UNIVERSITY OF CAPE COAST

TUTORS' AND STUDENTS' UTILIZATION OF ICT IN THE COLLEGES OF EDUCATION IN THE EASTERN REGION, GHANA

BY

CHARLES GYASI VAN-ESS

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2013

DECLARATION

Candidate's declaration

I hereby declare that this thesis 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: ……

Name: Charles Gyasi Van-Ess

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: …… Date: ……

Name: Prof. Yaw Afari Ankomah

Co-supervisor's Signature: …… Date: ……

Name: Dr. Janet Koomson

ABSTRACT

The study examines tutors' and students' utilization of ICT in the colleges of education in the Eastern Region of Ghana. In all, 257 respondents, made up of 176 students and 81 tutors, representing a retrieval rate of 95.2%, responded to the questionnaires with an alpha reliability of (0.759 for tutors and 0.712 for students) and this formed the sample of study. The study which was descriptive in nature employed the use of questionnaires for the collection of data. Frequencies were tallied and their corresponding percentages computed and were presented in tables.

Generally, computers were available in all the six colleges of education but were inadequate for students use since the student-computer ratio is approximately 17:1. Again, although majority of 146 (56.8%) respondents had personal computers, they hardly used them. Also, the computer laboratories 86 (33.5%), internet cafés 82 (31.9%) and offices 69 (26.8%) mainly served as the venues for accessing ICT services by the respondents. Further, inadequate computers and peripherals for the students, conflicting teaching-time schedule, and dysfunctional hardware were the main barriers to the successful integration of ICT in the colleges of education. However, the colleges of education could improve access, availability and proficiency through tutors and students development programmes. Provision could also be made by Principals on the teaching-time schedule for students to improve their proficiency levels. Tutors, on the other hand, should be trained adequately by the Ministry of Education to enable them integrate ICT in their teaching and learning process effectively.

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DEDICATION

To My Family and In memory of My Late Father.

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CHAPTER ONE

INTRODUCTION

Background to the Study

All over the world, institutions and structures are changing as a result of access to increased amounts of information (Kelly, 1998). It is therefore obvious that for education to really prepare students for success, educators have a responsibility to teach students how to use technology to solve problems in the various fields of their study. As a result "computers have become a routine tool for helping teachers accomplish their professional work" (Becker, Ravitz & Wong, 1999 p. 32). Many teachers however, do not facilitate substantial student use of computers for learning activities (Becker, Ravitz & Wong, 1999; de Corte, 1990; Karsenti & Tchaméni-Ngamo, 2007, Newhouse, 1999).

That is to say, the role of technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy (Rosen & Well, 1995; Thierer, 2000). As agreed by most experts in the field of education that, when properly used, information and communication technology hold great promise to improve teaching and learning in addition to shaping workforce opportunities. Literature attests to the fact that the power of ICT can help in teaching and learning processes (Fonkoua, 2006; Newhouse, 2002). Also, it has been suggested that using technology well in classrooms can even prepare students to be more effective citizens in increasingly

open and democratic societies (John & Sutherland, 2004). A Research in West and Central Africa shows that ICT for teaching and learning in school environments can contribute to developing a more child-centred approach to pedagogy (ROCARE, 2006). This made Poole (1996) to suggest that computer illiteracy is now regarded as the new illiteracy. He points to the fact that this has actually gingered a new and strong desire to equip schools with computer facilities and qualified personnel necessary to produce technologically proficient and efficient students in the countries of the world. Many studies have again found positive effect associated with technology aided instruction (Burnett, 1994; Fitzgerald & Warner, 1996).

The world has experienced a rapid growth in information technology for some decades now. This development has taken place in so many dimensions in the field of communication media such as internet, computer television and more. The most versatile machine created in the information technology sector is the computer. It has been accepted by people in various forms of work and this is as a result of its multipurpose functions that are used to solve problem at various levels. According to Bosu (2008), the computer based technology is the use of computers to access information, communicate, support instruction and assist in the accomplishment of administrative and managerial tasks in educational institutions. Beyond the mere introduction of Information Technology in schools, the fundamental debate by most expects in the field of education is to find a way to modify the methodology and transform education in a way in which it reflects the world around us. This presupposes that New Information and Communication

Technologies (ICT) via the computer and the internet are therefore a great way to pursue this change.

In the view of Picciano (2002), as cited in Bosu (2008), with computer technology task could be accomplished more effectively and efficiently and should therefore be integrated in any education plan. He opines that information and communication technologies (ICT) are used to gather, analyze, modify and exchange information. The internet and interactive computer-based multimedia capabilities are also transforming educational institutions and the way teachers teach and students learn (Charp, 1998). Dwyer (1994) in his writings also suggest that technology in education provides an array of tools for acquiring information and increasing access to successful learning. Aribisala (2006) further posits that ICTs are increasingly playing an important role in organisations and in society's ability to produce access, adopt and apply information. According to him, they are however being heralded as the tools for the post-industrial age and the foundations for a knowledge economy due to their ability to facilitate the transfer and acquisition of knowledge. Further, stressing the importance of the use of ICT in schools, Olurunsola (2007) opines that through ICT, educational needs have been met; it changes the needs of education as well as the potential processes. He continues that message can be communicated through the e-mail, telex or telephones particularly the mobile ones.

Similarly, the pervasiveness of ICT has brought about rapid teleological, social, political and economic transformation, which has eventuated in a network society organized around ICT (Yusuf, 2005). The author posited that ICT is an

indispensable part of educational administration as its application makes institutions more efficient and productive, thereby engendering a variety of tools such as the computer and the internet to enhance and facilitate teachers' pedagogical activities. Teaching and learning as suggested by Ajayi (2008) has gone beyond the teacher standing in front of a group of pupils and disseminating information to them without the students' adequate participation. According to the author, with the aid of ICT, teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore. Also to him, the computer and the internet are increasingly making their way into teaching and learning practices and processes. This made Bosu (2008) to postulate that in order for technology to be utilized effectively, a technological infrastructure must exist, and the specific technology being introduced needs to be compatible with experiences and values of potential users. Many schools now use computers routinely for administrative and academic work (Chulagasyena, 1999). Therefore, teachers have to develop their computer skills for teaching preparation and teaching performance. For, good computer-aided instruction leads to a high quality of teaching and helps students to understand the subject content more easily.

According to Ajayi (2008), the use of these facilities, such as computer and internet involves various methods which include systematized feedback system computer-based operation/network, video conferencing and audio conferencing, internet/ worldwide websites and computer assisted instruction. It must however be noted that the effective use of the various method of the ICT in

teaching and learning depends on the availability of these facilities and teachers' competence in using them. The current rise in information and communication technology (ICT) provides new challenges to education. Information technology almost imposes an unconditional incorporation of ICT tools in the teaching and learning process as a means of preparing students to enter a job market where information technology is pervasive. Consequently, many colleges of education in Ghana have managed to acquire computers that are intended to enable them provide their student-teachers with basic knowledge and skills in the processing of information via computers.

The potential of computer technologies to revolutionize teacher education teaching and learning has long been celebrated by education technologists. Academic journals in the field of educational technology regularly features research focusing on the ability of technologies like the computer and the Internet to accelerate university students' learning, enhance and democratize access to educational opportunities, and support interactivity, interaction, and collaboration (e.g. Draper & Brown 2004; Corlett et al., 2005; Oliver 2006). In short, the turn towards computer-based teaching and learning over the past 20 years is assumed to have revolutionized and revitalized the education sector. Thus, stark ultimatums continue to be made by education technologists that higher education must either 'transform or die' in the face of technological progress (Bates, 2004).

Most importantly, effectively introducing technology into schools is also largely dependent upon the availability and accessibility of ICT resources (e.g. hardware, software and communications infrastructure) (Hennessy, Harrison &

Wamakote, 2010). Clearly, if technology cannot be accessed by the teacher, as in so many educational settings in Ghana, then it will not be used. It is a known fact, they continue that state funding for such resources is scarce, and that ICT resources tend to be more available in urban than rural areas and Ghana is no exception. Liverpool's literature on the developing use of ICT to enhance teaching and learning in East African schools, shows that while the process has previously been painfully slow the situation has been improving in the last few years (Liverpool, 2002). An extensive literature review of Liverpool's work further adds that schools are increasingly being equipped with computers for teaching, learning and administrative purposes, connectivity is improving and students are enthusiastic about using computers for learning, despite the lack of equipment available (Hennessy & Onguko, forthcoming).

Ghana's national development strategy (Government of Ghana, 1995) emphasizes the use of information and communications technology (ICT) to accelerate the socioeconomic development of the country. A national commission on ICT was set up in 2002 to develop a national ICT policy in order to achieve this national goal. The development of this policy was based on an extensive nation-wide consultation with stakeholders from the public and private sectors, the academic community, as well as civil society, including members of various political parties and groupings.

The report of this commission is what is now known as the Ghana ICT for Accelerated Development Policy (ICT4AD) (Republic of Ghana, 2003). The ICT4AD policy represents the vision of Ghana in the information era. It takes into

consideration the targeted goals of key socio-economic development framework documents such as the Vision 2020. The ICT4AD policy statement therefore sets out the road map for the development of Ghana's information society and economy. It provides a basis for facilitating the socio-economic development of the country in the emerging information, knowledge and technological age. Promoting ICTs in education by deploying and exploiting the potential of ICTs in education is one of the 14 identified pillars of the ICT4AD policy.

The need for the learning of the Information and Communication Technology (ICT) as enshrined in the Ghana ICT for Accelerated Development (ICT4AD) necessitated the formulation of the policy statement of the government of Ghana in relation to information and communication technology (ICT) in the country. The policy stipulated that "as part of the mission to: transform the educational system to provide the requisite educational, and training services and environment capable of producing the right types of skills and human resources required for developing and driving Ghana's information and knowledge-based economy and society, the Government is committed to a comprehensive programme of rapid deployment, utilization and exploitation of ICTs within the educational system from primary school upwards. Policy efforts shall be directed at using ICTs to facilitate education and learning within the educational system and to promote e-learning and education as well as life-long learning within the population at large".

Looking at this policy statement of the government of Ghana in relation to ICT, there is therefore the need for the government to provide the necessary

infrastructure, logistics and personnel for the smooth acceleration of the policy. When all these factors are put in place and made available to educators and learners then the acquisition of skills can take place very effectively, thereby enhancing the effective utilization of ICT. Hence, empowering educators and learners in the field of ICT will in no doubt improve the quality of education in the country.

The education sector in Ghana is in that regard mandated to modernize the curricula at all levels to cater for the integration and introduction of computer-technology studies and the use of technology in teaching and learning. However, the pre-tertiary teachers' computer-based technology literacy levels are generally believed to be very low or nonexistent, and most tutors in all colleges of education do not use computer-based technologies in their classrooms.

