UNIVERSITY OF CAPE COAST

ASSESSING THE SKILL LEVEL OF TEACHER - TRAINEES TO HANDLE INFORMATION AND COMMUNICATION TECHNOLOGY AT THE BASIC EDUCATION LEVEL IN THE CENTRAL REGION OF GHANA

BRUCE THOMAS SUALLAH

2013

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By

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Dissertation submitted to the Centre for Continuing Education of the Faculty of Education, University of Cape Coast, in partial fulfilment of the requirements for award of Master of Education Degree in Information Technology

MAY 2013

DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature……. Date……

Bruce Thomas Suallah

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines for the supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature…….. Date……

Mr. Paul Dela Ahiatrogah

ABSTRACT

The 2007 educational reform of Ghana has it that greater emphasis will be put on Information and Communication Technology (ICT) and Science and Technology. In addition, special attention will be given to the training of teachers in Information and Communication Technology (ICT) among other subjects. The objective of this study was to assess the skill level of teacher - trainees to handle ICT at the Basic Education level in the Central Region of Ghana.

Descriptive research design was employed in this study where questionnaire was the main tool to collect data for the study. A sample size of 7 ICT tutors and 252 teacher-trainees responded to the questionnaire out of a population size of 9 ICT tutors and 870 teacher-trainees from the three Colleges of Education located in the Central Region of Ghana.

Statistical Product and Service Solution (SPSS) version 18 for Windows was used to help in data analysis. Frequencies and percentages were used as a statistical tool to analyze research questions one, three, four, five and six while frequency, mean score and standard deviation were used as statistical tools to analyze research questions two. A total of six research questions were answered. Some of the findings and a recommendation of the study are:

1. Most ICT infrastructure is available at the colleges of education.
2. Teacher - trainees showed high competence level in most basic ICT applications and software skills needed to handle ICT at the basic education level.

   Recommendation: Ministry of Education should ensure the availability of Basic Schools' teaching syllabus in all training colleges.

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DEDICATION

To my two lovely children, Muhammad and Kaysan, and also to their mother, Hajia Hawa Seiba.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Information and Communication Technologies (ICT) can be an extremely powerful enabler in efforts to bring positive and sustainable development to countries around the globe. ICT gives students and teachers new tools with which to learn and teach. Besides, ICT can enable teachers to transform their practices by providing them with improved educational content and more effective teaching methods. In addition, ICT can improve the learning process through the provision of more interactive educational materials that increase learner motivation and facilitate the acquisition of basic skills. The use of various multimedia devices such as television, videos and computer software can offer a more challenging and engaging learning environment for students of all ages.

Continuous teacher training in updating and enhancing their jj methodologies is critical to effective education policy and practice to keep pace with the constant advancement of technology. According to Waddi and Sonia (2010), the use of ICT in the classroom does not diminish the role of the teacher; neither does it automatically change teaching practices. Teachers need to see and feel how technology-assisted teaching and learning can be more efficient and effective than traditional methods (Brennan, 2000 and Sahin, 2003). Pre-service elementary teachers learn technology integration strategies

by working with and observing practicing teachers and students while they use technology (Abbot & Faris, 2000). In such an atmosphere, building the capacity of teachers so that they are equipped to deal with using ICT in classrooms is a challenge. Based on one U.S. educational policy analysis on technology investment and its effectiveness, it was concluded that "the most direct and cost-effective way to educate teachers about technology is through the pre-service education they receive in the college of education or other institutions" (U.S. Congress, 1995, p. 166-167).

It is not just acquiring the knowledge of ICT that is important. Teachers need to understand how to use ICT pedagogically. ICT used appropriately can stimulate the development of higher cognitive skills, deepen learning and contribute to the acquisition of skills needed for learning all life long and for working in today's job market (Tchombe,Maiga, Toure, Mbangwana, Diarra & Karsenti, 2008). But teachers must have opportunities to develop requisite aptitudes, be able to observe or experience constructive learning, and be motivated.

In most countries innovation was thought about, invited into educational practices, and pushed down the throats of teachers without warning or preparation (Maclure, 1997). To make innovations and reforms meaningful, those who will be most directly affected in schools, would be teachers, students, parents and administrators need to be part of the conception and planning process (Samoff, Sebatane, & Dembélé, 2003; Weva, 2003).

Education has undergone a significant shift in the way "educators and psychologists think about the nature of human learning and the conditions that best promote the varied dimensions of human learning" (Applefield, Huber, &

Moallen, 2001, p. 38). According to Cooper (1993), instruction has undergone a paradigm shift from behaviorism to cognitivism and now to constructivism. Constructivism exerts such a powerful influence in contemporary education that many professional groups are currently making concerted efforts to reform the methods and dynamics of classroom instruction so that they will harmonize with constructivist premises.

Pechman (1992) said professional groups such as the Association for Supervision and Curriculum Development, the National Council for Teachers of Mathematics, and the American Association for the Advancement of Science all advocate a shift away from direct instruction towards "active and inventive instruction", in other words, constructivism (Pechman, 1992, p. 34).

Constructivism is one of the most influential learning theories of the last two decades of the twentieth century, and it continues even now to exert more and more influence over educationist in this new millennium. It regards learners as active participants in the learning process because they use multiple learning styles and methods to achieve their goals. Technology in the classroom promotes the purpose of constructivist teaching to an almost revolutionary extent. Means (1994) and other researchers have confirmed that one of the evident consequences of the introduction of technology into the classroom was that it changes the modes of interaction between learners and teachers.

Strommen and Lincoln (1992) emphasized that what count more in a constructivist classroom is what students can do by themselves, either under the guidance of the teacher or individually, as they use the new technologies. According to Tam, (2000, p. 56); and Sahin, (2003, p. 73) constructivism is

able to generate ideas and principles about learning that have important implication for construction of technology-supported learning environments.

The introduction of ICT at teacher education institutions focuses on helping teacher - trainees to develop skills for using technology and integrating it into their practice. Technology courses such as ICT need to compensate for the deficiencies in the teacher education program by creating the conditions in which a learning theory such as constructivism can be used in practical teaching (Niederhauser, Salem & Fields, 1999).

Duffy and Jonassen (1992) observed that most teacher - trainees have "a vision of schooling that is grounded in didactic instructional methods. Didactic pedagogy reflects on behaviorism tradition that centers on the efficient transfer of knowledge to students and replication of basic skills". It should be noted, however, that technology is basically theory-neutral, and that it is therefore able, as an instructional tool, to support various pedagogical orientations.

In spite of this, it does not follow that the way in which technology is used in the classroom is theory-neutral because the teacher sets up the technology to conform to a particular pedagogical orientation of teaching and learning. The teacher - trainees will therefore design and structure activities in the ICT course at the Colleges of Education to come out with their full skills on the basis of their own experiences during their study.

Since early 1990s stakeholders in education in Ghana, have been concerned with how teachers and students use computers in schools and how their use supports learning. The Twenty-first century education reform policy has been focused on a shift from the traditional teacher-centered pedagogy to

more learner-centered methods. As a result, the Government of Ghana placed a strong emphasis on the role of ICT in contributing to the country's economy.

The country's medium-term development plan captured in the Ghana Poverty Reduction Strategy Paper (GPRS I&II) and the Education Strategic Plan 2003-2015 all suggest the use of ICT as a means of reaching out to the poor in Ghana (Colle, 2004). In 2004, Parliament passed into law Ghana's ICT for Accelerated Development (ICT4AD) policy to strengthen Government position on ICT. This policy represented the vision of Ghana in the information age with objectives such as; facilitating training of teachers and students in ICT. As a result all teacher education colleges were provided with ICT facilities and were mandated to train student teachers so that they will be in the position to integrate ICT into their teaching curriculum.

Teacher - trainees who are in these programs must be given the opportunities to apply new technologies such as computers in the classroom settings. The assumption on which this research is based was that teacher education programs train student teachers to be able to integrate technology into their teaching of the curriculum.

Statement of the Problem

The 2007 educational reform of Ghana has it that greater emphasis will be put on Information and Communication Technology (ICT) and Science and Technology. In addition, special attention will be given to the training of teachers in Information and Communication technology (ICT) among other subjects. As a result, in 2009, some Junior High Schools (JHSs) started the

teaching and learning of ICT and the first Basic Education Certificate Examination (BECE) was written in 2011.

Numerous researches conducted in the past on the state of ICT in Ghana have not looked at the availability of ICT infrastructure at the Colleges of Education, which provide training to teachers who handle ICT at the basic education level, and the level of training being provided.

The researcher designed this study so that it would give him the opportunity to investigate and analyze the infrastructure, the amount of ICT training teacher - trainees receive and how they would use it in the classroom to enhance teaching and learning.

Objectives

The specific objectives of the study are to find out.

1. The physical ICT infrastructure in place at the teacher education colleges.
2. The level of training given to teacher - trainees to handle ICT at the basic level of education.
3. The views of teacher - trainees about the ways in which computers can affect their teaching role in the classroom.
4. The implications of an instructional approach for teacher - trainees that focus on constructivist pedagogy that is supported by the use of computers.
5. Challenges that is inherent in the use of computers in a constructivist instructional approach.

Purpose of the Study

The purpose of this study is to determine whether teacher - trainees receive enough training that will help them in the process of integrating computers into the teaching and learning process in a classroom at the basic education level; and whether they are ready to use ICT to contribute in improving the quality of education in Ghana. It will also describe the current technological skills of ICT teachers at the Colleges of Education, whether student teachers are benefiting from the use of ICT, and how ready student teachers are to use ICT in teaching and learning.

Research Questions

The research question of this study is:

Are teacher - trainees equipped enough to handle ICT at the basic level of education in Ghana?

The study is also structured in terms of the following sub-questions:

1. What physical ICT infrastructure is in place at the teacher education colleges?
2. What are the views of teacher - trainees about the ways in which computers can affect their teaching role in the classroom?
3. Are teacher - trainees able to use the internet and its resources effectively?
4. What are the implications of an instructional approach for teacher - trainees that focus on constructivist pedagogy that is supported by the use of computers?

5. What challenges are inherent in the use of computers in a constructivist instructional approach?
6. What is the competence level of teacher - trainees in using various computer applications and basic application software?

Significance of the Study

This study would provide relevant and useful information for curriculum developers, the ministry of education, and ICT teachers and coordinators about the possible use of computers in teaching and learning situations in classrooms. The findings of this study would also be useful when changes are made to the curriculum at some time in the future.

Delimitation of the Study

This study was confined to ICT teachers and final year teacher - trainees in the three Colleges of Education in the central region of Ghana. The focus of the study was to assess the skill level of teacher - trainees to handle ICT at the basic education level in the central region of Ghana. All students in these colleges received training on how to integrate ICT in classroom lessons as part of their course for the award of Diploma in Basic Education

Limitation of the Study

This study could have covered the entire final year teacher - trainees of the 38 public Colleges of Education in the country but due to cost and time constraint this study was limited to only the three Colleges of Education in the Central Region of Ghana.

The instrument used in this study was questionnaire. This instrument may bring about subjectivity in the results since the respondents were more likely to complete the questionnaire according to how they understood the questions and how they felt at the time of completing the instrument. Additional instruments such as interview and observation would have brought out relevant data and also be able to verify information. For instance, observation would have reflected the actual competence level of the respondents.

The sampling procedures used were, multi-stage and systematic sampling methods. This was due to the limited time available to me to complete the study. The target population was the final year teacher - trainees of the three Colleges of Education who had the characteristics of interest for this research.

Finally, the study may suffer other setbacks such as respondents withholding some information while responding to the questionnaire. Besides, at the time of the study, students were taking their final examinations and so did not have enough time to spend on the questionnaire. These situations might have affected the result of the study marginally but not to the extent that the entire findings cannot be relied on.

Definition of Terms

ICT: (Information and Communications Technologies). It is defined, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information" (Tinio, 2003, p. 4).

Colleges of Education: Institutions mandated to prepare teachers for the basic schools.

Teacher-trainees: Adolescents who have completed Senior High School and undergoing training to teach at the basic education level.

Standards or competences: are descriptions of what a qualified teacher in a given country should know and be able to do.

Knowledge: the content knowledge, professional knowledge, emerging and contemporary knowledge and practical understanding that a teacher needs to perform his or her duties (Hooker, 2010).

