour to equip all colleges in the country with well-furnished computer laboratories to enable both the teachers and students to get high access to technology resources.
- The colleges of education must be provided and trained in software that will equip and help in imparting knowledge after their completion.
- The Heads of the institutions in collaboration with the Heads of Departments should emphasize the use of computer laboratory during weekends and after classes as part of the co-curricular activities in the colleges of education. This will enable the students to get enough time to use the laboratory computers in learning and doing research.

Suggestions for Further Studies

The following are recommended for further research:

- It is suggested that this study should be replicated to include DBE three students in order to make the research a whole.
- Similar study should be conducted in other colleges in Ghana and the results compared with mine to have a fair idea in relation to what is pertaining in the college country wide.

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