Statement of the Problem

There is a universal recognition of the need to use Information and Communication Technology (ICT) in education as we enter the era of globalization where the free flow of information via satellite and the internet hold sway in global information dissemination of knowledge (Aduwa-Ogiegbaen & Iyamu, 2005). The ICT4AD vision for Ghana is to improve the quality of life of the people of Ghana by significantly enriching their social, economic and cultural well-being through the rapid development and modernization of the economy and society using information and communication technologies as the main engine for accelerated and sustainable economic and social development. However, in spite of the huge efforts by the government of Ghana to position ICT via computer

technologies and the internet as a central tenet at the various levels of education in the country as envisaged in the vision, the fact that many students and teachers make only limited formal academic use of ICT during their teaching and learning is less discussed by educational technologists in the area of colleges of education.

This situation has prompted some commentators to dismiss ICT in higher education as nothing more than a 'service' area of curriculum and pedagogy which many students and faculties are reluctant to engage in with an active or sustained manner (Reffell & Whitworth, 2002). As is usually the case in educational debate, blame for this disparity has been most frequently attributed to deficits of skills, motivation, and know-how on the part of students, faculty, and the educational institutions themselves (Keller, 2005; Simmons et al., 2005). In this regard, a lot of studies have shown the multifaceted problems militating against the effective use of ICT in the teaching learning process in schools.

Furthermore, there is an almost universal emphasis on the utilization of ICT (basically the computer and internet usage) by both teachers and students for software use and information gathering in the colleges of education. However, for one to use ICT effectively there is the need to have access and skills for its usage. The skills emphasis here is reinforced due to the lack of technology located in the classrooms and a corresponding concentration on purpose – built computer laboratories (Hennessy, Harrison & Wamakote, 2010). In recent times also, despite a great deal of effort and optimism by the government of Ghana for many more learners and educators to benefit from access to ICT, the infrastructures necessary for deploying technological resources are insufficient if not lacking. It

is also a growing concern that, more teachers are working in conditions that are not conducive to supporting ICT use in the colleges of education in the country.

It is obvious that the current rise in information and communication technology (ICT) therefore provides new challenges to education. This era of information technology almost imposes an unconditional incorporation of ICT tools in the teaching and learning process as a means of preparing would-be teachers to enter the job market where information technology is pervasive. An exposure to the basic use of computer and the unique role the computer can play in the teaching and learning is therefore necessary to provide students with a much broader view of Information and Communication Technology.

However, despite the numerous benefits, there are considerable concerns regarding whether college ICT programmes are indeed serving their intended purpose of exposing students to the usage of the technological tools that would enhance skill acquisition, and promote mastery over subject matter. Unfortunately, the emergence of ICT in Ghanaian colleges of education especially, those in the Eastern Region, seem to lack definite goals for teaching and learning. This is happening so independently that the extent to which its introduction is benefiting education of the students and tutors in the area of utilization is uncertain. Again, although the colleges of education in the Eastern Region are institutions of learning that train students to teach, it cannot be ascertained whether ICT is serving its purpose or whether it has any influence on teaching and learning. More so, looking at the educational importance of ICT, the availability and extent of computer and internet technologies use to access and

gather information in Ghanaian colleges of education have not been fully described. Importantly, though the idea of ICT in the colleges of education has been fully endorsed by policy makers, educators, teachers and many others, it is interesting that so much of its potential in the area of its utilization is not only unrealised but apparently unrecognised. There is therefore the need to find out the extent of ICT utilization by both tutors and students at the colleges of education in the Eastern Region of Ghana.

Purpose of the Study

In Ghana, there is support and interest across the whole education sector for the development and integration of ICT into education policy, curriculum and practice. There is a clear consensus that the introduction and use of ICT in schools should be grounded in a clear understanding of the purpose, practice and social content of the country's school. There is a growing recognition of the many different ways that ICT can contribute to, or transform, the activities, roles and relationship experience by youth and adults in the education settings.

The purpose of the study was to assess the extent to which the utilization of Information and Communication Technology (ICT) is enhancing effective teaching and learning in the colleges of education in Eastern Region of Ghana. It further sought to ascertain whether there are availability and accessibility of ICT facilities and to identify the barriers to the use of those facilities. Again, the purpose was to find out the proficiency levels of both tutors and would-be teachers in the use of ICT.

Research Questions

The study sought to answer the following research questions:

1. How available and accessible are ICT facilities to students and tutors in colleges of education in the Eastern Region?
2. How do students and tutors rate their proficiency in the use of ICT in the colleges of education in the Eastern Region?
3. What are the ICT/computer technology utilization patterns of students' and tutors' in colleges of education in the Eastern Region?
4. What are the barriers to the utilization of computer and internet as ICT tools in the Eastern Region?

Significance of the Problem

The study will help to find the true state of ICT facilities and how computer technologies are being used by both teachers and would-be teachers of colleges of education in the Eastern Region of Ghana. The study will again inform policy makers like the Ministry of Education (MOE) to help improve upon the integration of ICT the school curriculum in the country. Similarly, the study will provide Ghana Education Service (GES), the implementers of educational policies in the country, the needed impetus to give proper training to teachers and would-be teachers to enhance the integration of ICT and computer technologies into Ghanaian basic schools. Furthermore, the findings of this study will help educational developers to design the appropriate facilities that can promote effective teaching and learning in the various schools in the country and the world as a whole.

Also, the government will be informed as to whether the GES is actually making head ways in its quest to making Ghanaian school children ICT literates. Finally, the findings of this study will serve as inspiration for similar work to be conducted in other colleges of education in other regions of the country.

Delimitation of the Study

Many areas need intensive study concerning ICT via computer utilization in colleges of education, but in a study like this it is very difficult, if not impossible, to cover all such areas. This particular study was confined to the utilization of ICT via computer technologies by tutors and students of colleges of education. Finally, the study will be restricted to the Eastern Region of Ghana and for that matter, the colleges of education in the catchment area.

Limitations of the Study

Like any other study, this work has its own limitations. The questionnaire for the study would have been prepared for all tutors and students of the colleges of education in the Eastern Region. This would have helped the researcher ascertain the true picture of tutors' and students' utilization rate of ICT via computer technologies of the colleges of education in the region so as to make the generalization more effective. However, this was not practicable. The third year students were out of campus on teaching practice for the whole year so it was difficult getting a majority of them for the study.

Definition of Terms

Educational Technology: is the field concerned with the design, development, utilization, management, and evaluation of processes and resources for learning.

Technology (process): construction uses and the organization of knowledge for the achievement of practical purposes in intellectual and social contexts.

Technology (tool): material construction and operation of physical systems based on systematic knowledge of how to design artefacts.

Information and communication technology (ICT): refers to computer technologies but also includes other technologies used for the collection, manipulation, storage and communication of information (Newhouse, 2002). *Information and communication technology* refers to the combination of computer-based technologies and telecommunication technology for the purpose of gathering data or information, processing data, sharing and disseminating information from one place to another. For example wireless and satellite communications blend with computer-based networks for data and information transfer over long distances. In the context of this study, ICT and Information Technology (IT) were used interchangeably.

Application: May be used to refer to a type of software as a word processor or generally to the use of computers in a particular situation.

Computer: An electronic device or machine that works or operates under the control of a stored programme, or instructions stored in its own memory. It can accept data in one form and manipulate or process data according to specified rules, to produce meaningful information or results and store them.

Computer Literacy: Concerning the knowledge, skills and attitudes which enable individuals to use computer technology to benefit them and others in relation to tasks they wish to accomplish.

Computer Awareness: Concerning the understanding of the role of computer technology and its social implications associated with the use of computers in society.

E-mail (Electronic Mail): Text messages and computer files exchanged through computer communication, via internet or intranet networks.

Hardware: The tangible components of computers including processors, input, output, communications and memory.

Interactive Multimedia: The use of a computer to control and present combinations of media such as text, graphics, video and sound. Sometimes the term is shortened to multimedia.

Internet: The international network of computer using common protocols such as TCP/IP.

Intranet: A communications network, based on the same technologies used for the internet but only available to authorized users within an organization or company.

Software: The sets of instructions and data used by computers, sometimes referred to as computer programmes.

Technology refers to computer-based tools such as computers, multimedia and the internet used for teaching and learning purposes.

Technology integration: Is defined as the use of computer technology to create or reorganize the learning environment (Mills & Tincher, 2003). Technology

infusion, on the other hand, involves technology-based tools such as course management systems, spreadsheets, multimedia, and telecommunications used to augment particular instructional events. In the context of this study, however,

Technology integration: Refers to the blending of computer-based tools with learning and instructional activities that provides a richer teaching and learning environment.

Staff technology use*:* refers to faculty use of computer-based technology for teaching and learning. This includes the use of mainstream application software (e.g. word processing, spreadsheet, and presentation software) curriculum/subject-based software, the web, and multimedia tools.

Organization of the Rest of the Study

The entire study comprises five chapters. The first chapter provided the introduction to the study covering such areas as, the background of the study and statement of the problem among others.

Chapter Two reviewed related literature and examined the concept of educational technology, Educational technology in Ghana, Technology and teacher education in Ghana, the concept ICT, Roger's theory of diffusion of innovation, Staff and student technology utilization and others.

The research methodology is described in the third chapter and the following are treated under it; research design, population of the study, the sample and sampling procedures, development of instrument, pilot testing, data collection procedure and data analysis.

Chapter Four presents results and discusses the data whilst Chapter Five presents a summary, draws conclusions and makes recommendations to improve practice.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter reviews the literature relevant to the study. The areas reviewed included Roger's theory of diffusion of innovation, concept of educational technology, Staff and student technology utilization, Educational technology in Ghana, the concept ICT and Modelling ICT development in education. Again, the chapter delves into the Potential of ICT in education, Accessibility of ICT facilities in education, Integrating ICT in education, and Barriers to ICT integration in education. The chapter further sought to review the Rationale for the use of ICT in schools, Use of ICT in teaching and learning, Gender, age and ICT, Supporting management with ICT Development and exploitation of ICT in education in Ghana and finally summarised it.

Rogers' Theory of Diffusion of Innovations

The primary intent of the theory of innovation diffusion is to illustrate how any technological innovation moves from invention to widespread use, or non-use (Dillon & Morris, 1996, as cited in Stefl-Mabry, 1999). The purpose of the theory is to provide individuals from any discipline interested in the diffusion of an innovation with a conceptual paradigm or framework for understanding the process of diffusion and social change. Surry (1997) observed that the innovation decision process, individual innovativeness, rate of adoption, and perceived attributes discussed by Rogers (1995) are among the most widely-used theories of

diffusion. Rogers' theory and many others based on his works help us to understand the process of adopting technologies. The key questions researchers have asked and sought to answer include (i) Why are some technologies adopted and some not? (ii) Why do some staff members or schools readily embrace new tools, while others are very slow to change? (iii) What factors are at play as people and organizations begin using new technologies (Wilson, Sherry, Dobrovolny, Batty & Ryder, 2001).

Wilson et al. (2001) pointed out that adoption can also be seen as a process of information diffusion, culminating in a rational choice to use (or not use) the new technology. This perspective relies principally upon a view of learning as information acquisition (Mayer, 1996). A prospective user engages in a process of inquiry concerning the technology (Hall & Hord, 1987; Rogers, 1995; Wilson et al., 2001). After learning more about the pros and cons, the user (or group of users) commits to a testing, followed by a full-scale adoption and implementation of the technology.