Organization of the Rest of the Study

Chapter Two provides a review of related literature. The objective of this chapter is to provide a theoretical background to the research. The chapter begins with the write up on the effect of theories on learning and instruction processes. It continues with issues about training teacher - trainees to use technology and Views of teacher - trainees about the ways in which computers can affect their teaching role in the classroom. The chapter also highlighted on the aims and scope ICT teaching syllabus for Junior High Schools.

Chapter Three provides a description of the methodology and the plan of analyses employed in this study. It resumes with a brief review of the methodology followed by detailed description of all the methods and steps that were taken in arriving at the conclusions of this study. The chapter also includes the study design and the instruments used. It documents the sample size and sampling procedures and concludes with sources of data and the techniques for data analysis.

Chapter Four presents the results and discussion from the analyses of the data received from the respondents. Chapter Five provides a discussion on the summary, conclusions and recommendations of the study. It also suggests future policy initiatives that could cause better integration of ICT in the teaching and learning processes at the basic education level.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Overview

Modern teachers face a number of challenges as they undertake the often arduous process of integrating technology into their classroom teaching routines, Jones and Mercer (1993, p. 19).

Many of these teachers, if not most of them have no clear idea on how to use computers in their classrooms or how to organize and manage technology-integrated classrooms. Teachers need skills and training of a very definite kind before they are fit to integrate technology with learning in the current classroom context. Because behaviourist and constructivist theories of learning are usually used to describe how individuals succeed in learning, they have become the basis upon which a more learner-centered type of instruction process has been constructed. Jones and Mercer (1993) therefore characterized these theories of learning as "ways of describing how people learn in terms of their individual thoughts and actions and how an individual adapts to the complexities of the society in which they live and operate" (Mercer and Jones, 1993, p. 19).

This chapter reviews and examines research that describe how computers have been used in the teaching and learning processes to equip teacher - trainees in teacher education colleges to become skilled in techniques of integrating technology in teaching and learning in the classroom.

Training Teacher - trainees to use Technology

"Students studying to become teachers are not only in the role of learners, but also are pivotal in determining the future role of computers in education" (Byrum & Cashman, 1993, p. 262). Teacher education and training is a means for professional updating, which deals with all developmental functions, directed at the maintenance and enhancement of one's professional competence and literacy. Teacher's professional growth supports the idea that ICT in teacher education and training is an important factor in teachers' job effectiveness and development. This is so because teachers' education and training is generally considered to be essential for school effectiveness and improvement (Larose et al., 1999).

According to Haddad (2003), research indicates that ICT can change the way teachers teach and that it is especially useful in supporting more student-centered approaches to instruction and in developing the higher order skills and promoting collaborative activities. Leach (2008) stated that the impact of ICT use on the teacher include extending subject knowledge, enabling planning and preparation for teaching to be more efficient, and developing the range of teachers existing pedagogic practices. Recognizing the importance of ICT in teaching and learning, majority of countries in the world have provided ICT teacher training in a variety of forms and degrees, a situation Ghana is no exception.

According to Jung (2005), ICT as part of teaching method uses tools such as videotape and CD-ROM to help teacher - trainees to see how technology can be integrated into their work. These CD-ROMs contain video

descriptions and demonstrations of how technology is used in teachers' classrooms. Besides, they provide “examples of real educators and learners using successful practices of technology to support instruction and learning in their classrooms.” Video sequences are viewed by teachers' focus groups who then discuss the strategies and techniques of classroom management, assessment, and organization. This way, teachers learn how to use ICT in their classrooms by actually being engaged in the process of ICT-integrated training.

In addition, the use of ICT as part of training methods promote teachers’ ICT-pedagogy integration in the classroom by demonstrating examples and allowing discussions among teachers throughout the whole training process. Participants of the training actually use ICT to learn about ICT skills and develop ICT-integrated pedagogies. These training strategies help teacher - trainees to benefit by actively experiencing ICT skills as learners (Jung, 2005).

According to Wetzel and Strudler (1999) and Mergendoller, Johnson, Rockman and Willis (1994), three ways to successfully integrate technology into a teacher education program are to use technology to: (a) make real world situations more accessible; (b) access and communicate human and data resources; and (c) enhance traditional teaching approaches and practices. In addition, teacher confidence is another key element determining the quality of any ICT-enhanced school-based teacher education. The lack of computer instruction often accounts for teachers’ low confidence level when they initiate computer activities.

Views of Teacher - Trainees about how Computers can Affect Teaching Role in the Classroom

Studies support the view that it is counter-productive to attempt to integrate teachers and learners in a computer-rich classroom environment by means of sporadic courses that are intended to familiarize course-goers with the technology or software in hand. Schacter (2001) report that the most efficient way of helping teachers and learners to familiarize themselves with computer-assisted education is by providing the largest possible number of opportunities for hands-on work in courses where computers are already being used.

As part of their research into the perceptions of teacher - trainees on how the roles of teachers have been changed by technology, Carr-Chellman and Dyer (2000) asked teacher - trainees to respond to a reading about the future vision of education. The results showed that many respondents preferred traditional teacher roles that reflected the kind of teaching methods that they had experienced as learners. The researchers suggest that these responses are very much in line with the way in which human beings respond to change in general.

Because teachers would prefer teacher roles to conform to what they personally experienced as learners and as students, they tend to be less than enthusiastic about any radical deviations from their expectations. Carr-Chellman and Dyer's (2000) results therefore probably reflect more accurately how teachers view the changes that are taking place in the education profession in general rather than how they view the role of technology per se in education.

Byrum and Cashman (1993) studied 436 pre service teachers and found that the majority of pre service teachers believed they were well prepared to use computers. However, their preparedness was expressed in reference to software categories such as: tool software, electronic communication software, drill and practice software, and software selection. It is significant to note that these pre service teachers did not describe their preparation to use computers in the classroom in terms of the computer's impact on teaching and learning, rather their preparedness was expressed based on their computer proficiency.

Byrum and Cashman (1993) found that, after receiving formal instruction about classroom applications of computers, pre service teachers maintained traditional views of a teacher-centered classroom and preferred to use the computer as a supplement to instruction. Byrum and Cashman suggested that insufficient computer modeling by teacher educators and inadequate constructivist-based computer integration experiences influenced this behaviorist attitude toward computer use in instructional situations.

While some teachers viewed the computer as a valuable tool for enhancing student learning, Bosch (1993) found that many teachers viewed the computer as a subject to be taught in a separate class; and if the computer was taught in a computer class, many teachers believed it did not need to be used in their class. In addition, teachers thought that there was not enough time for students to carry out computer activities in the content classrooms (Bosch, 1993; Dupagne & Krendl, 1992). Kerr (1991) stated that educators tended to see themselves as teachers first and as users of educational technology a distant second. Kerr (1991) also noted that teachers have many

non-curricular activities to be concerned with before they can integrate technology into the classroom. Many teachers stated they had to learn how to use the computer before they could try to integrate it (Kerr, 1991).

In-depth computer-assisted education is therefore essential for teacher - trainees. These teachers need to have become so skilled in computer-related tasks and procedures, and so comfortable in an environment in which education is being delivered by means of computers, but they are able to pass their knowledge on to learners with maximum self-confidence, skill and efficiency. Dr Lynda Robert, a special adviser on technology to the United states Department of Education, wrote: "If you can get teachers to use technology effectively in their own lives, you have won 90 percent of the battle" (Rosenthal, 1999).

Implications of an Instructional Approach Supported by the use of Computers

Constructivist Pedagogy Supported by the use of Computers

In constructivist learning, teachers primarily become facilitators, organizers, planners, liaison officers, coordinators, and the link between learners and the resources of institution and the authorities. Teachers also become referees in the computer-assisted classrooms because the responsibility for ensuring that all the necessary conditions for learning are present ultimately resides with teachers. Yet although teachers in classrooms of this kind are "responsible" for maintaining proper working conditions and because they are "in control" in the sense of being responsible for what

happens in the classroom, they do not exert the kind of centralized authoritarian control and responsibility that is the hallmark of the traditional behaviourist classroom.

Constructivist teachers in charge of computer-assisted classrooms undertake the following kinds of activities:

1. They observe the work of learners (whether single or in teams) in an unassuming, non-directed and non-invasive manner.
2. They intervene in learner activities only if it is absolutely necessary to give proper direction and focus to the activities in which learners are engaged.
3. They have a clear idea of a kind of outcomes that learners need to be able to manifest as proof of their proficiency in certain predetermined skills and activities.
4. They are responsible for acquiring, servicing and maintaining all forms of technology, and for arranging for the maintenance of the fabric of classroom, its furniture, equipment and accoutrements.
5. They encourage learners where and when necessary, and praise the achievements of groups and individuals.
6. They are responsible for creating and maintaining the kind of goodwill, fairness and satisfaction in a classroom without which constructivist computer-assisted learning cannot take place.

Objectivist Pedagogy Supported by the use of Computers

Gover and Gavenk (1995) stated that traditional behaviourist classrooms are mostly teacher-oriented. In such classrooms, teachers serve as intellectual and moral role models for the learners. The teacher's role in a classroom of this kind is to demarcate very precisely everything that the learner needs to learn. One of the roles of the teacher in a traditional behaviourist classroom is to maintain the boundaries between what is "in the syllabus" and what is "not in the syllabus", and to ensure that impermeability of these boundaries. The behaviourist teacher therefore becomes a referee and an authority on what is valid knowledge and what is irrelevant and impermissible in terms of the syllabus. It is one of the teacher's duties in the behaviourist classroom to ensure that the interest and enthusiasm of learners will be very strictly and carefully monitored so that it does not spill over into areas of human knowledge and achievement that are not in the "syllabus".

Use of technology from the behaviorist perspective mirrors traditional classroom practice: users are relatively passive, the content and interaction between the user and the software are predetermined, and there is a limited repertoire of acceptable responses (Jonassen, 2000). The acquisition of facts through repeated practice and rote memory, or learning from the technology, is the goal of instruction (Jonassen & Reeves, 1996).

Computer assisted instruction (CAI), integrated learning systems, drill-practice programs, computer-based tutoring systems, and assessment software are some of the technologies designed based on the behaviorist learning theory (Jonassen, 2000). CAI and integrated learning systems have been readily adopted in many schools as they closely match the traditional routine of

classroom life. Jonassen argues that CAI can increase achievement because it leads to automaticity of lower-level skills through extended practice. Computer is endlessly patient with the learner and monitors this practice.

In the tutorial form of computer-assisted instruction, the computer provides additional information to the learner if an incorrect answer is supplied. This continues until the learner is successful. Skinner's views of immediate positive reinforcement following a correct answer are directly applicable to drill-and-practice and tutorial forms of CAI (Yaakub, 1998).

It is precisely for these reasons that the traditional teacher is responsible for curtailing learners' freedom and initiatives. Enthusiasm may not be encouraged because enthusiasm is bound to lead into areas of interest and modes of enquiry that are not sanctioned by the syllabus. The maintenance of boundaries (as defined by the syllabus) is overwhelmingly important in the traditional behaviourist classroom.

Challenges in the use of Computers in a Constructivist Instructional Approach

In educational use of technology, Jonassen and Reeves (1996) made a distinction between learning from computers and learning with computers. Much of the early research and development with technologies considered the enhanced learning that could be achieved when computers played an important and key role in delivering content and creating learning opportunities to help students make meaning and develop an understanding. In such settings, there was a distinctly diminished role for the teacher. Jonassen (1991) suggests that the more opportunistic and effective uses of technologies in classrooms are

those where learning is achieved with the aid of technology, and the resulting environment is one where the technology supports and scaffolds the learning rather than being the object or derivative of the learning.

McClintock (1992) stated that in a constructivist-learning environment, technology plays an acknowledged and purposeful role in the day-to-day activities, but does not become the object of instruction. When used in a constructivist manner, students utilize technologies to a) manipulate data, b) explore relationships, c) intentionally and actively process information, d) construct personal and socially shared meaning and e) reflect on the learning process (Jonassen, Peck & Wilson, 1999).

Computers can successfully enhance the problem solving abilities of the students by using project-based learning (PBL) activities; because they are used, most often, in an environment where people are drawn to collaborate naturally as a result of their cultural expectations. Tretten and Zachariou (1995) carried out an assessment of PBL in four elementary schools by administering teacher questionnaires and interviews, and a survey of parents. The informants reported that PBL had a variety of positive benefits for students, such as, attitudes towards learning, work habits, problem-solving capabilities and self-esteem.

A study by Ryba and Brown (2000), conducted in two classrooms in an elementary school in New Zealand, found that teachers' beliefs about themselves and their roles in the classroom, as well as their philosophy of education had a central place in shaping the nature of their computer use. Those teachers who saw learner-centered classrooms and authentic learning

tasks as central to the success of their students were more likely to use the technology on a continuing basis.

Bruner (1973) noted that when teaching in a constructivist framework, the teacher's responsibility is to provide an environment from which experiences are born, deciphered, and grow in the student's mind. In this manner, students construct knowledge themselves instead of receiving it from teachers. In a constructivist classroom, students may work in cooperative learning groups and work on projects that require solutions to problems (Cognition and Technology Group at Vanderbilt, 1990). Moreover, in constructivist environments, the teacher acts as a facilitator and guides the self-motivated students to set their own goals and in effect, teach themselves (Papert, 1980).

Means and Olson (1997) found that technology increased the complexity with which students could deal successfully and created a multiplicity of roles, leading to student specialization. It allowed in-depth exploration of a smaller number of ideas and related facts around authentic, challenging tasks. They further state: When students are using technology as a tool or a support for communicating with others, they are in an active role rather than the passive role of recipient of information transmitted by a teacher, textbook, or broadcast. The student is actively making choices about how to generate, obtain, manipulate, or display information. Hypermedia allows users to enter virtual environments that include text, sound, visual images, animation and video.

Ayersman (1996) found that the use of hypermedia applications promoted deep comprehension and enhanced listening comprehension, story

production and decoding skills and improved ability to discover links among people, places, events and issues within historical contexts. Riddle (1995) discovered that students using hypermedia demonstrated increased ability to convey insight and individuality, greater descriptive detail, and unique perspectives.

In the USA, the Challenge 2000 Multimedia Project supported by multimedia gives students opportunities to use technology effectively in the planning, development and presentation of their projects (Thomas, 2000). Students who took part in this project had better results than comparison students on content mastery, audience sensitivity and coherent design. In addition to hypermedia applications, the Internet may provide a rich source of outside information resources that allow students to address complex problems.

The Internet connects teachers and students to people outside the school environment, providing access to expertise not available locally. Irving (1991) conducted a two-year study in six schools in which students were given access to on-line information services. Conclusions of the study were that "on-line services provided immediate, on-demand and up to date material not available in or near the schools, and access to specific information on topics for which school books either did not exist or were not in the school resource collection". Constructivist learning works well with web-based activities. Students entering this environment bring with them their prior knowledge. They engage in a web-based activity such as searching the Internet, gathering information, organizing their thoughts, or communicating with peers via email thus adding to their cognitive infrastructure

Computers and Teaching in the Classroom

The Role of Computers in the Classroom

According to Jaber (1997), when learners use computers to study in classrooms, there are many ready-made opportunities (1) for exploring variant solutions to problems, (2) for obtaining more information and insights than might have been available to the solitary learner, and (3) for collaborative problem-solving and peer stimulation.

Computers can transform education in the classroom. Computers and their peripherals might include any of the following: hardware and software, word processing programs, graphics capabilities, programmed instruction for problem-solving, spreadsheets, databases, dial-up connections or broadband, networked connections, and other forms of telecommunication and advanced technology. From a constructivist point of view, computers differentiate intrinsically between the roles played by learners and teachers and create a format in which constructivist educational methods may be applied and realized. We may therefore say that computers transform teacher-based instruction into students-centered instruction (Forcier, 1996).

According to Grabe and Grabe (1996) computers and the conditions that accompany their implementation create teaching and learning that is both learner-centered and more obviously amenable to group work and peer support. Because of these enormous potential advantages, the main concern in classroom instruction today is to ascertain how technology and teacher instruction may be optimally integrated. While computer tools such as word processors, spreadsheets, database and multimedia authoring programs may assist learners to learn more actively, they also encourage learners to become

responsible for their own learning. Under these circumstances, technology of the kinds indicated here provides an obvious format for the realization of constructivist methods in the classroom (Grabe & Grabe, 1996).

The role of Teachers in a Computer-rich Environment

Means (1994) and other researchers have confirmed that one of the most evident consequences of the introduction of technology into the classroom is that it changes the modes of interaction between learners and teachers. Because many learners are proficient in the manipulation of technologies such as personal computers, technology immediately creates a leveling effect on the classroom.

It is pointless for a teacher even to attempt to maintain the kind of almost hieratic dignity and mystique that is characteristic of the behaviourist teacher in the face of the obvious superiority that many learners manifest when it comes to manipulating complex forms of technology such as the computer. To the behaviorist, this may be a disaster. But to the constructivist, the loosening of bonds of passivity and complacency and the learner's acceptance of personal responsibility for his or her education is an enormous dividend of a wholly constructive kind.

Computer technology creates a situation in the classroom in which the teacher is not the sole authority and in which learner initiative becomes not merely desirable, but indeed necessary. While younger teachers tend to adapt themselves more easily to more democratic and centrifugal methods of instruction (usually because they themselves have often been exposed to this kind of educational method as learners), older teachers may understandably

feel threatened because (ironically) their conditioning has prepared them for the kind of radical doubt and confrontation that takes place in the fully active constructivist classroom.

The integration of technology into classrooms for learners has also revolutionized the classroom scene. The teacher is no longer the sole focus of attention, the approved purveyor of information, or the guardian of pedagogic protocols. In a classroom in which technology is equally accessible to all learners, the teacher becomes a facilitator rather than an infallible authority.

Dede (1998), quoted by Batane (2004) approves of what happens when teachers use technology instead of didactic monologues. In a classroom supported by technology, teachers rotate about the classroom and observe learners from over their shoulders rather than from the prestigious position at the center of the front of the classroom. The constructivist teacher is also far more likely to use the methods of socratic dialogue by asking leading questions and by probing for a solution already implicit with the learners but to assemble the information that he or she already possesses.

The constructivist teacher also suggests where resources might be found, but does not usually present them in a ready-made and pre-digested format. In every way, the learner in the constructivist classroom is encouraged to be responsible, to take initiative, to explore, to extend boundaries, and to discover solutions.

In the behaviourist classroom, on the other hand, the learner is habituated to being a passive observer of how the teacher works through a problem and arrives at a situation which the learner is then invited to replicate. Reproduction, replication, centripetally, memorization and received dogma are

all hallmarks of a behaviourist classroom. Experimentation, hypothesis, initiative, centrifugalize, trial-and-error, self-motivated inquiry, collaboration and teamwork are all hallmarks of the constructivist classroom.

The teacher does not lose dignity, authority or prestige in the computer-rich classroom. It is true that there is no place in such classrooms for teachers who cannot accept the decentralization of activity and responsibility that accompanies the widespread use of computers for education. It is also true that modern teachers need to be experts both in their subject specialties as well as in the software programs that their learners use. "Nowadays, the teacher must be specialist in rigorous subject matter and be adept with modern technologies" (Donley 1996). This new "burden" on teachers simply reflects changing patterns of imparting and processing information in the larger society in which we live.

It is technology itself in the form of the computer that has dealt coup de grace to traditional authoritarian modes of teaching. The role of the teacher in the computer-rich classroom is not less important; it is simply different. Teachers are just as necessary as ever they were. But the skills they need to make the teaching successful in the technological classroom are vastly different from the skills needed in traditional authoritarian teaching situations. The onus is on them to make technology-based education a success. Without skilled choreography on the part of teachers, learners might easily lapse into old habits of futility and passivity – technology or no technology (Hanson-Smith 1997, quoted in Batane, 2004)

Also, educators' use of ICT and subsequent integration of technology into their teaching and learning is dependent on a number of factors. Such

factors include teachers' readiness, confidence, knowledge and ability to evaluate the role of ICT in teaching and learning, and lack of skills to be able to use the ICT equipment (Manson, 2000; Lau & Sim, 2008). In most cases, the shortcomings result in lack of confidence among teachers in utilising ICT in curriculum delivery (Tella, Tella, Toyobo, Adika & Odeyinka, 2007).

ICT Teaching Syllabus for Junior High Schools In Ghana

This syllabus was designed to provide basic skills in Information and Communications Technology (ICT) for Junior High School (JHS) students.

General Aims

The syllabus was designed to help the pupil to:

1. acquire basic ICT literacy
2. develop interest and use ICT in learning other subjects
3. use the Internet effectively for information
4. follows basic ethics in the use of ICT
5. acquire keyboarding skills

Scope of Content

The content of this course has been designed to offer basic knowledge and skills to students to afford them the opportunity to explore the use of ICT as a foundation for further study of the subject. For enhancing teaching and learning, the course is based on the following themes to be covered in three years of Junior High School (JHS):

1. Introduction to ICT
2. Word Processing

3. Spread sheet
4. Internet
5. Keyboarding skills. These themes are to be covered in three years of Junior High School (JHS).

Technological Proficiency of Teacher - trainees

This involves the competency outcomes, and the supporting knowledge and skills that are needed by teacher - trainees to utilize ICT in performing the job roles related to teaching. In general, this set of competencies aims to prepare teachers to become users of various ICTs to help both the students and themselves benefit from the technology. The prime benefits are: 1) access to information and knowledge resources, 2) communication and knowledge sharing, and 3) work efficiency. Some of these competencies are expected to be acquired during the pre-service training while the rest are long-term competencies that teachers will have to acquire in-service.

The ICT syllabus for the Junior High Schools (JHS) is designed to help students acquire basic ICT literacy, develop interest and use ICT in learning other subjects, use the Internet effectively for information, follow basic ethics in the use of ICT, and acquire keyboarding skills. If the level of ICT training in the Colleges of Education is okay, then these objectives should not be difficult for teacher - trainees to achieve. According to the National Competency Standard for Teachers, teacher - trainees should be able to demonstrate knowledge and skills in computer hardware, understand and effectively use the Internet and network applications and resources, and use basic application software and windows operating system

Teacher - trainees and Computer Hardware

This competency domain relates to technical operations and concepts, and productivity of various ICT tools like computers and communication devices. The ICT teaching syllabus (2007) indicated that students will be able to; 1) identify the main components of a personal computer, and 2) identify the main hardware components and state their functions. To be able to achieve these specific objectives the National Competency Standard for Teachers (2008) state that teacher - trainees should be able to:

1. Identify and define the functions of the main components (i.e. monitor, CPU, keyboard, mouse) of the computer
2. Identify and define the functions of computer peripherals (i.e. printer, scanner, modem, digital camera, speaker, etc.)
3. Properly connect main components, configure peripherals and install drivers when required
4. Configure computer settings of various software and hardware
5. Understand the basic functions of the operating system
6. Organize and manage computer files, folders and directories
7. Use storage devices (i.e. hard disk, diskette, CD, flash memory, etc.) for storing and sharing computer files.
8. Create back-ups of important files

Teacher - trainees and the Internet

The specific objectives contained in the ICT teaching syllabus (2007) are that students will be able to; 1) explain the concept of the Internet and World Wide Web (www), 2) identify the features of a web browser and their

uses, 3) launch and exit a webpage, and 4) outline the advantages and disadvantages of the internet. To achieve these objectives, according to the National Competency Standard for Teachers (2008) teacher - trainees should be able to:

1. Connect to the internet via dial-up or LAN.
2. Configure and use Web Browsers and Help applications.
3. Send and receive emails with attachments, manage emails and use LAN and Web-based mail servers.
4. Effectively use synchronous and asynchronous web-based communication tools like instant messengers, voice and teleconference.
5. Connect and use shared printers, shared folders and other devices within a network.
6. Effectively use search engines, web directories and bookmarks.
7. Connect and use shared printers, shared folders and other devices within a network.
8. Effectively use search engines, web directories and bookmarks.
9. Download and install relevant applications including freeware, cookies, shareware, updates, patches, viewers and support applications (National Competency Standard for Teachers).

The Ability of Teacher - trainees to use Basic Computer and Application Software

The specific objectives contained in the ICT teaching syllabus (2007) were that students will be able to; 1) Select texts, 2) copy/cut and paste texts/ full document in the same and new document, 3) re-save edited document, 4)

create and name a new Word document file, 5) format a Word Processing document using bullets and numbering, 6) align texts appropriately, 7) type on double line spacing, and 8) save file in folder. The National Competency Standard for Teachers stated that the effective and appropriate use of office and teaching productivity tools by teacher - trainees is indicated by basic application skills such as:

1. Using a word processor to enter and edit text and images
2. Format text, control margins, layout and tables
3. Print, store and retrieve text documents from a word processor
4. Use a calculation spreadsheet to enter data, sort data and format cells into tables.
5. Make computation, use formula and create graphs using spreadsheets.
6. Print and store data tables using a spreadsheet application.