Technology adoption may also be seen as the assimilation of new cultural tools and practices (Rogers, 1995). This view is consistent with theories that stress learners' participation within communities of practice (Lave & Wenger, 1991, as cited in Wilson et al., 2001). The focus is on socially constructed meanings and the sharing of those meanings through participation in purposive activities. The technology itself, in addition to its physical form and function, is also a social construction whose meaning is shared among community members. How the technology fits into existing social purposes and practices will largely determine

its prospects for its appropriation and use by the community (Wilson, et al., 2001).

When new ideas are invented, diffused, and are adopted or rejected, leading to various consequences, social change occurs (Rogers, 1995). According to Rogers, this social change can be planned or spontaneous, intended or unintended; for example, a physics department invents a new network interface and protocol for exchanging leading edge information among physicists (planned change) versus the spontaneous and exponential demand for access to the Internet with the advent of the World Wide Web (spontaneous change).

The Innovation Decision Process

The Innovation Decision Process (IDP) states that diffusion is a process that occurs over time and can be seen as having five distinct stages (Rogers, 1995). The stages in the process are knowledge, persuasion, decision, implementation, and confirmation.

The IDP is thus a framework for analyzing the adoption and diffusion of an innovation (Rogers, 1995). The innovation-decision process is essentially an information-seeking and information processing activity, in which the individual is motivated to reduce uncertainty about the relative advantages and disadvantages of an innovation (Rogers, 1995).

Knowledge occurs when an individual is exposed to an innovation's existence and gains some understanding of how it functions. Types of knowledge range from awareness about the innovation, how to use an innovation properly, and principles-knowledge dealing with the functioning principles underlying how

the innovation works. Predispositions such as selective exposure and selective perception may influence an individual's behaviour toward communication messages about an innovation and the effects that such messages are likely to have. Hassinger, (as cited in Rogers, 1995), argues that even if individuals are exposed to innovation messages, such exposure will have little effect unless the innovation is perceived as relevant to the individual's needs and consistent with the individual's attitudes and beliefs.

Persuasion occurs when an individual forms a favourable or unfavourable attitude toward or opinion of the innovation based upon perceived characteristics of the innovation, such as relative advantage, complexity, and so on. Persuasion is also influenced by information sought from near-peers whose subjective opinion of the innovation is most convincing (Rogers, 1995). When someone who is like us shares a positive evaluation of the innovation, we are more motivated to adopt it. Social networks therefore provide an effective avenue for diffusion of innovations.

Decision occurs when an individual engages in activities that lead to a choice to adopt or reject the innovation. *Adoption* is a decision to make use of an innovation as the best course of action available. Active rejection means considering and trying the innovation out on a limited basis, and deciding not to adopt. Passive rejection, also called non-adoption, consists of never really considering the use of the innovation.

Implementation occurs when an individual puts the innovation into use. Until this stage, the process has been a mental exercise. Implementation involves

an overt behaviour change as the new idea is actually put into practice. This stage may continue for a lengthy period of time until the innovation finally loses its distinctive and noticeable quality as a new idea. Re-invention, the degree to which an innovation is changed or modified by the user, can also occur in this stage.

Confirmation occurs when an individual seeks reinforcement of an innovation-decision already made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation. Each stage in the innovation-decision process is a potential rejection point. One can gain awareness of an innovation in the knowledge stage, and then simply forget about it. Rejection can occur even after a prior decision to adopt, which is called discontinuance. The underlying point about the innovation decision process is that the decision is made through a cost-benefit analysis with uncertainty playing bad referee between the adopter and the innovation. People will not hesitate to adopt an innovation if its overall effect will enhance their utility and productivity. That is the relative advantage issue, as Rogers (1995) explains below.

The Attributes of an Innovation that Influence its Rate of Adoption

Rogers (1995) gives five characteristics or attributes of innovations. These are relative advantage, compatibility, complexity, trialability, and observability. He defined these characteristics as follows:

Relative advantage describes the degree to which an innovation is perceived as better than that which it supersedes. Potential adopters must be convinced that the innovation will serve their needs better than what is currently

in place. The more they are convinced of this potential in the innovation, the greater their dispositions to accept it or even adopt it.

Compatibility is the degree to which an innovation is consistent with the existing values, past experience, and needs of the potential adopter. Familiarity with the innovation, based on what potential adopters are used to, enhances their acceptance and consequent adoption of the innovation. The innovator must convince them about the relevance and purpose of the change or innovation.

Complexity is the degree to which an innovation is perceived as difficult to understand and use. Our natural inclinations as humans are always to avoid pain or difficulties, whether psychological or physical. We tend to embrace changes that bring us comfort and make our work or solution process easier. Therefore, the rate of adoption is higher when potential adopters perceive the innovation to be easy to work with or use. This condition is typically associated with industrial machinery or software use. The more user-friendly the innovation content is, the greater its acceptance and possible adoption.

Trialability is whether an innovation may be experimented with on a limited basis. Potential adopters need the opportunity to test the innovation before using it or discontinuing using it.

Observability is the degree to which the results of an innovation are visible to others. Potential adopters tend to embrace an innovation when the effects of implementing the innovation are meaningful and measurable. Innovations that are perceived by individuals as having greater relative advantage, compatibility,

trialability, observability, and less complexity will be adopted more rapidly than other innovations (Rogers, 1995).

Concept of Educational Technology

Educational technology is perceived differently in terms of meaning by writers. The following definitions are identified. According to the National Centre for Programmed Learning (NCPL), United Kingdom, defines educational technology as the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training. In the absence of scientifically established principles, educational technology implements techniques of empirical testing to improve the learning (Percival & Ellington, 1988). The Commission on Instructional Technology (CIT) defines educational technology as a systematic way of designing, implementing and evaluating the total process of learning and teaching in terms of specific objectives based on research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction (Saettler, 1990).

In 2000, the Association for Educational Communication and Technology (AECT) in the United States came up with an "official" definition of educational technology that embraces all the above definitions: "educational technology is a complex integrated process involving people, procedures, ideas and organization for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of learning" (Silber, 2000).

In relation to the last definition, the scope of educational technology covers three main areas of teaching and learning which include: educational management functions, educational development functions and learning resources. The management functions include organizational and personnel management. It is an integrated process involving people, procedures, ideas, devices and organization. It is within the area of educational development that problems relating to all aspects of learning are analyzed and managed. It is clear from these functions and resources that educational technology is directed towards improving of teaching and learning and it is the means through which effective and efficient teaching and learning could be achieved.

Staff and student Technology Utilization

Cuban (1986; 2000) argued that computers are largely incompatible with the requirements of teaching, and that, for the most part, teachers will continue to reject their use as instruments of student work during class. Using data from a nationally representative survey of 4th through 12th grade teachers, this paper demonstrates that although Cuban correctly characterizes frequent use of computers in academic subject classes as a teaching practice of a small and distinct minority, certain conditions make a big difference in the likelihood of a teacher having her students use computers frequently during class time. In particular, academic subject-matter teachers who have at least five computers present in their classroom, who have at least average levels of technical expertise in their use, and who are in the top quartile on a reliable and extensive measure of constructivist teaching philosophy are very likely to have students make regular

use of computers during class. More than 3/4 of such teachers have students use word processing programmes regularly during class and a majority are regular users of at least one other type of software besides skill-based games.

In addition, other factors-such as an orientation towards depth rather than breadth in their teaching(perhaps caused by limited pressures to cover large amounts of content) and block scheduling structures that provide for long class periods-are also associated with greater use of computers by students during class. Finally, the paper provides evidence that certain approaches to using computers result in students taking greater initiative in using computers outside of class time-approaches consistent with a constructivist teaching philosophy, rather than a standards-based, accountability-oriented approach to teaching. Thus, despite their clear minority status as a primary resource in academic subject classroom teaching, computers are playing a major role in at least one major direction of current instructional reform efforts.

Cuban (1986) has argued that computers, as a medium of instruction and as a tool for student learning, are largely incompatible with the requirement of teaching. Cuban's reason in arriving at this conclusion is that teachers are already over-burdened enough without the requirement for them to incorporate student computer use as a regular part of their instructional practice. Furthermore, he claimed that computers are hard to master, hard to use, and often breakdown. Thus these conditions constitute disincentives for teachers to make realistic investment of effort into having students use them frequently. Cuban made these observations in the second half of the 1980's where technology as we know it

today was non-existent. Some aspects of his stated position against the use instructional technology may no longer hold. In that many different types of computers have been introduced into the world.

Becker (2000) basing his argument on data from the 1998 national survey of teachers, teaching, learning, and computing (TLC), agrees with Cuban's position that teachers' overload conditions may still limit widespread classroom use of computers. Over 4,000 K-12 teachers in more than 1,100 schools across the U.S. participated in the TLC survey, which sought to gain insight into teachers' educational philosophies and characteristic teaching practices, teachers' use of computers in teaching, and various aspects of school's environment. A 20-page survey designed to investigate questions raised by Cuban's (1986) critique was administered.

Becker (2000) argued that under the right conditions, computers are obviously becoming a valuable and well-functioning instructional tool. Becker mentioned teachers' comfort and skills in using computers, allocation of time in the school schedule for students to use computers as part of class assignment, availability of sufficient technology facilities and equipment, convenient access to these facilities, and teachers' personal philosophies that support student-centred, constructivist pedagogy as some of the conditions that enhance classroom use of computers.

According to Becker (2000), the TLC data show that only a small minority of secondary school academic classes use computers significantly for (i) students acquiring information, (ii) analyzing ideas, and (iii) demonstrating and

communicating content understanding in science, social studies, mathematics, and other academic work. He pointed out that scheduling problems, pressure of curriculum coverage, and convenient access to computers accounted for this situation.

Kelly (2005) in his dissertation abstract reported that despite the availability of instructional technology on college campuses, faculty members tend to under-use technology for instruction. His study examined the relationships among faculty, their perceptions of organizational support, professional development practices, and the use of technology for instruction and communication. The present level of technology use was compared to the desired level of technology use for instruction and communication, the perceived level of organizational support and the professional development activities of the faculty. Kelly's findings suggest that the majority of the faculty members were receptive to the use of technology in instruction and communication. The findings also revealed that the faculty desired more technology for instruction, a higher degree of organizational support for technology and more professional development related to technology. The study recommended the establishment of a faculty technology development committee and a faculty college programme improvement committee. The study also recommended a permanent faculty-driven assessment and improvement process for increasing the use of technology.

Also, a study by Hernandez-Ramos (2005) of K-12 schools in Santa Clara County, California in the heart of Silicon Valley, revealed that exposure to technology in teaching preparation programmes, knowledge of software

applications, and constructivist beliefs were found to be positively related to more frequent use of technology by teachers, both for themselves and their students. This finding was corroborated in an earlier study by Iding, Crosby and Speitel (2002), who reported that overwhelmingly, teachers and pre-service teachers who report using computers for their own personal use are at least moderately proficient with computers, have varying levels of access to computers in schools and individual classrooms, and are interested in learning more about technology for educational purposes. Their study also found that the majority is unaware of any educational software that could be helpful in their teaching, and does not use technology in many teaching-related tasks, including for student portfolios, as tutorials, for demonstrations and simulations, or for remediation.