Physical ICT Infrastructure in Place at Teacher Education Colleges

Though it has been argued that simply having ICT in schools will not guarantee their effective use, yet the fact still remains that a well-functioning ICT infrastructure is vital to education. Any modern Educational institution without an integrated computer system is not able to face challenges of 21st century and fulfill its strategy and mission. Baryamureeba (2003) argued that most of the equipments needed for graduate training in ICT/Computer Science discipline are very expensive and as a result most universities in Africa tend to produce more of the theory oriented graduates than practical-oriented ones.

In Colleges of Education, slow access to basic ICT equipment, low Internet connectivity and computers, and the inadequacies in the use of

audiovisual materials and equipments are barriers to the effective and professional development of teachers (Ololube, 2006). The challenges of establishing an infrastructure may involve the choice and development of the appropriate technology, the deployment of the technology and the operation of the technology, both on a general level and on a day-to-day basis.

CHAPTER THREE

METHODOLOGY

Overview

This chapter presents the methodology of this study. It provides detailed description of all the methods and steps used in arriving at the conclusion of this study. It contains a description of the study design and the instruments used. It also documents the sample size, sampling procedures, data collection procedure and data analysis.

Research Design

A descriptive survey was used to gather information for this study. According to Leedy and Ormrod (2010), "descriptive research examines a situation as it is. It does not involve changing or modifying the situation under investigation, nor is it intended to determine cause-and-effect relationships" (p. 182). Gay (1992) posits that a descriptive survey involves collecting data in order to test hypothesis or answer questions concerning the current status of the subject of study; it determines and report the way things are. Gay (1992) further maintains that a descriptive survey is useful for investigating a variety of educational problems including assessment of attitudes, opinions, demographic information, conditions and procedure.

Additionally, Fink (2002) points out that the descriptive survey seeks at describing, observing, and documenting aspects of a situation as it naturally

occurs rather than explaining it. This design helps to produce a good amount of responses from a wide range of people. Babbie (1990) also pointed out that the descriptive survey is very useful for generalizing from a sample to a population so that inferences can be made about the characteristics, attributes or behaviour of the population.

Osuala (1993), however, maintains that in using the descriptive survey, there is the difficulty of ensuring that questions to be answered are clear and not misleading. This stems from the fact that the survey results can vary significantly. It may also produce results, which cannot be relied upon because they delve into private matters, hence many people may not be completely truthful. Also, Fraenkel and Wallen (2001) pointed out that getting sufficient number of questionnaire completed and returned so that meaningful analysis could be made is another snag of the descriptive survey design.

It is against this backdrop that the descriptive survey design was considered by the researcher, as the most appropriate for bringing to the fore the use of ICT for teaching and learning in the Colleges of Education.

Population

The target population for the study was all the 38 public Colleges of Education in Ghana. The accessible population consisted of all final year teacher-trainees and the ICT teachers in selected public Colleges of Education in the Central Region of Ghana namely: Our Lady of Apostles (OLA) College of Education, Komenda College of Education and Foso College of Education. These three Colleges of Education were selected based on proximity, time and

accessibility. These 3 Colleges of Education in the Central Region have enrolment figure of 870 final year teacher-trainees and 9 ICT tutors.

Table 1 indicates the population of final year (Level 300) teacher - trainees and the ICT tutors of the three (3) selected Colleges of Education in the Central Region of Ghana.

Table 1: Population of ICT Tutors and Students in three Colleges of Education

Colleges	Population of Teacher-trainees	Population of ICT Tutors
OLA	300	4
Komenda	270	2
Foso	300	3
Total	**870**	**9**

Source: Institute of Education, UCC (2012)

Sample and Sampling Procedure

Purposive sampling was used to select Our Lady of Apostles (OLA) College of Education, Komenda College of Education and Foso College of Education. Purposive sampling method was used to select the above named Colleges because it was believed they have access to computer usage and also of the fact that their geographical locations were representative enough of the tutor and teacher-trainees.

The sample size for the study was 9 ICT tutors and 271 teacher-trainees. To get the sample size for the teacher-trainees and tutors, the multi-stage sampling technique was employed (Refer to Table 2). By this method, the list of all the teacher-trainees and tutors in the three Colleges of Education

in the Central Region was obtained from the Institute of Education, University of Cape Coast. The sample size was proportionally allocated to the three Colleges of Education such that Colleges with larger population got large sample size whilst those with smaller population got small sample size.

Finally, simple random technique using random numbers generated from Microsoft Excel was employed to select the sample size of 271 teacher-trainees and 9 ICT tutors. According to Krejcie and Morgan (1970), for a population of 870, the suggested minimum number that should be used as sample size is 271. This constituted the sample size of teacher-trainees used for the study. Similarly, Krejcie and Morgan suggested that with a population of ten, all ten can be used as sample size. As a result all nine ICT teachers constituted the sample size for the ICT teachers.

The choice of the sample size was also informed by factors such as cost, representativeness and sampling error which can be tolerated. Table 2 provides sample sizes (S) required from given population sizes (N). Bartels (1997) has summarized the advantages of sampling as follows: there is shorter time lag in the use of sampling in a research study; and there is greater scope. The disadvantages of sampling according to him are: errors due to sampling tend to be higher for small sample where the number of sample observations in certain cells may be very small.

Table 2: Distributions of Samples among the three Colleges of Education

Colleges	ICT Tutors Population	Tutors Sample	Teacher-trainees Population	Teacher-trainees Sample
OLA	4	4	300	94
Komenda	2	2	270	83
Foso	3	3	300	94
Total	**9**	**9**	**870**	**271**

Instrument

To obtain data pertinent to the research questions, questionnaire (see Appendices A and B) was used. The questionnaire was preferred because it was considered a suitable method by which reliable information could be elicited for the study where variables being investigated require statement of fact and opinion. Also, it was the best instrument where anonymity was assured. This is important because the results of the study would reveal the status on the use of Information and Communication Technology for teaching and learning at the Colleges of Education. The questionnaire required the respondents to provide answers based on a Likert-type scale.

The questionnaire was made up of seven Sections (Sections A-G). That for ICT tutors was made up of 63 items and 99 items for teacher-trainees. Section A, looked at the demographic data. The items in Section B have been designed to collect information on physical ICT infrastructure in place at the Colleges of Education. Section C gathered information on technological proficiency of ICT teachers and teacher-trainees. Section D looked at the views of ICT teachers and teacher - trainees about the ways computers can

affect teaching in the classroom. Section E collected data on ICT Teachers and teacher - trainees and the internet. Section F, took data on the implications of an instructional approach supported by the use of computers. Finally, section G provided data on challenges that are inherent in the use of computers in a constructivist instructional approach.

The responses to the items were designed on a four point Likert-type scale. Thus;Unfamiliar 1, Low 2, Medium 3, and High 4. In addition, Strongly Agree (SA) 1, Agree (A) 2, Disagree (D) 3, and Strongly Disagree (SD) 4. The reason was that the Likert-type scale is easier to construct and score (Osuala, 1993). Also, the Likert-type scale produces more homogeneous scales; allows the subject to indicate the degree or intensity of feelings, and permits spread of variance. The questionnaire items were designed according to guidelines suggested by Frankael & Wallen, 2001; Kaul, 1992; and Leedy & Ormrod, 2010. All the sections A, B, C, D, E, F and G of the questionnaire follow the guidelines.

Reliability

Reliability refers to "the extent to which ones findings can be replicated" (Merriam, 1988) or the "consistency of the results obtained from the data" (Lincoln & Guba, 1985). To test the instrument's validity and reliability, the initial draft was administered on 15 M. Ed IT final year students drawn from university of Cape Coast. The feedback obtained from this first administration was used to revise the final instrument.

The final instrument was tested for reliability using test-retest method of three weeks interval. The average Cronbach's alpha reliability coefficient

obtained for the seven sections of the instruments was 0.77. George and Mallery (2003) provide the following rules of thumb for Cronbach's alpha values: "_ > .9 – Excellent, _ > .8 – Good, _ > .7 – Acceptable, _ > .6 – Questionable, _ > .5 – Poor, and_ < .5 – Unacceptable" (p. 231). From this rule, the obtained alpha value for this research indicates that the instrument is reliable.

Data Collection Procedure

An introductory letter (See Appendix C) was obtained from the Centre for Continuing Education (Department of Masters of Education in Information Technology) which assisted the researcher to gain approval from the principals, tutors and teacher-trainees. The researcher then explained the purpose and significance of the study to the respondents.

Three hundred copies of the questionnaire were distributed to randomly selected teacher - trainees after lectures. The questionnaire was administered to the final year students of 2011/12 academic year. Ninety four (94), Ninety two (92) and Eighty four (84) teacher - trainees from Ola, Foso and Komenda Colleges of Education respectively, completed the questionnaire. A total of Two hundred and seventy (270) copies were returned, out of which 18 were discarded due to incomplete data, thus 252 were found usable, at a return and usable rate of 84%. The final total usable data involve 94(37.3%), 69(27.4%) and 89(35.3%) respondents from Ola, Komenda and Foso Colleges of Education respectively.

Data Analysis

The data collected was checked to ensure that responses were suitable. The checking was done to help exclude questionnaire which were found to be incomplete. The questionnaire were serially numbered for easy identification and finally, coded for easy analysis. Sections B, C, D, E, F and G were tabulated on a four point Likert–type scale and were scored, 1, 2, 3, and 4 for items with responses: Unfamiliar, Low, Medium, and High as well as Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD), respectively. All responses for each item in the questionnaire were entered and analyzed with relevant statistical tool by the help of Statistical Product for Service Solution (SPSS) version18 for windows.

The responses "Strongly Agree (SA)" and "Agree (A)" were put together as "Agree (A)" while the responses "Disagree (D)" and "Strongly Disagree (SD)" were also combined as "Disagree (D)" for easy analysis and interpretation of the respondents' data. In addition, items with responses "unfamiliar" and "low" were put together as "low" whilst "medium" and "high" were put together as "high" for easy analysis and interpretation. Research question one, three, four, five and six were analyzed using frequencies and percentages while research question two was analyzed using frequency, mean and standard deviation.

CHAPTER FOUR

RESULTS AND DISCUSSION

Overview

This chapter commenced with the analysis of the demographic characteristics of teacher - trainees, followed by the age distribution of teacher - trainees and ICT teachers. It continued with academic and professional qualification of ICT tutors, years of teaching experience of ICT tutors, and research question one through to research question six.

Demographic Characteristics of Teacher - Trainees

The demographic characteristics were described in terms of the institution, gender, age groups, and course of teacher - trainees. Data was collected in respect of gender and age group of respondents and the analysis presented in Table 3.

Table 3: Frequency of age groups by sex of teacher - trainees

	Gender of respondents			
Ages (Year)	Male	Female	Frequency	(%)
Between 15-20	2	1	3	1.2
Between 21-25	82	140	222	88.1
Between 26-30	12	15	27	10.7
Above 30	0	0	0	0
Total	**96**	**156**	**252**	**100.0**

From Table 3, all respondents fell within the age brackets of 15 years to 30 years. Three (1.2%) respondents were between the age group of 15 – 20 years, 222(88.1%) were between the age group of 21 – 25 years, 27(10.7%) were between the age group of 26 – 30 years, and none was above 30 years.

Age Distribution of ICT Tutors

There were 9 ICT teachers in the three institutions where this research was conducted. As at the time of the study, 2 of the tutors were absent and 7 were involved in the study. The age distribution of the ICT tutors was presented in Table 4 below.

Table 4: Age Distribution of ICT Tutors

Age (Years)	Frequency	(%)
Below 25	0	0
Between 26 – 30	0	0
Between 31 – 35	0	0
Between 36 - 40	2	28.6
Above 40	5	71.4
Total	**7**	**100**

Table 4 shows that 5(71.4%) of the respondents were above 40 years, 2(28.6%) were between the ages of 36 - 40 years whiles none of the ICT tutors was below 25 years, between 26 – 30 or between 31 – 40 years.

Academic Qualification of ICT Tutors

Table 5 shows the Academic qualification of the ICT tutors in the Colleges of Education where this research was conducted.