Teachers and faculty need motivation to integrate instructional technologies into their curricula and instruction. One way of providing such motivation is to require technology skills and use in teaching as part of faculty evaluation (Whale, 2006). A study involving K-12 teachers by Whale showed that few teachers are evaluated on their ability to use technology in the classroom despite conclusive evidence that its effective use has a positive impact on student achievement and that large amounts of resources are dedicated to placing technology in schools. Whale's study implies that if faculty members feel the use of technology in their instruction is part of faculty evaluation for tenure, they would take technology more seriously.

Wozney, Venkatesh and Abrami (2006), however, observed that we are experiencing exponential growth in the use of computer technology for learning

in K-12 schools, and that there is sufficient optimism in the potential of technology that governments have dedicated substantial research funds to identifying and promoting ways to deliver or enhance instruction with the use of technology. Their study found that (i) expectancy of success and perceived value were the most important issues in differentiating levels of computer use among teachers, (ii) personal use of computers outside of teaching activities was the most significant predictor of teacher use of technology in the classroom, and (iii) teacher's use of computer technologies was predominantly for "informative" (World Wide Web and CD-ROM) and "expressive" (word processing) purposes.

Teng and Allen (2005) examined the use of Blackboard as a web-based learning environment to enhance pre-service teachers' confidence in the integration of technology into their future instruction as in-service teachers. The findings of this study revealed that exposing participants to Blackboard and the electronic exchange of ideas improved their self-reported computer skills and their confidence in using and integrating technology in their future teaching. In this connection reluctant faculty members, when adequately and appropriately exposed to the power and potency of technology integration as instructional enhancers, are likely to adopt a more positive attitude towards technology innovations for teaching and learning. Vitale (2005) confirmed this observation in his dissertation abstract. His research on K-12 teachers and schools focused on factors cited by successful integrators of instructional technology that were instrumental in their professional growth and transformation as technology

integrators. His study strongly argued for the use of instructional design principles to build more effective professional development opportunities in their schools.

Educational Technology in Ghana

Technology use for teaching and learning is gaining acceptance in education globally; however, a formal integration of ICT in education in Ghana is still on the drawing boards. The national framework on which the deployment of ICTs in the education sector is based is contained in the Information Communications Technology for Accelerated Development policy document of Ghana (ICT4AD, 2003). According to this document, a recent survey showed that the level of computer literacy and awareness in the country is very low and this has been identified as one of the key factors limiting the development of the ICT industry and the education sector.

The national policy acknowledges the need for ICT training and education in the schools, colleges and universities, and the need to improve the educational system as a whole. As part of the ICT4AD mission, therefore, Ghana seeks to transform the educational system to provide the requisite educational services and environment capable of producing the right types of skills and human resources required for developing and driving Ghana's information and knowledge-based economy and society. The Government is therefore committed to a comprehensive programme of rapid deployment, utilization and exploitation of ICTs within the educational system from primary school upwards (ICT4AD, 2003).

The broad national strategy for the use of ICTs to improve the educational system is spelt out in the ICT4AD document as follows:

To modernize Ghana's educational system using ICTs to improve and expand access to education, training and research resources and facilities, as well as to improve the quality of education and training, and make the educational system responsive to the needs and requirements of the economy and society with specific reference to the development of the information and knowledge-based economy and society.

Educational Technology scholars and practitioners contributing to the field over the past four decades realize that formally defining Educational Technology is challenging for a number of reasons. First, defining an applied field like Educational Technology is more difficult than defining any of the social science disciplines. The reason is that there is no single knowledge base to ground Educational Technology as is the case in the social sciences. In an applied field, by its very nature, multiple knowledge bases are employed. The development of new knowledge causes shifts in thinking and introduces change and in the field of Educational technology multiple knowledge bases lead to multiplying change. This compounds the challenge of creating a viable definition. Second, defining Educational Technology as a process also creates dissonance between the popular notion of technology as state-of-the-art equipment and the older idea of technology as a process. This dissonance surrounding technology gives rise to definitions that are not easily understood within the field or widely embraced outside of the field of Educational Technology (ET).

What is revealed from exploring ET from the "inside" is that Educational Technology is an applied and decision-oriented field developing from multiple sources identified by accrued literatures produced in the field. This complicates efforts to define Educational Technology and demands a broad and multi-faceted approach to defining Educational Technology capable of clearly delineating underlying governing principles, multiple roles, and multiple knowledge bases associated with the field (Luppicini, 2005). This is to say that a one –fit definition for Educational technology will not be functionally viable.

The educational system in Ghana is currently based on the 6-3-3-4 model, consisting of 6 years of primary education, 3 years of junior high school, 3 years of senior high school, and 4 years of university education. In the first 9 years of schooling, teachers teach whole classes across the school curriculum. The basic qualification of teachers at these levels is the 4-year teacher education certificate and now 3-year diploma in basic education obtained from 38 pre-tertiary teacher training colleges spread over the country's ten geographic regions. Subject teaching starts at the senior high school and pre-tertiary teacher training college levels.

Teachers at these levels are graduates produced from the University of Education, Winneba and University of Cape Coast, which are the only two tertiary teacher education institutions in Ghana. Therefore, Ghana has two levels of teacher education: 38 three-year pre-tertiary colleges of education and two tertiary teacher education institutions. The introduction of ICTs into the colleges of education in eastern region started in some few years back. In all cases, the

initial emphasis was on improving the administrative and communication systems. With the increasing availability of ICT facilities and equipment on all campuses, however, the emphasis is now focused on staff and student use of the available technology tools for teaching and learning.

This study sought to investigate tutors' and students' utilization of ICT in the colleges of education in Eastern Region. The expectation was that the study would identify whether or not ICT facilities are available and accessible and the bottlenecks associated with the deployment of ICTs in the teacher education curricula of the colleges.

The Concept ICT

ICTs stand for information and communication technologies and are defined, for the purposes of this primer, as a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony.

In recent years there has been a groundswell of interest in how computers and the Internet can best be harnessed to improve the efficiency and effectiveness of education at all levels and in both formal and non-formal settings. But ICTs are more than just these technologies; older technologies such as the telephone, radio and television, although now given less attention, have a longer and richer history as instructional tools. For instance, radio and television have for over forty years been used for open and distance learning, although print remains the cheapest, most accessible and therefore most dominant delivery mechanism in both

developed and developing countries. The use of computers and the internet is still in its infancy in developing countries like Ghana, if these are used at all, due to limited infrastructure and the attendant high costs of access.

Moreover, different technologies are typically used in combination rather than as the sole delivery mechanism. For instance, the Kothmale Community Radio Internet uses both radio broadcasts and computer and Internet technologies to facilitate the sharing of information and provide educational opportunities in a rural community in Sri Lanka. The Open University of the United Kingdom (UKOU), established in 1969 as the first educational institution in the world wholly dedicated to open and distance learning, still relies heavily on print-based materials supplemented by radio, television and, in recent years, online programming. Similarly, the Indira Gandhi National Open University in India combines the use of print, recorded audio and video, broadcast radio and television, and audio conferencing technologies. However, for the purpose of this study, emphasis is placed on the use of the computer and internet.

However, this study is not primarily about hardware (the term applied to computers and all the connecting devices like scanners, modems, telephones, and satellites that are tools for information processing and communicating across the globe): it is about *teaching*, and, more particularly, *learning*, and the way that all these technologies that we group under the acronym ICT can transform schools as we currently know them. ICT have already impacted on the economies of all nations and on the fabric of society at every level within which teachers and students live and interact.

More than any other previous technology, ICT are providing learners access to vast stores of knowledge beyond the school, as well as with multimedia tools to add to this store of knowledge. ICT are largely instrumental, too, in shifting the emphasis in learning environments from teacher-centred to learner-centred; where teachers move from being the key source of information and transmitter of knowledge to becoming guides for student learning; and where the role of students changes from one of passively receiving information to being actively involved in their own learning.

There are several theoretical frameworks that are relevant to staff technology use for teaching and learning. Although Rogers' (1995) diffusion of innovation model has been meaningfully applied to many kinds of innovations, there are others that are particularly relevant to understanding the change process in educational settings.

Modelling ICT Development in Education

In developing a curriculum for ICT according to UNESCO, (2002), it is useful to have a model for ICT development. Such a model is not a miniature replica of some three dimensional object but rather a representation of the essential characteristics of ICT development to provide a scaffold or framework. Such a framework shows the interrelationship of various components within a system and aids understanding by educational administrators and policymakers.

Two models are presented here to provide a framework for what follows. The first model conceives ICT development as a continuum along which an educational system or an individual school can pinpoint the approach that relates

to the growth of ICT for their particular context. This model is referred to as *a continuum of approaches to ICT development.*

The second model depicts different stages in the way that those who are most involved in the use of ICT in schools – teachers and students – discover, learn about, understand, and specialize in the use of ICT tools.

This second model is referred to as *stages of teaching and learning with and through ICT*. The two models, *a continuum of approaches to ICT development* and *stages of teaching and learning with and through ICT,* together provide the framework for an ICT curriculum and for the professional development of teachers (UNESCO, 2002).

A Continuum of Approaches

Studies of ICT development in both developed and developing countries identify at least four broad approaches through which educational systems and individual schools proceed in their adoption and use of ICT. These four approaches, termed *emerging, applying, infusing,* and *transforming*, represent a continuum depicted as a model in figure 1.

Emerging	**Applying**	**Infusing**	**Transforming**

Figure 1. Model depicting a continuum of approaches to ICT development in schools (UNESCO, 2002).

The Emerging Approach

Schools at the beginning stages of ICT development demonstrate the emerging approach. Such schools begin to purchase, or have had donated, some computing equipment and software. In this initial phase, administrators and teachers are just starting to explore the possibilities and consequences of using ICT for school management and adding ICT to the curriculum. Schools at this emerging phase are still firmly grounded in traditional, teacher-centred practice. The curriculum reflects an increase in basic skills but there is an awareness of the uses of ICT. This curriculum assists movement to the next approach if so desired.

The Applying Approach

Those schools in which a new understanding of the contribution of ICT to learning has developed exemplify the applying approach. In this secondary phase, administrators and teachers use ICT for tasks already carried out in school management and in the curriculum. Teachers largely dominate the learning environment. Schools at the applying approach phase adapt the curriculum in order to increase the use of ICT in various subject areas with specific tools and software. This curriculum assists movement to the next approach if so desired.

The infusing approach

At the next stage, the infusing approach involves integrating or embedding ICT across the curriculum, and is seen in those schools that now employ a range of computer-based technologies in laboratories, classrooms, and administrative offices. Teachers explore new ways in which ICT changes their personal

productivity and professional practice. The curriculum begins to merge subject areas to reflect real-world applications.

The transforming approach

Schools that use ICT to rethink and renew school organization in creative ways are at the transforming approach. ICT becomes an integral though invisible part of daily personal productivity and professional practice. The focus of the curriculum is now learner-centred and integrates subject areas in real-world applications. ICT is taught as a separate subject at the professional level and is incorporated into all vocational areas. Schools have become centres of learning for their communities.