Table 5: Frequency Distribution of Academic qualification of the ICT tutors

Qualification	Frequency	(%)
Certificate	0	0
Diploma	0	0
Degree	3	42.9
Masters	4	57.1
PhD	0	0
Total	**7**	**100**

The results in Table 5 revealed that 4(57.1%) of the tutors hold Masters Degree in ICT and 3(42.9%) have first degree in computer science. None of the ICT teachers holds a certificate, diploma or PhD.

Professional Qualification of ICT Teachers

Table 6 reveals the professional qualification of the ICT tutors.

Table 6: Frequency Distribution of Professional Qualification of ICT Tutors

Qualification	Frequency	%
B. Sc Computer Science	1	14.3
B. Ed Computer Science	2	28.5
PGDE	0	0
M. Ed (IT)	3	42.9
M. Phil	1	14.3
Total	**7**	**100**

From Table 6, 3(42.9%) of the tutors hold Master of Education in Information Technology, 2(28.5%) hold B. Ed computer Science, 1(14.3%) hold B. Sc Computer Science while none of them had post Graduate Diploma in Education (PGDE).

Number of Years ICT Teachers have Taught

The study was interested in knowing the number of years ICT teachers have taught so that the level of experience of the tutors can be determined. Table 7 shows the number of years ICT teachers have been teaching.

Table 7: Years of Teaching

Years of teaching	Frequency	%
Below 5years	1	14.3
Between 6-10years	1	14.3
Between 11-15years	0	0
Above 15years	5	71.4
Total	**7**	**100**

Table 7 shows that majority of the ICT teachers, 5(71.4%) have taught for over 15 years, 1(14.3%) teacher have been teaching from 6 – 10 years and 1(14.3%) teacher had below 5 years teaching experience. The finding revealed that none of the tutors have been teaching for between 11 – 15 years.

Research Question One: What Physical ICT Infrastructure is in place at the Colleges of Education?

This research question seeks to assess the physical ICT facilities available at the Colleges of Education visited. Table 8 presents the frequency distribution of the physical ICT infrastructure found.

Table 8: Frequency of Physical ICT Infrastructure in Place at the Colleges of Education

Statement	Available	(%)	Not Available	(%)	Total Freq.
Computer laboratory	252	100	0	0	252
Computers	252	100	0	0	252
Projector	244	96.8	8	3.2	252
Smart board	68	27.0	184	73.0	252
Internet	232	92.1	20	7.9	252
Digital Camera	140	55.6	112	44.4	252
CDs on tutorial	70	27.8	182	72.2	252
CDs on Drill and Practice	41	16.3	211	83.7	252

Table 8 shows that 252(100%) respondents indicated computer laboratory and computers were available in the Colleges of Education visited (Ola, Foso and Komenda Colleges of Education). Similarly, 244(96.8%), 232(92.1%), and 140(55.6%) respondents respectively indicated projectors, internet and digital camera were available. These findings, which were corroborated by the ICT teachers, were in line with the study by Hennessy and Wamakote (2010), who revealed that effectively introducing technology into schools is largely dependent upon the availability and accessibility of ICT resources such as hardware, software and communications infrastructure.

Table 8 again shows that 184(73.0%), 182(72.2%) and 211(83.7%) respondents respectively indicated that Smart boards, CDs on tutorial and CDs on drill and practice were not available. It can be concluded that some

essential ICT teaching and learning materials are not available at the Colleges of Education. This finding confirms the observation by Ololube (2006) that in Colleges of Education, slow access to basic ICT equipment, low Internet connectivity and computers, and the inadequacies in the use of audiovisual materials and equipments are barriers to the effective and professional development of teachers.

According to Jung, (2005) ICT as part of teaching method uses tools such as videotape and CD-ROM to help teacher - trainees see how technology can be integrated into their work. Therefore, the unavailability of these teaching aids is likely to affect effective teaching and learning in the Colleges of Education where data was collected.

Research Question Two: What are the Views of Teacher - trainees about the Ways in which Computers can Affect their Teaching Role in the Classroom?

This section focuses on the views of teacher - trainees about the ways in which computers can affect their teaching roles in the classroom. Data collected elicited students' views on three main issues: classroom interaction, challenges in using computers, and classroom organization. The frequency, mean and standard deviations of the result analysis are presented in Table 9, while Table 10 shows the views of ICT teachers about the ways computers can affect teaching in the classroom.

Table 9: Views of teacher - trainees about the ways Computers can affect teaching in the classroom

Items	Agree Freq. (%)	Disagree Freq. (%)	Mean	SD
Computers are necessary for lesson delivery in the classroom	241(95.7)	11(4.4)	1.25	.58
Computers help teachers to achieve lesson objectives	221(87.7)	31(12.3)	1.60	.76
Computer is useful for learning drill and practice	233(92.5)	19(7.5)	1.56	.73
I learnt to use computer in my current institution	133(52.8)	119(47.2)	2.40	1.16
Computers are difficult to use	59(23.4)	193(76.6)	3.10	.92
Most instructional strategies are easily applied with the computer.	197(78.1)	55(21.9)	1.96	.80
Computers give better understanding of topics than lectures.	188(74.6)	64(25.4)	1.93	.93
Time is well spent if computers are used in the classroom	179(71.1)	73(28.9)	1.99	.94
Computer-related technologies are of little use in the classroom.	148(58.7)	104(41.3)	2.33	1.03
Computers should not be used in the classroom.	45(17.9)	207(82.1)	3.35	.98

Results in Table 9 show that, 241(95.7%) respondents agree that computers are necessary for lesson delivery. In addition, the mean rating of respondents suggest that they agree that computers help teachers to achieve

lesson objectives (1.60) and computers are useful for learning drill and practice (1.56). Also, more than half of the respondents 133(52%) agree that they learn to use computer in their current institution. This information from the respondents suggests that teacher - trainees believed computers can provide good interaction of learners in the classroom.

Furthermore, it is evident from Table 9 that 193(76.6%) disagree that computers are difficult to use. Also, the mean rating of respondents depicts that most instructional strategies are easily applied with the computer (1.96), and time is well spent if computers are used in the classroom (1.99). In addition, a standard deviation of .93 indicates that respondents agree that computers give better understanding of topics than lectures. These results indicate that computers provide minimal challenges when being used in lesson delivery.

With classroom organization, 148(58.7%) of the respondents indicated that computer-related technologies were of little use in the classroom. A mean of 3.35 and standard deviation of .98 shows that respondents disagree that computers should not be used in the classroom. The conclusion one can draw from these observations is that computers are important in the classroom.

This finding is in tune with the study by Means and Olson (1997) who observed that computers allow students in-depth exploration of a smaller number of ideas and related facts around authentic and challenging tasks.

To determine the views of ICT teachers about the ways computers can affect teaching in the classroom, responses were elicited from the ICT teachers and the results presented in Table 10.

Table 10: Views of ICT teachers about the ways computers can affect teaching in the classroom.

Statement	Agree Freq(%)	Disagree Freq(%)	Mean	SD
Computers are necessary for lesson delivery in my school	7(100)	0(0.0)	1.29	.488
Computers help in lesson preparation	7(100)	0(0.0)	1.43	.535
Computers help to include learning applications in lessons	6(85.7)	1(14.3)	1.71	.756
Computers help teachers to achieve lesson objectives	5(71.4)	2(28.6)	2.00	.816
I use computers to apply instructional strategies during lessons	5(71.4)	2(28.6)	2.14	.690
Using computers to teach give better understanding of topics than lectures.	6(85.7)	1(14.3)	1.71	.756
Time is well spent if computers are used in the classroom	6(85.7)	1(14.3)	2.29	1.254
Computer-related technologies are of little use in the classroom because they are too difficult to use.	4(57.1)	3(42.9)	3.29	.756
Computers should not be used in the classroom.	0(0.0)	7(100)	3.86	.378
JHS Syllabus is available to all teachers.	3(42.9)	4(57.1)	2.71	1.113

From Table 10, the views of ICT teachers were similar to those of the teacher - trainees. All ICT teachers 7(100%) agree that computers are necessary for lesson delivery in the school. The mean rating of respondent

ranging from 1.43 to 2.00 and standard deviations ranging from .488 to .816 indicate agreement of respondents to the statements; computers help in lesson preparation, computers help to include learning applications in lessons, and computers help teachers to achieve lesson objectives. These results show that both teachers and students interact well with computers in the classroom.

In addition, 5(71.4%) respondents indicated that they use computers to apply instructional strategies during lessons, while 6(85.7%) agree that using computers to teach give better understanding of topics than lectures. However, a mean score of 2.29 and a standard deviation of 1.254 shows that ICT teachers disagreed with the statement time is well spent if computers are used in the classroom. Though this response contradicts the responses by the teacher - trainees, the study sided with the ICT teachers since they often use computers in the classroom. For that reason, one can say that there exist some challenges in using computers in the classroom.

Furthermore, a mean score of 3.29 and a standard deviation of .756 indicate that the ICT teachers agreed with the statement; computer-related technologies are of little use in the classroom because they are too difficult to use. Again, mean scores of 3.86, and 2.71 and standard deviations of .378 and 1.113 show that the ICT teachers disagreed with the statements; computers should not be used in the classroom, and JHS Syllabus is available to all teachers. From the findings, it can be concluded that computers are more important than other computer-related technology.

Research Question Three: Are Teacher - Trainees able to use the Internet and its resources effectively?

This question intends to look at how teacher – trainees use internet and its resources. Responses were elicited from the respondents and the results of analysis presented in Table 11.

Table 11: Frequency Distribution of Teacher - trainees and the internet

Statement	Agree Freq.(%)	Disagree Freq.(%)	Total Freq.(%)
In my college, Internet is available all the time	171(67.9)	81(32.1)	252(100)
I can create and send emails to other students	193(76.6)	59(23.4)	252(100)
I use the internet to find the information I require.	224(88.9)	28(11.1)	252(100)
I can use the internet to download software	194(77.0)	58(23.0)	252(100)
I use internet to find information for my assignments.	210(83.3)	42(16.7)	252(100)
Internet helps to find additional information on lessons taught	242(96.0)	10(4)	252(100)
I use the internet to get expert knowledge To complete project	229(90.9)	23(9.1)	252(100)
I use the internet to interact with other students (online discussion)	196(77.8)	56(22.2)	252(100)
Students use internet for group and problem solving activities	212(84.1)	40(15.9)	252(100)
Students use the internet for individual work	219(87.0)	33(13.0)	252(100)
I use the internet for entertainment	209(82.9)	43(17.1)	252(100)

Table 11 shows that teacher - trainees were competent in most of the items. Over 65 percent of respondents noted they were fully competent or were regular and confident users of the Internet resources. For instance, 171(67.9%) respondents said internet was available at all times in their college, and 193(76.6%) said they could create and send email to other students. Besides, 196(77.8%) indicated that they used the internet to interact with other students (online discussion), and 224(88.9%) agreed that they used the internet to find information they required.

Also, 212(84.1%) agree that they use internet for group and problem solving activities, and 219(87.0%) agree that they use the internet for individual work. These responses were corroborated by the ICT teachers. Six (85.7%) of the ICT teachers indicated that they engaged learners to use the internet for problem solving activities. It can therefore be concluded that teacher – trainees use internet and its resources for both group and individual work.

This finding is in line with the study by Tretten and Zachariou (1995) who found that computers can successfully enhance the problem solving abilities of the students by using project-based learning (PBL) activities; because they are used, most often, in an environment where people are drawn to collaborate naturally as a result of their cultural expectations.

Furthermore, 242(96.0%) of the respondents agree that internet helps them to find additional information on lessons taught, while 229(90.9%) said they use the internet to get expert knowledge to complete project. In addition, 210(83.3%) said they use internet to find information for their assignments, and 194(77.0%) indicated that they can use the internet to download software.

However, 219(87.0%) showed that they use the internet for individual work, while 209(82.9%) indicated that they use the internet for entertainment.

While the teacher - trainees agreed to the statement that they use the internet for entertainment, the ICT teachers disagreed with that statement. This contradiction shows that the teacher - trainees, who are between 21 – 25 years, spend some time entertaining themselves on the internet, whilst the ICT teachers who are above 40 years have no time to spend on the internet for entertainment. In spite of this, most of the findings show that both teacher - trainees and ICT teachers use internet and its resources effectively.

Research Question Four: What are the Implications of Constructivist Pedagogy Supported by Computers?

Table 12 presents results of data collected to answer this research question.

Table 12: Implications of constructivist pedagogy supported by the use of Computers

	Teacher - trainees		ICT Teachers	
Statement	Agree Freq. (%)	Disagree Freq. (%)	Agree Freq. (%)	Disagree Freq. (%)
Computer is a very important tool for instruction.	241(95.7)	11(4.3)	7(100)	0(0.0)
Teachers use computer to teach lessons	175(69.5)	77(30.5)	6(85.7)	1(14.3)
Teachers prepare PowerPoint presentation for classroom lessons	135(53.5)	117(46.5)	5(71.4)	2(28.6)
Teachers use computer for drill and practice, and tutorial packages	91(36.1)	161(63.9)	2(28.6)	5(71.4)

Table 12 continued

Students are videotaped as they work on activities	52(20.7)	200(79.3)	2(28.6)	5(71.4)
Computer is more effective in providing individual feedback than a teacher.	139(55.1)	113(44.9)	4(57.1)	3(42.9)
Students are easily assessed using internet (online).	128(50.8)	124(49.2)	3(42.9)	4(57.1)
Assessing students through written multiple choice and essay questions are better.	195(77.4)	57(22.6)	2(28.6)	5(71.4)
Teacher promotes discussions, question and answers during lessons	232(92.1)	20(7.9)	7(0.0)	7(0.0)
Teacher allows students to present different ideas to get solutions to tasks	235(93.3)	17(6.8)	7(0.0)	7(0.0)

Most of the respondents were of the view that ICT was useful in education. For instance, 241(95.7%) respondents agree that computer is a very important tool for instruction, 175(69.5%) said their teachers use computer to teach lessons, and 135(53.5%) indicated that their teachers prepared PowerPoint presentation for classroom lessons. Also, 139(55.1%) said computer was more effective in providing individual feedback than a teacher. It can be seen from the Table 12 that 128(50.8%) of the respondents indicated that students were easily assessed using internet (online), and 195(77.4%) pointed out that assessing students through written multiple choice and essay questions were better.

However, 161(63.9%) and 200(79.3%) of the respondents disagreed that teachers used computer for drill and practice, and tutorial packages, as

well as students were videotaped as they worked on activities. This position of the teacher - trainees was corroborated by 5(71.4%) of the ICT teachers. In addition, though teacher - trainees agreed that students were easily assessed using internet (online), 4(57.1%) of the ICT teachers disagreed. Similarly, 195(77.4%) teacher - trainees agreed with the statement that assessing students through written multiple choice and essay questions were better, 5(71.4%) of the ICT teachers disagreed. From the findings, it can be concluded that though ICT teachers do not use drill and practice, tutorial packages and videotape in lesson delivery, they find the use of computers in assessing students better.

Research Question Five: What challenges are inherent in the use of Computers in a Constructivist Instructional Approach?

The result in Table 13 shows the analysis of results on challenges that are inherent in the use of computers in a constructivist instructional approach. Based on the responses of teacher - trainees on whether most instructional strategies are easily applied with the computer (Table 9), the researcher sought further information on challenges that are inherent in the use of computers in a constructivist instructional approach.

Table 13: Challenges teacher - trainees face in using computers in a constructivist instructional approach

Statement	Agree Freq. (%)	Disagree Freq. (%)	Total Freq. (%)
Students go to the computer laboratory for ICT lessons.	241(95.6)	11(4.4)	252(100)
Computers are in the classrooms.	27(10.7)	225(89.3)	252(100)
Each student sits by one computer.	139(55.2)	113(44.8)	252(100)

Table 13 continued

Students are taken through practical lessons step-by-step.	227(90.1)	25(9.9)	252(100)
Teachers use projector for presentation and demonstrations.	217(86.1)	35(13.9)	252(100)
Students are given individual activities to work on.	175(69.5)	77(30.5)	252(100)
Students are often times given group work.	193(76.6)	59(23.4)	252(100)
I know constructivist learning theory	87(34.5)	165(65.5)	252(100)
I prefer working in group	198(78.6)	54(21.4)	252(100)
I prefer working alone.	136(54.0)	116(46.0)	252(100)
I know other learning theories such as objectivism and social learning	136(54.0)	116(46.0)	252(100)

From Table 13, 241(95.6%) agreed with the statements that students go to the computer laboratory for ICT lessons, 139(55.2%) said each student sits by one computer, and 227(90.1%) indicated that students were taken through practical lessons step-by-step. In addition, 217(86.1%) agreed that ICT teachers use projector for lesson presentation and demonstration, 175(69.5%) indicated that students were given individual activities to work on, while 193(76.6%) agreed that students are often times given group work. As a result, 198(78.6%) said they prefer working in group, while 136(54.0%) said they prefer working alone.

Table 13 also indicates that 225(89.3%) and 165(65.5%) respondents respectively disagreed with the statements that computers are in the

classrooms and I know constructivist learning theory. However, 136(54.0%) said they know other learning theories such as objectivism and social learning, respectively. Though the teacher - trainees have indicated they do not know constructivist learning theory, 6(85.7%) of the ICT teachers said they consider constructivists' instruction when planning lessons (see Table 14). As a result, 193(76.6%) and 175(69.5%) teacher - trainees agreed that students are often times given both group and individual activities to work on. The findings suggest that both behaviourist and constructivist learning theories are used by the ICT teachers.

Table 14: Challenges ICT Teachers face in using Computers in a Constructivist Instructional Approach

Statement	Agree Freq. (%)	Disagree Freq. (%)	Total Freq.(%)
Students go to the computer laboratory for ICT lessons.	7(100)	0(0.0)	7(100)
The computers are in the classrooms.	2(28.6)	5(71.4)	7(100)
Each student sits by one computer.	2(28.6)	5(71.4)	7(100)
Students are taken through practical lessons step-by-step.	7(100)	0(0.0)	7(100)
I use projector for lesson presentation and demonstrations.	7(100)	0(0.0)	7(100)
Students are given individual activities to work on.	7(100)	0(0.0)	7(100)
Students are often times given group work.	7(100)	0(0.0)	7(100)
I consider constructivists' instruction when planning lessons	6(85.7)	1(14.3)	7(100)

From Table 14, all ICT teachers indicated that they use projector for lesson presentation and demonstrations. This response was corroborated by 217(86.1%) teacher - trainees (see Table 13). Five (71.4%) ICT teachers disagreed with the statement that each student sits by one computer during practical lessons. This contradicts the position of 139(55.2%) teacher - trainees who agreed with the statement.

It is also evident in Table 14 that all ICT teachers 7(100%) agreed that students were taken through practical lessons step-by-step. This behaviourist method of teaching might account for the reason why most teacher - trainees 133(52.8%) learnt to use computer in their current institutions. Again, it can be concluded that both behaviourism and constructivism are applied in training teacher - trainees.

This finding is supported by Jones and Mercer (1993) who found that behaviourist and constructivist theories of learning are usually used to describe how individuals succeed in learning, and so they have become the basis upon which a more learner-centered type of instruction process has been constructed.

Research Question Six: What is the Competence level of Teacher - Trainees in using various Computer Applications and Basic Application Software?

The competencies needed by teachers in information and communication technology are enormous. As a result, Tables 15, 16, 17, 18, and 19 provide the results of responses on research question six. Table 15 presents the results of findings on computer applications.

Table 15: Competence level of teacher - trainees and ICT Teachers in Computer Applications

	Teacher - trainees			ICT Teachers		
Items	Low Freq.(%)	High Freq.(%)	Total Freq.(%)	Low Freq.(%)	High Freq.(%)	Total Freq.(%)
Word Processing	57(22.6)	195(77.4)	252(100)	1(14.3)	6(85.7)	7(100)
Excel	68(27.0)	186(73.0)	252(100)	0(0.0)	7(100)	7(100)
Desktop Publisher	125(49.6)	127(50.4)	252(100)	0(0.0)	7(100)	7(100)
PowerPoint	83(32.9)	169(67.1)	252(100)	0(0.0)	7(100)	7(100)
Internet	35(13.9)	217(86.1)	252(100)	0(0.0)	7(100)	7(100)
E-mail	52(20.6)	200(79.4)	252(100)	0(0.0)	7(100)	7(100)
Coral draw	173(68.7)	79(31.3)	252(100)	3(42.9)	4(57.1)	7(100)
Encarta	148(58.7)	50(41.2)	252(100)	0(0.0)	7(100)	7(100)
Adobe reader	172(68.3)	80(31.7)	252(100)	2(28.6)	5(71.4)	7(100)
Access	126(50.0)	126(50.0)	252(100)	3(42.9)	4(57.1)	7(100)

From Table 15, majority of the teacher - trainees 195(77.4%), 186(73.0%), and 127(50.4%) respectively indicated that they have high level of competence in Word Processing, Excel, and Desktop Publisher. In addition, 169(67.1%), 217(86.1%), and 200(79.4%) respectively showed that they have high competence level in PowerPoint, Internet, and E-mail.

However, 173(68.7%), 148(58.7%), and 172(68.3%) indicated that they have low level of competence in Coral draw, Encarta, and Adobe reader. This reflects the competence level of the ICT teachers even though all ICT teachers said they have high level of competence in Encarta as shown in Table 16.

Interestingly, 50% of teacher - trainees indicated that they have high competence level in Access while 50% also indicated that they have low level competence in Access. This response from the teacher - trainees reflected the competence level of the ICT teachers. From Table 15, 3(42.9%) ICT teachers indicated they had low competence in Access, while 4(57.1%) said they have high competence in Access.

The result in Table 15 generally revealed that ICT teachers have high competence in most basic ICT applications. The high level of competence of the ICT teachers reflected in the responses of the teacher - trainees.

Table 16 presents results of response by teacher - trainees in basic windows skills.

Table 16: Frequency of Competence level of Teacher - Trainees in Windows Skills

Statement	Low Freq. (%)	High Freq. (%)	Total Freq. (%)
I can boot and shut down computer.	8(3.2)	244(96.8)	252(100)
I can locate files and folders on the computer.	14(5.6)	238(94.4)	252(100)
I can search for files and folders on the computer.	23(9.1)	229(90.9)	252(100)
I know how to use Window explorer to manage files.	85(33.7)	167(66.3)	252(100)
I can move and copy files.	79(13.9)	217(86.1)	252(100)
I can create and rename files and folders.	37(14.7)	215(85.3)	252(100)
I can minimize, maximize and resize			

Table 16 continued

windows.	33(13.1)	219(86.9)	252(100)
I can cut, copy and paste between applications.	56(22.3)	196(77.7)	252(100)
I know how to install and update antivirus.	129(51.2)	123(48.8)	252(100)
I can install computer programs.	115(45.6)	137(54.4)	252(100)

From Table 16, 244(96.8%) respondents had high competence level in booting and shutting down computer. In addition, 238(94.4%) had high competence level in locating files and folders on the computer, and 229(90.9%) had high competence level in searching for files and folders on the computer. Furthermore, 167(66.3%) respondents know how to use Window explorer to manage files, while 217(86.1%) said they can move and copy files. Besides, 215(85.3%) indicated that they can create and rename files and folders, and 219(86.9%) said they can minimize, maximize and resize windows. In addition, 196(77.7%), teacher – trainees can cut, copy and paste between applications.

The results in Table 16 also shows that 137(54.4%) respondents disagreed with the statement I can install computer programs, while 129(51.2%) indicated that they can install and update antivirus. The findings clearly show that the respondents are able to use windows application with little difficulty.

Table 17: Frequency of Competence level of teacher - trainees in Word Processing Skills

Items	Low Freq. (%)	High Freq (%)	Total Freq. (%)
I can perform formatting, tasks such as changing font size, font type, bold and text alignment.	64 (25.4)	188(74.6)	252(100)
I can identify the features of word processing window.	75(29.8)	177(70.2)	252(100)
I can use Microsoft word's grammar and spelling checker.	86(34.1)	166(65.9)	252(100)
I can create and edit tables.	95(37.7)	157(62.3)	252(100)
I can import images and pictures into my document	89(35.3)	163(64.7)	252(100)
I can use drawing tools to insert AutoShapes into my document	99(39.3)	153(60.7)	252(100)
I can find, save and print my own document.	68(27.0)	184(73.0)	252(100)

Table 17 shows that 188(74.6%) teacher - trainees had high competence in performing formatting tasks such as changing font size, font type, bold and text alignment. In addition, 177(70.2%) respondents can identify the features of word processing window, while 166(65.9%) respondents can use Microsoft word's grammar and spelling checker. Furthermore, 157(62.3%) respondents can create and edit tables. Also, 163(64.7%) teacher – trainees said they can import images and pictures into my document. Finally, 153(60.7%) respondents can use drawing tools to insert

AutoShapes into my document, and 184(73.0%) respondents can find, save and print their own document. From the findings teacher - trainees have appreciable word processing skills.