Potential of ICT in Education

The Panel of Education Technology (1997) brings to the fore that a shift from teacher-controlled towards more students controlled arrangement of the learning process can be facilitated by ICT. It says that many of the current ICT applications are used to facilitate teacher-controlled arrangement of the learning process. Applications of ICT are adapted to the existing education beliefs and teaching routines and are being used just as a substitute for other media. Brummelhuis (2000) is also of the view that the beliefs and attitudes of teachers towards their teaching practice have not changed and basically in the secondary school, the teaching and learning process itself has not changed. Itzkan also noted that the use of ICT as a substitution of current teaching and learning activities can be seen as the first of three phases through which the new technologies generally

diffuses and these three phases are the substitution phase, the transition phase and the transformation phase.

According to Itazkan (1994), in the substitution phase, the technology replicate or automates the existing practices and technology is used for existing educational activities, for example, drill and practice exercises on the computer. In the transition phase new instructional methods begin to evolve, like the use of e-mail to communicate with peers. Here technology is used for activities for which it was not necessary brought in and this challenge old instructional practice. In the transformation phases, the technology provides completely new instructional situations and the old customs become obsolete. Here the instructional task, for which the technology was originally acquired, may no longer be desired. What all these phases means is that the continuing use of ICT for substituting existing practices will not contribute to solutions for today's problem in education. Therefore, carefully planned actions are needed to get beyond ICT use just for substitution. A student-controlled, constructivist approach to education can be realized through the use of the new technologies in transition phase.

Brummelhuis (2001) also brought to the fore that the teacher control teaching and learning is characterized by testing the whole class at the same time, whole class teaching, all students working at the same time and on the same content with the teacher being the most important source of information. The student-controlled teaching and learning is also characterized by student frequently applying self-monitoring, students working at their own pace and

students working in groups or individual. Brummelhuis version clearly shows that ICT in education gives room for students to bring out their own initiatives, creativity and participate fully in the learning process. This in turn will boost the achievement level of the students.

Accessibility of ICT Facilities in Education

A study was conducted by Albirini (2006) in examining the factors relating to the teachers' attitudes toward information and communication technologies. In the study, a questionnaire was designed to collect evidence from high school English teachers about their perceptions of computer attributes, cultural perceptions, computer competence, computer access, and personal characteristics (including computer training background). The sample consisted of 63 male and 251 female teachers. The results showed that a relatively high percentage of the respondents (57%) had computers at home while only 33.4% of the respondents had access to computers at school. This percentage gives a clear indication of the insufficiency of computers at Syrian schools, particularly for teacher use. Thus, Albirini's findings substantiated this globally felt barrier that computer access has often been one of the most important obstacles to technology adoption and integration worldwide (Pelgrum, 2001).

On the other hand, Mumtaz (2000) stated that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. Another report on teachers' use of technology by the National Centre for Education Statistics (September, 2000) indicates a correlation between availability of computers and

computer use. In general, teachers who had computers in their classes were more likely to use them in instruction than teachers who did not. More than 50% of teachers who had computers in their schools used them for research and activities related to lesson preparation. A total of 78% of teachers surveyed cited limited access to computers as a barrier to effectively using computers in their classes. Of this total, 38% thought "not enough computers" was a "great barrier" to using technology in their classes. Therefore, efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students an administrative staff. According to Becker (2000), figures from the United States of America show that only about one third of the teachers use computers on regular basis, although majority has a computer in their classroom.

Integrating ICT in Education

There is now strong focus on the development of ICT policy and integration of ICT in curriculum and practice across the whole education sector. ICT has become an important concept in primary, secondary and tertiary education. According to Becker, Acivitz & Wong (1999) the computer is one of the range of technologies that are available to teachers and students and they argue that apart from some exceptional schools, the computers had little impression on what happens in the classroom. Much debate has been raised over the reasons for this minimal impact of the computers in schools and in the classroom. Technologies such as radio, projections and televisions have had little effect on the experiences of students and teachers in schools over the last decade

where large amount of money has been spent on these resources (Becker et al., 1999).

Mumtaz (2000) posited that lack of time is a factor that hinders technology integration in schools. This barrier becomes manifest in two ways: (a) release time and (b) scheduled time (Mumtaz, 2000). Some results of a study conducted by the National Centre for Education Statistics (2000) with in-service teachers revealed that 82% of the participants thought that lack of release time was the most significant factor that prevented them from using computers in their classes as well as prepare materials for use with their classes. In the same way, teachers felt that, with their regularly scheduled classes, they did not have enough opportunities to practice using computers in their classes. Furthermore, lack of time scheduled on the timetable to use computers with students is a factor mentioned by teachers as a barrier to using computers in their classes. This shows that approximately 80% of the teachers surveyed in the above study thought there was not enough time scheduled for students to use computers. Even though some of the teachers had a genuine need to use computers with their students, there was no available time to do it. Hence, the lack of time required to successfully integrate technology into the curriculum is a recurring issue.

Barrier to ICT Integration in Education

Kennedy (1988, p. 329) said that "it is not just enough for people to act differently in the course of change but in addition, they may be required to change the way they think about certain issues, which is deeper and more complex change." Koontz and Weihrich (1990) gave reasons why people resist change. To

them, people want to feel secure and have some control over the change so if they do not know what to expect, this may cause fear and induce them to resist the change. They went on to say that, people may resist change if they do not know the reason for the change. Dennis (1980) also explained that "people do not always adopt an innovation, even if adopting it is logical and beneficial."

In an observation, Bitner and Bitner (2002) added that barriers to ICT can be centred on the support networks that are available to the school. These include support from the teachers, the administration, technical service and students as well. This is to say that whereas the role of the teacher is crucial in the success of integrating ICT, the support system is a factor on which the success of the programme highly depends on. This brings to the fore that the technical and curriculum areas need to be provided with support that is both on site and ongoing.

According to Marshall (1993), whilst the vision for many people foundation for ICT was a constructivist perspective, technology's pioneers was not necessarily adopted by those who were providing professional development or those who were using technology in their classroom. Professional development is centred on instructional methods of integrating ICT, which is aided in changing the thinking of pre-service teachers about the use of ICT and its role in students learning. There had been arguments that, teachers change their views of ICT integration from thinking they would teach about technology to support student learning (Walsh & Vannatta, 2002). However, teachers do not require proficiency in a large variety of technology application, for successful integration of ICT in

teaching and learning but rather they need to feel comfortable and confident in instructional methods of ICT integration.

It is suggested that teachers need to reform their concept of learning to be able to see how computers could be used as a tool for the construction of knowledge, instead of instruction in the classroom management (Schmind, Fresmire & Lisner, 2001). They hold on to the fact that, accessibility of the computer in the classroom is limited especially the 'one user' design of the educational software. Therefore it is difficult to find ways to cater for the individual needs of the students.

Lack of follow-up support is also another barrier to ICT integration because activities often take place from the school site. Mauza (2002) suggested that in order for ICT integration to be effective, in class assistance, support must be provided and it must be context specific. He suggested that programmed designed to help teachers integrate ICT into their classrooms should be introduced and demonstrated. Hand-on and discussion of the implication that the demonstrated applications have on teaching and learning should be done. Mauza (2002) again reported a number of factors for successful integration. He claimed that as teachers acquires skills in ICT; they find it easy to incorporate strategies to integrate ICT into the curriculum, taking into consideration, access to equipment and creativity in the curriculum design. He recommends that teachers would need to recognize the benefits of ICT in the teaching and learning process before they will be willing to implement it in the classrooms.

Rationale for ICT Use in Schools

Education and training are fundamental to achieving priorities for a country's economy in the twenty-first century. A country needs to be "enterprising, innovative, adaptable and socially responsible participants in the information economy" and will be at a serious disadvantage in the global knowledge economy if it fails to produce workers, professionals and managers with the skills to work in the online environment (National Office of the Information Economy, 1999). Adequately qualified ICT students and ICT-rich leaving surroundings will intensify students learning across the curriculum and this has given rise to the need for ICT competent teachers. Three main rationales bring up the use, of ICT in schools. One is concerned with the organizational productivity of the school. The second is also concern with technology literacy and the third is concern with support for learning ICT (DEST, 2002).

Becker (1999) cited the need for computers to be used to solve regular curriculum problems that occurs. This implies that the computers being problem solving machines could be used to solve typical school problems especially those problems concerning student learning, teacher's instruction and school administration. Becker (1999) continued by saying, that for the implementation of the curriculum, educational technology should be selected. This presupposes that ICT has the potential of bringing into the education system effective and efficient learning environment.

Lankshear and Snyder (2002) also were of the view that students learning would be made more effective and there will be an increase in their output if a

teacher selects the most appropriate, educational technology. If part of the curriculum is not completed as a result of technology then the outcome of that learning situation will be zero yielding no productivity. There are situations where certain technology should be used because it solves major problems in teaching and learning but Lankershear et al. (2002) also proposes that while it is important to consider educational productivity, it should not be the only consideration in deciding to lose a technology. The use of some technologies are expensive than others, the procurement, installation, maintaining and support users of ICT are relatively more expensive. However, this must be compared with the potential outcomes.

Bosu (2008) in explaining why ICT should be used in education postulated that computers technology is everywhere and being integrated into all aspect of society, therefore one needs the skills. She brought out the importance of ICT in education, saying that, ICT is motivational, can capture and hold students attention in the classroom. It also provides skill building practice. Again, in her view educators need to make positive contribution in society as they teach future leaders and other citizens of the society and for that matter to enhance students achievement and teacher performance, they should provide interactive learning, discovery learning and link learners to instructional resources.

Use of ICT in Teaching and Learning

This part of the review discusses the effect of ICT on the curriculum, its effect on the student, the effect on the learning, effect on the role of the teachers and the effect to the learning environment.

Effect on the Curriculum

The Oxford advanced learner's dictionary explains curriculum as the subjects that are included in a course of study or taught in school, college etc. the Newhouse (2002) refers to curriculum as coming from Latin meaning to run a racecourse. The Pennsylvania State Board of Education defines it as a series of planned instruction that is co-ordinated and articulated in a manner design to result in the achievement by students of specific knowledge and skills. Newhouse (2002) again goes on to say that curriculum in education refers to a combination of the learning outcomes of pedagogy and content that students are to address. It has been argued that the curriculum and ICT co-exist which means that ICT helps in transmitting the curriculum and at the same time helps in changing the content of the curriculum.

The effect of ICT is seen on both declarative and procedural knowledge in that the current curriculum and models of teaching and learning were not designed to accommodate the increasing rapid widening quality of knowledge (Riel 1998). The quantity of declarative knowledge is therefore growing rapidly, through the efficiency of ICT and at the same time ICT is providing the instruments to readily assessment of knowledge. Riel (1998) further states that the technology itself has added quantities of declarative knowledge to the skills and knowledge required in society and working places which is now different from when school was instituted. Students now require flexible and general sets of procedure knowledge rather than specific bodies of declarative knowledge.

Evidently the curriculum must remain relevant to societal and workplace needs. It is reasonable for "…..children's school-based learning later" (Lankershear et al., 2000 p. 130). Becta (2002) supports the fact that the effect would be glearing in almost all disciplines of learning but there will be a substantive degree of variation between the disciplines. Eddie (2000) also acknowledges that the curriculum is a very important indicator in which learning can be assessed. The focused on strictly followed paper-based examinations and prescribed learning outcomes are not appropriate to facilitating ICT to learners and as a result ICT use has been reduced by learners.

Effect of ICT on Students

In terms of computer expertise of the students, Rowe (1993) defined two groups of students. The top and bottom 20% when she found out that most children differ greatly in the use of the computer in both its efficiency and effectiveness. She developed a set of indicators for effective use of computer that were used to profile match and created four groups of students. She named those who intertwine learning and computer use and were confident computer uses as orchestrates. Those who see the computers as a separate area of learning she named as Amplifiers. Those who view computers as non-essential, that they are mainly used for calculation and word processing as she named as the Machinist and finally those who made limited use of computers, mainly copping others and using drill and practice package she named as the 'preservators'.

A research conducted by Loader and Neville (1991) with a year Eight class using computers in Australia revelled that almost all the students had good

ICT skills and positive attitudes. The tendency was there for the students not to depend mostly on their teachers but to work by themselves. In 1991 they (Loader et al.) presented another report where about 95% students of were using computers liked using their computers and preferred completing their work on their computers to using papers and pen.

Effect of ICT on Learning

Decorate (1990) posited that the computers is a support tool in the learning environment and so its effects on learning cannot be isolated. Many researchers have been made over the decade (Not necessarily related to using computers) where decisions about suitable application of computers to learning have been made. On a report from the impute CT2 conducted in the United Kingdom by Becta (2002) it was found that there is no consistent relationship between the average amount of ICT use reported for any subject at a given stages and it evidences of effectiveness in raising the academic performance.

Rather than providing cross age tutoring programmes, increasing instructional time, and reducing class size from 35 – 20, it was seen that west Virginia's basic skill/ computer Education programme was more cost effective in promoting and improving students achievement (Main Shakeshaft, Becker and Kottkamp 1999). Becta (2002) also argued that in more than a third of all the comparison made between pupils expected and actual scores, the difference in attainment associated with the greater use of ICT were vividly present. To Becta, given the right conditions for access and participation, much gain in students learning is recorded with ICT. It is better to start the use of ICT with the

consideration of its impact on learning and the curriculum (Laferriere, Breuleux & Bracewell, 1999).

Schacter (1999) claimed that the students who used computer based instruction scored higher percentage than students who do not use computer based instruction on a test of achievement. He observed that while there is no direct link between using ICT and students leaving it are still clearly shown that there could still be an indirect significant positive effect of the use of ICT on learning.

Rieber and Welliver (1989) argued that the media is the final step in instructional design and not the first because different instructional situation calls for different instructional elements. This argument came about as a result of the criticism on the media comparison studies. They claim that the media were of non value applied to research into the use of educational television and so many questioned their value to educational ICT research. Rieber et al. (1989) again quoted the education task force report of the United State Department of Education (1994) which suggested that one of the four important points for improving the use of technology in schools is the identification of instruction problems and the development of realistic solutions.

Effect of ICT on the Roles of the Teacher

Teachers' characteristics (e.g. individual's educational level, age, gender, educational experience, experience with the computer for educational purposes and financial position) can influence the adoption of an innovation (Rogers, 1995; Schiller, 2003). According to the report by the National Centre for Education Statistics (2000), it revealed that teachers with fewer years of experience were

more likely to use computers in their classes than teachers with more years of experience. More specifically, teachers with three years or less teaching experience reported using computers 48% of the time; teachers with 4-9 years, 45% of the time; those with 10 – 19 years, 47% of the time, while teachers with 20 years or more reportedly used computers only 33% of the time. This invariably may be as a result of the fact that new teachers have been exposed to computers during their training and therefore, have more experience using this tool. Then, one of the factors that determine the extent to which teachers use computers in their classes may be the number of years they have been teaching.

According to Collis (1989, p.17), "many elements of the traditional school organization would and should remain regardless of information technology's potential" and suggested that there is always the need for human to human interaction always need and motivation and so teachers would always need to be instructional leaders. Miller and Olson (1994) also agued that the main neglected reason "why Computers have not altered the curriculum is the way it is predicted by some educationists" is the "influence of traditional teaching methods and routines of practicing teachers." Becta (1994) also brought to the view that it would be necessary to produce systemic evidence that the teaching practices is being supported by computer use such as learning based on discovery and problem solving. But Riel (1998, p. 1) argues that the use of computers systems to provide just in time learning massively undervalue the role of the teacher." He pointed out to the fact that in handling conflict and multiple perspectives, students understanding of the need for this inter dependence would be developed. Rieber et

al. (1989) opined that the lecture and test – based model of teaching and learning is itself the product of introduction of a technology. They pointed out that technological development and the transformation of learning has a clear link and therefore challenged participants in school-based learning to adopt and apply the technology and the model of teaching and learning that will yield result. This brings to the fore that teachers then need to reflect on how they put their influence to use in their classrooms.

Effect of ICT on the Learning Environment

ICT has become an important tool for teaching and learning and has therefore attracted a great deal of investments in the African countries. Some researchers have investigated the ways in which learning take place in ICT-based environments in African classrooms. For example, de Jager and Nassimbeni (1998), in their evaluation of computer literacy training for South African students, report that students are not only attracted by ICT but that the technique has significantly enhanced their information and awareness of its implications in different areas. However, the researchers maintain that information literacy training has little effect on the participants' writing abilities in essays or assignments.

In contrast, McLean's (2001) study on an effective method of providing computer-aided instruction resource material in histology confirms the inherent value of computing as a useful tool for learning. She ascertains that, despite their different educational and socio-economic backgrounds, students become acquainted with different varieties of computer-based education without

marginalization of any group. This is coupled with an advantage of adapting the system to the student's own pace, which promotes self-directed learning, independent study and self-assessment quizzes that contain similar questions to what they handle in a block test. McClean points out that creating interactive educational material does not require the presence of expert designers, but that standard software and being familiar with a word processing programme are adequate tools to help a teacher use web page design facilities.

Students' engagement with the curriculum would increase as they are given the necessary opportunity to create their own ideas (Riel, 1998). He said that the computer software could be used to provide student with learning expensiveness as they interact with the computers using them frequently. The leaning process as it is understood will better facilitate the development of student conceptual framework and assist in deeper learning styles as students have more influence on the learning process. These activities could be more responsive to the students needs. The use of the computers has therefore been increased and it is providing learning experiences when and where they are needed. The opportunities being offered to students are bringing out greater independence not only in terms of when and how to learn but also on what they learn, this is by Cradler & Brieghforth (2002). They described the computer as inducing learning independence.

In most traditional learning situations, it is not possible to provide each student with an instructor or to design learning experience spelling for that students but the interactivity nature of the computers system provided the

opportunity to develop software which will simulate the role of an instructor (Riel, 1998). He went on to say that the intelligent tutoring software might use information about the student to recommend appropriate sections of tutorials for the students. Riel (1998) again agreed that the use of ICT learning is extrapolated to the support of a learning community. Teachers are thus, edged to consider providing a range of activities that would enable students to become critical thinkers and problems solvers. Schacter (1999) prescribed the use of computer for the analyses of data, presentation of data, linking of data or information simulation of environment and conditions for the support of interactive communications.

Software, with their interactive and multimedia feature could be used to enable students understands concepts, ideas and provides experiences in a variety of ways to students. Studies have shown increased in achievement in special needs of students when computers are used. They could be provided with computer support for learning activities jeered towards their individual needs. Eddie (2000) added that the use of online technologies is often to provide more individualized programme and the computers software could be used to support such programme for students who require individual learning.

Gender, Age and ICT

Male and Females students of different age groups are affected in one way or the other by the use of ICT. They are important variables because they make the ICT system work. The issue of gender and age has been an important topic within the research on ICT. This is because ICT and ICT professions are often

held to be repelling to women in particular but are associated with their male counterparts. This perception may have prompted Venkatesh and Morris (2000) to investigate about age and gender differences in the overlooked context of individual adoption and sustained usage of technology in the workplace using the Theory of Planned Behaviour (TPB). They studied on user reactions and technology usage behaviour over a 5-month period among 355 workers being introduced to a new software technology application. The results showed that the decisions of men and younger worker were more strongly influenced by their attitude toward using the new technology. In contrast, women and older worker were more strongly influenced by subjective norm and perceived behavioural control. Then, these groups of people adopt very different decision processes in evaluating new technologies. On the other hand, Albirini (2006) found that age was not a significant factor in relation to teachers' attitudes towards ICT.

However, in the work of Afshari, Bakar, Luan, Samah and Fooi (2009) it was revealed in the current study that age correlated negatively with the Jordanian EFL teachers' attitudes towards ICT in Jordan (r = -0.13, p <0.01). This result demonstrated that as the age of the teachers decreased, their attitudes towards ICT increased. This finding they claimed confirms the results of Roberts, Hutchinson and Little's study (2003) that the probability that teachers would use ICT in the classroom was limited by the reality that teachers who were educated 20 years ago were trained by people who themselves were trained before the arrival of computers in schools.

On the issue of age and ICT use once again, Baltes (1987) stated that research conducted by Australia's council on the ageing receded that olden adult that enhance their capacity for independent living. They are therefore the strongest growing group considering the use of ICT. They recognize autonomy, as a result of declining fear of technology among older people. On the other hand, it is said that ICT is paramount in supporting and improving the quality of education of the youth. It is of immense interest that student or the younger group develops and have the skills required making effective use of ICT and having adequate access to new technologies. This is because ICT developments are changing the way people carry out their daily activities (Melenhorst 2002). The multimedia interface are user friendly and reduce the effort that one would have to put in the achieve targets and therefore the youth enjoy using it to their satisfaction.

Baltes & Lang (1997) posit that as one grow older; the body loses strength or energy and has low mental stimulation. Due to this older people aspire to use their mental and physical faculties more economically than young people. Younger people have all the strength, energy and high mental stimulations to strive deep into the use of ICT without any struggle, therefore the essence of the youth using the appreciating ICT is in the right direction since it will help them to use the full, their mental and physical resources more efficiently and effectively.

Supporting Management with ICT

Management and administrative task are nowadays being done increasingly by computers. Newhouse (2002) posits that database are maintained to include a large amount of information about each student in the school which

could easily be retrieved and analyzed when the need arise. Computers have the potential of improving the efficiency of many tasks done in the school. They could be used as a tool by the classroom teacher for the preparation of his lessons and management of his teaching resources. The networked systems provide opportunity for a range of people (parent, staff, administrators and students) to have access to information where necessary. In the secondary school particularly, the use of ICT software to support time tabling has become important. Newhouse (2002) claimed the allocation of student, staff and room are done in the school as it seems to be very complex and time consuming.

As a result of the increase in the use of computer by many schools and organization, management and administration of schools should change and become computer-literates as we live in a world which is dynamic and change is a sure factor. The computers themselves though powerful tools, and user friendly, their impact cannot be felt until one has access to use them (Oshagbemi, 1988).

Deployment and Exploitation of ICTs in Education in Ghana

Ghana's national development strategy (Government of Ghana, 1995) emphasizes the use of information and communications technology (ICT) to accelerate the socioeconomic development of the country. A national commission on ICT was set up in 2002 to develop a national ICT policy in order to achieve this national goal. The development of this policy was based on an extensive nation-wide consultation with stakeholders from the public and private sectors, the academic community, as well as civil society, including members of various political parties and groupings.