These findings fall in line with suggestions by the National Competency Standard for Teachers (2008) that the effective and appropriate use of office and teaching productivity tools by teacher - trainees is indicated by:

1. Using a word processor to enter and edit text and images
2. Format text, control margins, layout and tables
3. Print, store and retrieve text documents from a word processor, and
4. Crop, scale, colour, correct and enhance digital images.

Table 18: Frequency of Competence level of teacher - trainees in Spreadsheet (Excel) Skills

Items	Low Freq. (%)	High Freq. (%)	Total Freq. (%)
I can launch a spreadsheet application.	105(41.7)	147(58.3)	252(100)
I can identify the features of a spreadsheet window.	110(43.7)	142(56.3)	252(100)
I can enter, edit and format data in cells	102(40.5)	150(59.5)	252(100)
I can insert and delete rows and columns	91(36.1)	160(63.9)	252(100)
I can switch between work sheets	126(50.0)	126(50.0)	252(100)
I can sort data in columns	111(44.1)	141(55.9)	252(100)
I can enter a simple formular in a spreadsheet window	114(45.2)	138(54.8)	252(100)
I am able to import information from word document to excel.	136(53.9)	69(46.1)	252(100)

Table 18 revealed that 147(58.3%) respondents had high competence in launching a spreadsheet application, and 142(56.3%) respondents indicated that they can identify the features of a spreadsheet window. Besides, 160(63.9%) respondents said they can enter, edit and format data in cells. In addition, 141(55.9%) respondents said they can insert and delete rows and columns, and 138(54.8%) said they can switch between work sheets, sort data in columns, and enter a simple formular in a spreadsheet window.

The Table 18 also shows that 126(50.0%) respondents had high competence in switching between work sheets while 126(50.0%) respondents had low competence in switching between work sheets. In addition, 136(53.9%) respondents had low competence in the ability to import information from word document to excel. These findings notwithstanding, it can be concluded that teacher - trainees have high competence in spreadsheet skills.

Also, these findings are in tune with the study by the National Competency Standard for Teachers (2008) which revealed that the effective and appropriate use of office and teaching productivity tools by teacher - trainees is indicated by:

1. Using a calculation spreadsheet to enter data, sort data and format cells into tables.
2. Making computation, using formula and create graphs using spreadsheets
3. Printing and storing data tables using a spreadsheet application
4. Using a presentation package to add text and sequence a presentation

Table 19: Frequency of Competence level of teacher - trainees in Use of Peripherals

Items	Low Freq. (%)	High Freq. (%)	Total Freq. (%)
I can effectively use keyboard and mouse of a computer.	37(14.7)	125(85.3)	252(100)
I am able to print documents from a printer	99(39.3)	153(60.7)	252(100)
I can deal with print queues	132(52.4)	120(47.6)	252(100)
I can scan images into a computer.	139(55.1)	113(44.9)	252(100)
I can burn files to CDs and DVDs	121(48.1)	131(51.9)	252(100)
I can transfer files from a digital camera to a computer	120(47.6)	132(52.4)	252(100)
I can identify memory chip, processor, mother board and hard disk in the system unit.	78(31.0)	174(69.0)	252(100)
I can identify the front and back parts of the system unit.	73(29.0)	179(71.0)	252(100)

On the use of peripherals, over 50 percent of teacher - trainees indicated high competence in most of the statements. From Table 19, 125(85.3%) respondents said they can effectively use keyboard and mouse of a computer. Also, 153(60.7%) respondents indicated high competence in printing documents from a printer while, 131(51.9%) respondents pointed out that they can burn files to CDs and DVDs. In addition, 132(52.4%) respondents showed that they can transfer files from a digital camera to a computer. Besides, 174(69%) respondents indicated that they can identify

memory chip, processor, mother board and hard disk in the system unit. However, 179(71.0%) respondents said they cannot identify the front and back parts of the system unit.

The Table 19 also revealed that 132(52.4%) and 139(55.1%) of the respondents had low competence in dealing with print queues and scanning images into a computer. From the Table 19, it can generally be said that teacher - trainees had high competence in the use of most peripherals.

These findings are in line with the study by the National Competency Standard for Teachers (2008) which revealed that for teacher - trainees to teach efficiently they should be able to:

1. Identify and define the functions of computer peripherals (i.e. printer, scanner, modem, digital camera, speaker, etc.)
2. Properly connect main components, configure peripherals and install drivers when required
3. Configure computer settings of various software and hardware
4. Attach and configure scanners, cameras, cell phones to acquire digital images
5. Store digital images using optical media (CD, DVD, flash disk) and online repositories

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview

This Chapter provides outlines of the main findings and conclusions derived from the empirical results. The chapter also discusses the policy implications of the study, and directions for future research.

Summary

The objective of this study was to assess the skill level of teacher - trainees to handle ICT at the Basic Education level in the Central Region of Ghana. Descriptive research design was employed in this study where questionnaire was the main tool to collect data for the study. A sample size of 7 ICT tutors and 252 teacher-trainees (students) responded to the questionnaire out of a population size of 9 ICT tutors and 870 teacher-trainees (students) from the three Colleges of Education located in the Central Region of Ghana.

The sample size for tutors and teacher-trainees were obtained using the multi-stage sampling technique. The respondents were randomly drawn from the three selected Colleges of Education; Our Lady of Apostles (OLA) College of Education, Komenda College of Education and Foso College of Education.

The research used six research questions to guide the study. Questionnaires were the main data collection instrument. Statistical Program for Social Sciences (SPSS) version 18 for Windows was used to help in data

analysis. Frequencies and percentages were used as a statistical tool to analyze research questions one, three, four, five and six while frequency, mean score and standard deviation were used as a statistical tool to analyze research questions two. The main findings of the study were as follows:

1. Both teacher - trainees and ICT teachers indicated the availability of computer laboratory, computers, projectors, internet and digital camera in their respective institutions. They, however, indicated non availability of Smart boards, CDs on tutorial, and CDs on drill and practice.
2. Teacher - trainees believed that computers were necessary for lesson delivery, achieving lesson objectives, and learning drill and practice. They also indicated that most instructional strategies were easily applied with computer, and that time is well spent if computers are used in the classroom. It was also indicated that computers give better understanding of topics than lectures. The teacher - trainees intimated that they leant to use computer in their current institutions.
3. Both teacher - trainees and ICT teachers use internet and its resources effectively to: interact with other students (online discussion), find information they require, work on group activities, find additional information on lessons taught, get expert knowledge to complete project, find information for their assignments, and download software.
4. With the way ICT teachers use computers and projectors in lesson delivery, majority of the teacher - trainees were of the view that ICT is useful in education. They were however not happy with non usage of

computer for drill and practice, and tutorial packages, as well as students not videotaped as they work on activities.

5. Teacher - trainees perceived computers to provide minimal challenges when being used in lesson delivery. They indicated that students go to the computer laboratory for ICT lessons, each student sits by one computer, students are taken through practical lessons step-by-step, teachers use projector for lesson presentation and demonstrations, and students are given both individual and group activities to work on.
6. Though teacher - trainees showed that they do not know constructivist learning theory, their tutors indicated that they considered constructivists' instruction when planning lessons. The step – by – step practical lesson and the consideration of constructivists' instruction when planning lessons by tutors show a blend of behaviourist and constructivist learning theories in training the to be teachers.
7. Teacher - trainees showed high competence level in most basic ICT applications and software skills such as window skills, Word Processing Skills, Spreadsheet (Excel) Skills, and use of peripherals. These are key ICT competences needed for handling ICT at the Basic Education level.

Conclusions

From the study, it was observed that the right caliber of tutors with the needed qualifications and experience have been employed to train teachers in ICT. These, coupled with the availability of physical ICT infrastructure, have

increased enthusiasm of teacher - trainees to learn ICT. In addition, the blend of learning theories also enhanced teaching and learning.

The findings from this study indicate that teacher - trainees have the requisite skills to handle ICT at the Basic Education Level in the Central Region of Ghana.

Policy Implications

Based on the findings of this study, the following policy conclusions were drawn:

1. As shown in the study, neither the ICT teachers nor teacher - trainees had ICT teaching syllabus for Junior High Schools. This spectacle was not the best since training of teachers should strictly be guided by what they are expected to do after training. If the object is for teacher - trainees to have knowledge and skills required of a teacher in order to teach at the basic schools, then the ministry of Education should ensure the availability of Basic Schools' teaching syllabus in all training colleges.
2. In addition, efforts should also be made by the Ministry of Education to increase the number of computers in the computer laboratories. This way every student will have access to a computer and so actively participate in projects and lessons.
3. Evidence emerging from the study further suggests that some teaching and learning materials such as Smart boards, CDs on tutorial, and CDs on drill and practice were not available. Looking at the use of many learning theories by the ICT tutors, it is

necessary to employ all important teaching and learning materials to ensure comprehensive teaching and learning. The Ministry of Education as well as Principals and heads of departments in the Colleges of Education should ensure the availability of these ICT teaching aids.

Direction for Future Research

It is not easy to deal with all aspect of this study in a single research since skill level of teachers has several dimensions including confidence, readiness and attitude.

It is therefore recommended that a replica of this study using larger sample size and more evenly distributed across the 38 Colleges of Education should be carried out as this will show the true picture of teacher - trainees' ability to handle ICT in basic schools in the entire country, Ghana. Additional research using observation research design to ascertain how teacher - trainees are able to integrate ICT in a constructivist classroom is necessary. Further analysis should aim at confidence, readiness and attitude of teacher - trainees to handle ICT at the Basic Education level in Ghana.

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APPENDIX A

UNIVERSITY OF CAPE COAST
CENTRE FOR CONTINUING EDUCATION

Questionnaire for teacher - trainees

This questionnaire is to collect data on how to inculcate ICT in lesson delivery.
Please, frank response from you would be of great help for this study. The feedback from you would be treated with confidentiality.

Please;

- Do not write your name.
- Read the questions carefully before you answer.
- Be honest and sincere with your answers

(A) Demographic data

1. Institution: Ola College of Education [ ]
   Komenda College of Education [ ]
   Fosu College of Education [ ]
2. Gender: Male [ ] Female [ ]
3. Age: Between 15 - 20 years [ ]
   Between 21 – 25 years [ ]
   Between 26 – 30 years [ ]
   Above 30 years [ ]
4. Course……

(B) Physical ICT infrastructure in place at the Colleges of Education.

Tick **[√]** to indicate the **availability** or otherwise of the following ICT resources in your college.

	ICT Resource	Available [√]	NOT Available [×]
5	Computer laboratory		
6	Computers		
7	Projector		
8	Smart board		
9	Internet		
10	Digital Camera		
11	Printer		
12	CDs on Tutorial		
13	CDs on Drill and Practice		

(C). Technological proficiency of teacher - trainees

The purpose of this section is to gather information about your skill and level of

proficiency in using various computer applications. Indicate your level of proficiency with

each item using: **unfamiliar, low proficiency, medium proficiency, high proficiency**

	Computer application	Level of proficiency			
		Unfamiliar	Low	Medium	High
14	Word Processing				
15	Database				
16	Spreadsheet				
17	Desktop Publishing				
18	PowerPoint				
19	Internet				
20	E-mail				
21	Coral draw				
22	Encarta				
23	Adobe reader				
24	Access				

(D). Views of teacher - trainees about the ways computers can affect teaching in the classroom.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)

	Statement	SA	A	D	SD
25	Computers are necessary for lesson delivery in the classroom				
26	Computers help teachers to achieve lesson objectives				
27	Computer is useful for learning drill and practice				
28	I learnt to use computer in my current institution				
29	Computers are difficult to use				
30	Most instructional strategies are easily applied with the computer.				
31	Computers give better understanding of topics than lectures.				
32	Time is well spent if computers are used in the classroom				
33	Computer-related technologies are of little use in the classroom.				
34	Computers should not be used in the classroom.				