The report of this commission is what is now known as the Ghana ICT for Accelerated Development Policy (ICT4AD) (Republic of Ghana, 2003). The ICT4AD policy represents the vision of Ghana in the information era. It takes into consideration the targeted goals of key socio-economic development framework documents such as the Vision 2020. The ICT4AD policy statement therefore sets out the road map for the development of Ghana's information society and economy. It provides a basis for facilitating the socio-economic development of the country in the emerging information, knowledge and technological age.

Promoting ICTs in education by deploying and exploiting the potential of ICTs in education is one of the 14 identified pillars of the ICT4AD policy. The need for the learning of the Information and Communication Technology (ICT) as enshrined in the Ghana ICT for Accelerated Development (ICT4AD) necessitated the formulation of the policy statement of the government of Ghana in relation to information and communication technology (ICT) in the country.

Policy Statement

As part of the mission to: *transform the educational system to provide the requisite educational, and training services and environment capable of producing the right types of skills and human resources required for developing and driving Ghana's information and knowledge-based economy and society*, the Government is committed to a comprehensive programme of rapid deployment, utilization and exploitation of ICTs within the educational system from primary school upwards.

Policy efforts shall be directed at using ICTs to facilitate education and learning within the educational system and to promote e-learning and education as well as life-long learning within the population at large. As part of this policy commitment the Government shall put in place policy measures to strengthen science education at all levels of the educational system and as well as promote technical and vocational training with emphasis on the use of ICTs to facilitate the training and learning process. This policy commitment shall in addition contribute to addressing some of the other identified developmental challenges facing Ghana, including: *the challenges of the social and economic pressures of a youthful population; the challenges of turning the youthful population into an asset for development as* well as the *challenges limited human resource capacity characterized by low professional, technical and managerial manpower base of the country*.

Policy Objectives and Strategies

The Objectives

1. To facilitate the deployment, utilization and exploitation of ICTs within the educational system to improve on educational access and delivery and to support teaching and learning from primary school upwards
2. To modernize the educational system to improve the quality of education and training at all levels of the educational system and expanding access to educational, training and research resources and facilities
3. To orientate all levels of the country's educational system to the teaching and learning of science and technology in order to accelerate the acculturation of

science and technology in society and produce a critical mass of requisite human resource and a well informed citizenry

4. To achieve universal basic education and improve the level of basic and computer literacy in the country
5. To ensure a population in which all citizens are at least functionally literate and productive
6. To expand and increase access to secondary and tertiary education
7. To strengthen science education at all levels and in all aspects of the educational system, especially at the basic and secondary levels
8. To promote technical and vocational education and training to enhance middle level management in science and technology levels

Strategies

1. Modernize Ghana's educational system using ICTs to improve and expand access to educational, training and research resources and facilities
2. Improve the quality of education and training and make the educational system responsive to the needs and requirements of the economy and society with specific reference to the development of the information and knowledge-based economy and society.
3. Transform Ghana into an information and knowledge-driven ICT literate nation
4. Introduce computers into all primary, secondary, vocational and technical schools
5. Promote electronic distance education and training and virtual learning systems to complement and supplement face-to-face campus based education and training systems

6. Mainstream ICTs throughout the entire educational system to promote life-long learning
7. Transform the educational system to ensure that there is uninterrupted quality education for all Ghanaians from pre-school to age 17 to reduce poverty and create the opportunity for human development.
8. Promote ICT awareness computer literacy within the public at large
9. Develop and restructure the relevant ICT curricula for all levels of the educational system
10. Encourage collaboration between local and international educational institutions to facilitate educational exchange and the promotion of ICT education and training.
11. Put in place special schemes to enable students, teachers and educational institutions to purchase computers through attractive financial packages.
12. Develop an educational intranet to provide educational materials and tools at all levels of the educational system.
13. Leverage the use of electronic distance learning networks to enhance the delivery of ICT education and training
14. Develop re-training and re-skilling ICT programmes for the management staff of Ministry of
15. Education and educational institutions at all levels.
16. Develop educational management and information systems to improve the quality of management of educational institutions.

17. Promote Internet access to all educational institutions including the schools, universities and colleges
18. Promote e-learning in the schools and universities
19. Strengthen science education at all levels and in all aspects of the educational system, especially at the basic and secondary levels
20. Promote technical and vocational education and training to enhance middle level management in science and technology delivery to all sectors
21. Facilitate collaboration between the Ministry of Education and various accreditation agencies and examination bodies for ICT education and training.
22. Ensure that all universities and colleges take steps to progressively offer their programmes and courses online to broaden access to higher education to a large section of the population and to maximize the quality and efficiency of learning processes, systems and activities.

Policy Measures, Instruments and Initiatives

To achieve the policy objective to develop the educational sector, and improve education access through the deployment and exploitation of ICTs within the educational system, the Government is committed to implementing a number of policy initiatives and measures including those targeted at:

1. transforming Ghana into an ICT literate nation and promoting basic literacy and ICT literacy of the population at large through the implementation of special initiatives targeting both the formal and informal educational system from basic level to higher education level.

2. modernizing the educational system using ICTs to improve and expand access to educational, training and research resources and facilities;
3. promoting and encouraging distance education, including electronic distance education and virtual learning focusing on tertiary level education and training in all fields and disciplines to broaden access to educational and training resource and services to a larger section of the society

Key Implementation Agencies, Players and Stakeholders

1. The Ministry of Education, Youth and Sports.
2. The Universities, Polytechnics, Colleges and Research Institutions.
3. Local and Foreign Educational and Training Provision Organizations.

Summary

In summary, it is acknowledged that for Ghana to make any appreciable progress in its socio-economic development efforts, substantial resources will need to be directed at the introduction of ICT at all levels of education in the country. The key role that ICTs can play in widening access to education to a wider section of the population and for facilitating educational delivery and training at all levels has been recognized by many countries. The Government of Ghana has then acknowledged the need for ICT training and education in the schools, colleges and universities, and to improve the educational system as a whole. ICTs are largely instrumental in shifting the emphasis in learning environments from teacher-centred to learner-centred; where teachers move from being the key source of information and transmitter of knowledge to becoming

guides for student learning; and where the role of students changes from one of passively receiving information to being actively involved in their own learning.

It is therefore imperative that adequately qualified ICT students and ICT-rich leaving surroundings will intensify students learning across the curriculum and this has given rise to the need for ICT competent tutors. The ultimate impact of the heavy investments that the government of Ghana with regards to the colleges of education (and in that case those in the Eastern Region) make on technology infrastructure and facilities will remain elusive if tutors and would-be teachers are not well equipped in terms of knowledge and skills to help integrate ICT into their instruction and student learning environment. College leaders must also recognize the differentiated activities that promote professional learning within the school culture and challenge the notion that professional development is "basal" in nature and that “one-size-fits every participant” does not work.

The informal social networks, as explained by Rogers’ (1995) channels of communication, are also critical in the growth of teachers who would eventually become successful integrators of instructional technology. The situation in colleges of education also requires management to take tutors and students technology professional development in a much more purposeful direction, reform curricula to reflect the need for and enhance technology utilization and integration, and address the perceptions, attitudes and beliefs of staff in planning, designing, and implementing technology innovations.

This is because; computers support communication beyond the classroom walls and enable schools and communities to provide an environment for co-

operative learning (high order thinking skills and solving complex problems). School administrators use computers to access and manage information. Also, it is said to be a major tool used in society without which job opportunities are limited and organizations within society use them to work more efficiently and effectively.

Again, current research (Bauer & Kenton, 2005; Collier, Rivera, & Weinburgh, 2004; Whale, 2006) indicates that when technology, in other words ICT, is integrated with emerging models of teaching and learning, can transform education. Schools all over the world now see computer-based technology as a tool for enriching the curriculum and enhancing teaching and learning. Faculty or staff members therefore, play an important role as implementers of institutional technology innovation (Judson, 2006), and their use of technology for teaching and learning would justify the huge investment that their institutions make in technology infrastructure and equipment.

To conclude, the integration and utilization of ICT in the colleges of education in Ghana is a major step in promoting innovation. It is very obvious that ICT has demonstrable benefits for the future life of both tutors and student-teachers. The Government has thus started implementing ICT policies that will transform Ghana into an ICT literate nation and promoting basic literacy and ICT literacy of the population at large through the implementation of special initiatives targeting both the formal and informal educational system from basic level to higher education level. However, the educational system currently is bedevilled with myriads of problems such as lack of adequate computers and other ICTs

tools, poor internet connectivity, lack of adequate manpower, and lack of coherent ICT policy framework. As a result, for the educational system to leap frog in its quest of ICTs integration, there is the need to take a critical look at the efficient and effective utilization of ICT, both by tutors and student-teachers in the colleges of education, more especially in the Eastern Region of the country.

CHAPTER THREE

METHODOLOGY

This chapter describes the research design, the population, the sample and sampling procedures, the instrument and the pilot-test that were adopted for the study. Also, the procedures that were followed for data collection and data analyses were described.

Research Design

The study is a descriptive survey. Its main aim was to find out from tutors and students how they utilize ICT both in and out of college. The descriptive survey offers the chance of gathering data from a relatively large number of cases at a particular time so as to make inferences and generalizations from the study of the sample. It is essentially cross-sectional (Best & Kahn, 1995). Considering the purpose of the study, it is very obvious that the descriptive (cross-sectional) survey is the appropriate design that led to drawing meaningful conclusion from the study.

Fraenkel and Wallen (2000) also perceived the descriptive survey as a research design that attempts to describe existing situations without actually analyzing relationships among variables. It is again designed to obtain information concerning the current status of the phenomena.

According to Cooper and Schindler (2001), the descriptive study has become popular because of its versatility across disciplines. They further

explained that descriptive investigations have broad appeal to the administrator and policy analyst for planning, monitoring and evaluating. O'Sullivan and Rassel (1999) have explained also that in descriptive survey, "how" questions address issues such as quantity, cost, effectiveness, and adequacy. Gay (1992) claimed that the descriptive survey technique is useful for investigating a variety of educational problems which normally includes opinion, assessment of attitudes, demographic information as well as conditions and procedures. Descriptive sample survey enables one to collect data from members of a population in other to find the status of that population with respect to one or more variables.

However, there is the problem of ensuring that questions to be responded to using the descriptive survey design are clear and not misleading because results can vary significantly depending on the exact wording of questions. The descriptive survey design also produce untrustworthy results because it inquires into private matters that people may not be completely truthful about. To offset these shortcomings, the wordings of the research instrument were subjected to scrutiny by my supervisors.

These limitations notwithstanding, the researcher believes that this descriptive survey was the appropriate design for this study for the following reasons:

1. I believed that it would allow direct contact with tutors and students whose views were relevant for investigating utilisation of ICT in the colleges of education in Eastern Region of Ghana;

2. It would lead to the drawing of useful and meaningful conclusions from the study. This design was chosen because it has the advantages of producing a good amount of responses from a wide range of people. It also provides a clear picture of events and people's behaviour on the basis of data gathered at a point in time.