(E). Teacher - trainees and the internet

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
35	In my college, Internet is available all the time				
36	I can create and send emails to other students				
37	I use the internet to find the information I require.				
38	I can use the internet to download software				
39	I use internet to find information for my assignments.				
40	Internet helps to find additional information on lessons taught				
41	I use the internet to get expert knowledge to complete project				
42	I use the internet to interact with other students (online discussion)				
43	Students use internet for group and problem solving activities				

44	Students use the internet for individual work				
45	I use the internet for entertainment				

(F). Implications of an instructional approach supported by the use of computers.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
46	Computer is a very important tool for instruction.				
47	Teachers use computer to teach lessons				
48	Teachers prepare PowerPoint presentation for classroom lessons				
49	Teachers use computer for drill and practice, and tutorial packages				
50	Students are videotaped as they work on activities				
51	Computer is more effective in providing individual feedback than a teacher.				
52	Students are easily assessed using internet (online).				
53	Assessing students through written multiple choice and essay questions are better.				
54	Teacher promotes discussions, question and answers during lessons				
55	Teacher allows students to present different ideas to get solutions to tasks				

(G). Challenges that are inherent in the use of computers in a constructivist instructional approach.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
56	Students go to the computer laboratory for ICT lessons.				
57	Computers are in the classrooms.				

58	Each student sits by one computer.				
59	Students are taken through practical lessons step-by-step.				
60	Teachers use projector for presentation and demonstrations.				
61	Students are given individual activities to work on.				
62	Students are often times given group work.				
63	I prefer working in group				
64	I prefer working alone.				
65	I know constructivist learning theory				
66	I know other learning theories such as objectivism and social learning				

(H) Competent level of teacher - trainees in hardware and software.

Tick [√] to indicate your level of skills from 0 to 3:

(0 = No skills at all, 1 = fairly, 2 = Good, 3 = very skilled).

	Statements (General Window Skills)	**0**	**1**	**2**	**3**
67	I can boot and shut down computer.				
68	I can locate files and folders on the computer.				
69	I can search for files and folders on the computer.				
70	I know how to use Window explorer to manage files.				
71	I can move and copy files.				
72	I can create and rename files and folders.				
73	I can minimize, maximize and resize windows.				
74	I can cut, copy and paste between applications.				
75	I know how to install and update antivirus.				
76.	I can install computer programs.				
	Word Processing Skills	**0**	**1**	**2**	**3**
77.	I can perform formatting tasks such as changing font size, font type, bold and text alignment.				
78.	I can identify the features of word processing window.				
79.	I can use Microsoft word's grammar and spelling checker.				
80.	I can create and edit tables.				
81.	I can import images and pictures into my document				
82	I can use drawing tools to insert AutoShapes into my				

	document				
83	I can find, save and print my own document.				
	Spreadsheet (Excel) Skills	**0**	**1**	**2**	**3**
84.	I can launch a spreadsheet application.				
85	I can identify the features of a spreadsheet window.				
86	I can enter, edit and format data in cells				
87	I can insert and delete rows and columns				
88	I can switch between work sheets				
89	I can sort data in columns				
90	I can enter a simple formular in a spreadsheet window				
91	I am able to import information from word document to excel.				
	Use of Peripherals	**0**	**1**	**2**	**3**
92	I can effectively use keyboard and mouse of a computer.				
93	I am able to print documents from a printer				
94	I can deal with print queues				
95	I can scan images into a computer.				
96	I can burn files to CDs and DVDs				
97.	I can transfer files from a digital camera to a computer				
98.	I can identify memory chip, processor, mother board and hard disk in the system unit.				
99.	I can identify the front and back parts of the system unit.				

APPENDIX B

UNIVERSITY OF CAPE COAST
CENTRE FOR CONTINUING EDUCATION

Questionnaire for ICT teachers

This questionnaire is to collect data on how to inculcate ICT in lesson delivery.
Please, frank response from you would be of great help for this study. The feedback from you would be treated with confidentiality.

Please;

- Do not write your name.
- Read the questions carefully before you answer.
- Be honest and sincere with your answers

(A). Demographic Data

1. Institution: Ola College of Education [ ]
   Komenda College of Education [ ]
   Fosu College of Education [ ]

2. Gender: Male [ ] Female [ ]

3. Age: Below 25 years [ ]
   Between 26 – 30 years [ ]
   Between 31 – 35 years [ ]
   Between 36 – 40 years [ ]
   Above 40 years [ ]

4. What is your academic qualification?
   Diploma [ ]
   B.A Arts [ ]
   M.A [ ]
   BSc Computer Science [ ]
   M. Phil [ ]
   Others, (specify)……

5. What is your professional qualification?
   Diploma [ ]
   B. Ed [ ]

PGDE [ ]
M. Ed [ ]
M. Ed (IT) [ ]
Others,(specify) ……

6. How many years have you been in the teaching field?
   Below 5years [ ]
   Between 6-10years [ ]
   Between 11-15years [ ]
   Above 15years [ ]

(B). Physical ICT infrastructure in place at the Colleges of Education.
Tick **[√]** to indicate the **availability** or otherwise of the following ICT resources in your college.

	ICT Resource	Available [√]	NOT Available [×]
7	Computer laboratory		
8	Computers		
9	Projector		
10	Smart board		
11	Internet		
12	Digital Camera		
13	Printer(s)		
14	CDs on Tutorial		
15	CDs on Drill and Practice		

(C). Technological proficiency of ICT teachers

The purpose of this section is to gather information about your skill and level of
proficiency in using various computer applications. Indicate your level of proficiency with
each item using: **unfamiliar, low proficiency, medium proficiency, high proficiency**

	Computer Application	Level of Proficiency			
		Unfamiliar	Low	Medium	High
16	Word Processing				
17	Database				
18	Spreadsheet [Excel]				
19	Desktop Publishing				
20	PowerPoint				
21	Internet				

22	Encarta				
23	E-mail				
24	Coral draw				
25	Adobe reader				
26	Access				

(D). Views of ICT teachers about the ways computers can affect teaching in the classroom.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion. Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
27	Computers are necessary for lesson delivery in my school				
28	Computers help in lesson preparation				
29	Computers help to include learning applications in lessons				
30	Computers help teachers to achieve lesson objectives				
31	I use computers to apply instructional strategies during lessons				
32	Using computers to teach give better understanding of topics than lectures.				
33	Time is well spent if computers are used in the classroom				
34	Computer-related technologies are of little use in the classroom because they are too difficult to use.				
35	Computers should not be used in the classroom.				
36	JHS Syllabus is available to all teachers.				

(E). ICT Teachers and the internet

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
37	In my college, Internet is available all the time				
38	I can create and send emails to students				
39	I use the internet to find the information I require.				

40	Internet is helpful in lesson preparation				
41	I can use the internet to download software				
42	Internet helps to find latest information for my lessons				
43	I use the internet to get expert knowledge to achieve lesson objectives				
44	I use the internet to interact with students (online discussion)				
45	I engage learners to use the internet for problem solving activities				
46	Learners use the internet for individual work				
47	I use the internet for entertainment				

(F). Implications of an instructional approach supported by the use of computers.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
48	Computer is a very important tool for instruction.				
49	I always use computer to teach				
50	I prepare PowerPoint presentation for my classroom lessons				
51	I use computer for drill and practice, and tutorial packages				
52	Students are videotaped as they work on activities				
53	The computer is more effective in providing individual feedback than a teacher.				
54	Students are easily assessed using internet (online).				
55	Assessing students through written multiple choice and essay questions are better				

(G). Challenges that are inherent in the use of computers in a constructivist instructional approach.

To what extent do you agree with the statements below? Tick [√] to indicate your opinion.

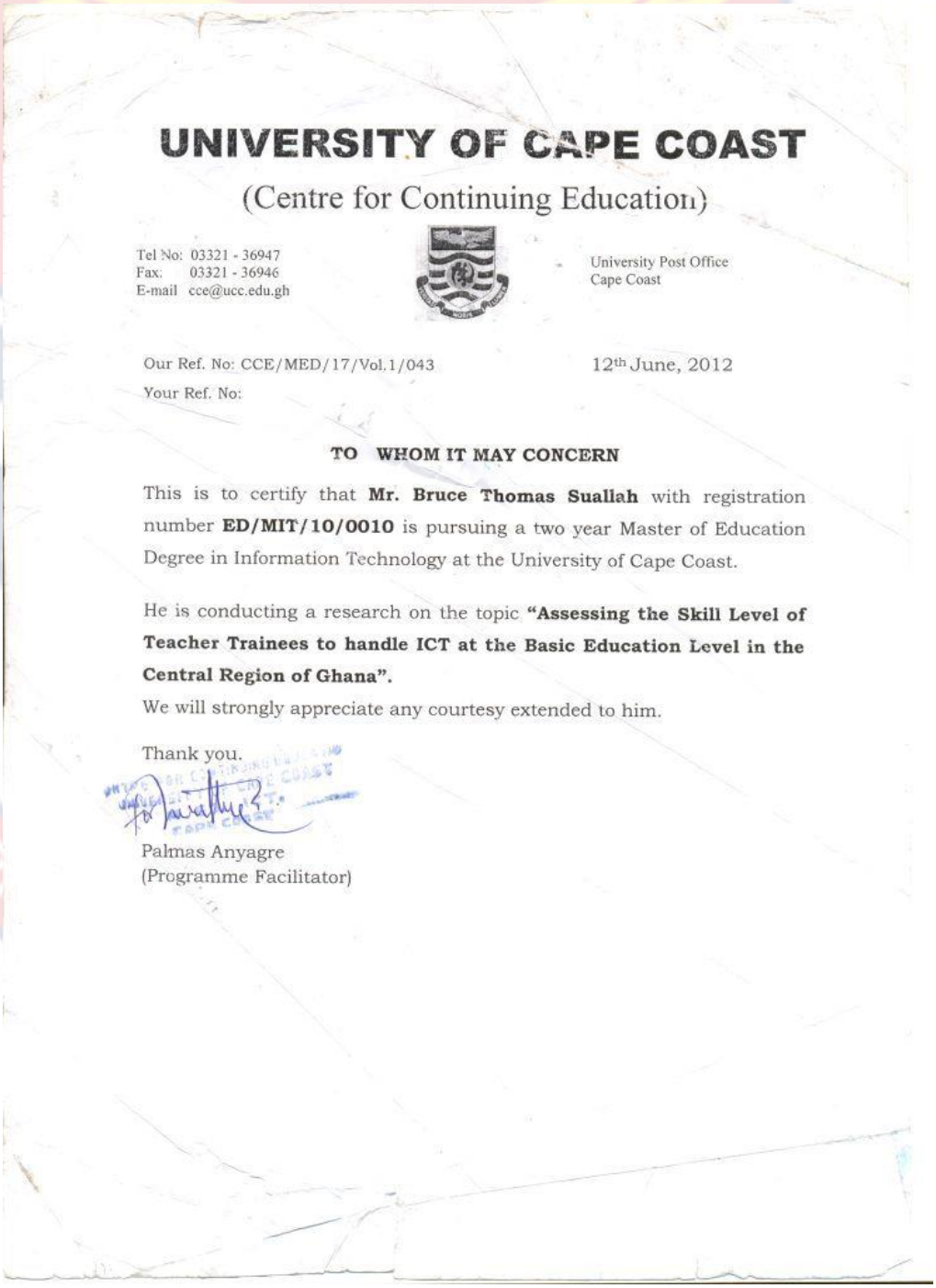
Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

	Statement	SA	A	D	SD
56	Students go to the computer laboratory for ICT lessons.				

57	The computers are in the classrooms.				
58	Each student sits by one computer.				
59	Students are taken through practical lessons step-by-step.				
60	I use projector for lesson presentation and demonstrations.				
61	Students are given individual activities to work on.				
62	Students are often times given group work.				
63	I consider constructivists' instruction when planning lessons				

APPENDIX C

LETTER OF INTRODUCTION



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University Post Office
Cape Coast

Our Ref. No: CCE/MED/17/Vol.1/043

12th June, 2012

Your Ref. No:

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Bruce Thomas Suallah** with registration number **ED/MIT/10/0010** is pursuing a two year Master of Education Degree in Information Technology at the University of Cape Coast.

He is conducting a research on the topic **"Assessing the Skill Level of Teacher Trainees to handle ICT at the Basic Education Level in the Central Region of Ghana".**

We will strongly appreciate any courtesy extended to him.

Thank you.

Palmas Anyagre
(Programme Facilitator)