Population

There were a total of six colleges of education comprising the Seventh Day Adventist College of Education- Asokore, Abetifi Presbyterian College of Education- Abetifi, Kibi Presbyterian College of Education- Kibi, Presbyterian College of Education - Akoropong, Presbyterian Women's College of Education and Mount Mary's College of Education. All these colleges were selected to enable the researcher get a fair and better representation of the study and to generalize accordingly. The target population consisted of all students and tutors of colleges of education in the Eastern Region, Ghana as shown in Table 1 below. Thirty students and fifteen tutors were selected using simple random sample technique from each of the six colleges. In all 270 questionnaires were administered.

Table 1: Accessible Population in the Colleges of Education in Eastern Region

	Staff Population			Student Population		
Colleges	Male	Female	Total	Male	Female	Total
Abetifi	26	8	34	240	160	400
Aburi Women	34	13	47	381	159	540
Akropong	41	11	52	561	374	935
Asokori SDA	37	12	49	413	395	808
Kibi Presby	20	11	31	359	166	525
Mount Mary	39	5	44	293	301	594
Total	**197**	**60**	**257**	**2247**	**1555**	**3802**

Sample and Sampling Procedure

All the colleges of education in Eastern Region of Ghana have been selected for the study so as to get a fair idea of the tutors and students utilisation of ICT in the Colleges of Education in the Region. The study population were the academic staff and students in the six colleges of education in the region who are directly involved in the use of ICT and training of the students. The selection of the respondents was done by using a combination of sampling techniques, namely, purposive, quota and simple random sampling. The idea of the selection of these techniques was to have representative sample of both tutors and students of each of the colleges of education in the region. The heads of the resource centres in the various colleges of education was purposively selected. The quota sampling technique was used to apportion various quotas to groups in the

population for the sample to be representative enough to make good generalization, such as gender and levels of respondents. Using simple random sampling, 180 students and 90 tutors were selected to serve as respondents in this study.

A combination of purposive, quota and simple random sampling techniques were used as said earlier. The purposive sampling was used to sample out all the heads of the resource centres in the various colleges of education of the sampled population. This sampling procedure is appropriate on occasions when, based on previous knowledge of a population and the specific purpose of the research, investigators use personal judgment to select a sample. The researchers used their knowledge of the population to judge whether or not a particular sample will be representative (Fraenkel & Wallen 2000). The quota scheme was used to apportion various quotas to groups in the population for the sample to be representative enough to make good generalization. The simple random sampling (lottery) was used to select the study sample. This method enabled the target population to be given an equal chance of being selected. The questionnaires, by way of the lottery method, were distributed to both the academic staff (tutors) and the students. However, the heads of the resource centres were purposively selected since they were seen to have expert opinions which were relevant for the study.

Research Instruments

The main instrument for data collection for the study was questionnaires which were given to both students and tutors. The reason being that questionnaire

is one of the worldly accepted instruments used for the collection of data and it can be administered to a large number of respondents at the same time. The respondents can also answer the items on the questionnaire at their own convenient time. Again, compared to instruments like interviews and observations, questionnaires are less expensive and can be administrated through the mail. Since no instrument has been found that specifically measure the level of students' and teachers' use of ICT in the colleges of education, four questionnaires were used in this research; they are availability and accessibility of ICT facilities, proficiency in ICT use, patterns of ICT use and barriers to ICT use.

The instruments were self designed after consulting literature on the variables in the study. The researcher took into consideration the peculiarities of Ghanaian students and tutors in the colleges of education. The instruments were given to experts in questionnaire construction who were in the field of ICT/computer education to ensure simple sentence, clarity and appropriateness of statements in the instrument. Also, the researcher determined the validity of the instrument by consulting the supervisors who were competent and familiar with the purpose of the study and examined the items in order to judge whether they were adequate for measuring what they were suppose to measure and whether they were a representative sample of the behaviour domain under investigation.

The questionnaire consisted of five main segments. The first section consisted of respondents' personal data, of tutors, their work experience and present rank in the Ghana Education Service and of students' level. The second section dealt with the availability and accessibility of ICT facilities in the

colleges. The respondents answered questions on the location of ICT in the colleges, whether the ICT laboratory is fully connected to the internet and also to find out whether tutors and students have access to the ICT facility for academic use. The third section finds out the proficiency level of both students and tutors for which the computers in the colleges are used. This looked into the types of ICT applications or the programmes that are run in the colleges. It also finds out the rationale for ICT use in the colleges. This was five point Likert scales with responses like almost always, frequently, sometimes, rarely and never.

The forth section also concerned itself with the ICT utilisation patterns by both tutors and students in the colleges. The respondents again answered questions on how often they do use computer for professional work both in and out of campus. This section also looked at the types of computers used in the various colleges, whether they were networked and the type of accessories that were available to them.

The fifth and final section also sought out information on the constraints in the application and use of ICT facilities. Here the researcher sought to find out the problems encountered in the use of ICT and what authorities do to solve those problems. This also has five point Likert scales with responses ranging from never, little, somewhat, much to a great deal. The instrument used in this study was developed and validated by the researcher and pilot-tested on a sample of similar students and tutors of colleges of education at the central region who did not participate in the major study. However, the initial versions of the instrument were given to experts for suggestions and comments before coming up with the

final versions. The experts are researchers in education and experienced tutors in ICT education. The experts' suggestions were considered item by item bearing in mind relevance and simplicity of each item to the variable being measured. All these steps were taken to ensure content validity of the instrument. This is to ensure that the instruments measured what they were supposed to measure. The Cronbach's Alpha reliability coefficient of 0.712 and 0.759 were obtained for students' and tutors' questionnaires respectively.

Pilot-testing of Instruments

In other to get the validity, reliability, consistency and appropriateness of the questionnaire instrument, a pre-test of the instrument was conducted at the Central Region. According to Leedy (1997), "All questionnaires should be pre-tested on a small population." This makes this pre-testing very necessary; as it revealed poor worded questions; ambiguities and helped to bring out any item that respondents had difficulties understanding. The reason for selecting the Central Region is that it has the same characteristics as the region of study. In determining the reliability of the instruments, the researcher used the alpha coefficient approach frequently called the Cronbach's alpha to calculate reliability.

To test the quality of measurement used in this study, or test the "consistency" or "repeatability" of the measures, a quantitative analysis of inquiry was performed using the SPSS (version 16.0) and Microsoft Excel (2007), computer software, to statistically test the reliability of the research instrument. In the analysis, the sum variables were used because its reliability was very high compared to a single variable. The reliability estimates for the sum variables were

computed by the following: Mean square variance between subjects-residual variance/ mean square variance between subjects (Kautto-Koivula, 1993). As a result, the alpha reliability of (0.759 for tutors and 0.712 for students) was obtained which shows a strong reliability of the research instrument (Saunders, Lewis & Thornhill, 2000).

Data Collection Procedure

The instruments were administered personally to the respondents in all the colleges of education and collected on the same day of administration. In administering the instrument necessary precautions were taken by the researcher to erase any form of subjectivity on the part of the respondents. The respondents were assured utmost confidentiality by the researcher. Respondents were given ample time to read through the information whilst the researcher was available to clarify any issues.

Quantitative technique was used for the study. Questionnaires were used to assess the nature of ICT in the colleges of education in the eastern region of Ghana. It was also used to identify the reasons for the low level of use of ICT in the colleges. The use of the quantitative technique helped quantify the distribution and frequencies of ICT facilities, availability and its utilisation. The research instrument was questionnaire and was used to achieve the main objective of the study. A written questionnaire was used to collect data on the availability and utilisation of ICT and also on the barriers of ICT usage.

Before embarking on the data collection exercise, the researcher collected a letter of introduction from the Institute for Education Planning and

Administration (IEPA) and showed to the Principals of the various colleges of education. At this stage, the researcher was able to establish the necessary rapport with the respondents and assured them of their confidentiality. Sample frame of those selected to respond to the questionnaire were checked and identification numbers assigned to every respondent. This enabled the distribution of the questionnaires to be easy and faster. Questionnaires were then collected and gathered immediately. The rationale for the above approach was to ensure that all the target respondents would be captured and all questionnaires retrieved. Personal contact also helped the researcher to explain some portions of the questionnaire to respondents when deemed it fit.

Data Analysis

The data that were collected were analyzed using the Statistical Package of the Social Sciences (SPSS) and Microsoft Excel specifically, Description statistics, Tables, Percentages, Frequencies, Cross tab-means, Standard Deviations, Pie Chart and Chi-square. The questionnaires were given serial numbers and codes for easy identification before scoring the responses. The variables were then coded and tabulated. Descriptive statistics were used and that gave the researcher the opportunity to make precise statement and described things in an accurate manner. Mean perceived level of ICT use by students and teachers and standard deviations were computed. Frequency distribution tables were used to present the distribution of respondents' view.

Based on the research questions the data were analysed in the following ways:

Research questions	Respondents	items	Analyses
How available and accessible are ICT facilities to student and tutors in colleges of education in Eastern Region?	Tutors Students	Section B 1-5 1-5	Description statistics, Tables, Percentages, Frequencies and Pie Chart
How proficient are students and tutors in the use of ICT in the colleges of education in Eastern Region?	Tutors Students	Section C 6-17 6-15	Description statistics, Tables, Percentages, cross tabs-means, Standard Deviations and Frequencies
What are the ICT utilization patterns of students' and tutors' in the colleges of education in Eastern Region?	Tutors Students	Section D 18-29 16-27	Description statistics, Tables, Percentages, Frequencies and Chi-square
What are the barriers to the utilisation of ICT facilities to students and tutors in the colleges of education?	Tutors Students	Section E 30-42 28-40	Tables, Percentages, Means and Standard Deviations

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter presents the results of the study. The study assessed tutors' and students' utilisation of ICT and its effects on effective teaching and learning in colleges of education in the Eastern Region. It specifically sought to address the following research questions:

1. How available and accessible are ICT facilities to students and tutors in colleges of education in the Eastern Region?
2. How proficient are students and tutors in the use of ICT in the colleges of education in the Eastern Region?
3. What are the ICT/computer technology utilisation patterns of students and tutors in colleges of education in the Eastern Region?
4. What are the barriers to the utilisation of ICT in colleges of education in the Eastern Region?

In all, 270 respondents made up of 180 students and 90 tutors were targeted for the study but 257 including 176 students and 81 tutors responded. This represented 95.2% retrieval rate. Frequencies were tallied and their corresponding percentages computed, and presented in tables. Tables and graphs were briefly introduced and discussed to address the research questions stated above.

Background Information of Respondents

Data on the characteristics of the respondents were collected to help have fair understanding of the background of the respondents in the study. These pieces of information included gender, age (in years), and academic levels of the students. The gender, status, and duration of service in the college were requested from the tutors as well.

Gender of Respondents

The study considered relevant data on the gender of the student and tutor respondents to the study. Table 2 summarized the gender distribution of the respondents.

Table 2: Gender Distribution of Respondents

	Students		Tutors		Total	
Gender	No.	%	No.	%	No.	%
Males	93	52.8	45	55.6	138	53.7
Females	83	47.2	36	44.4	119	46.3
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

A glance at Table 2 shows that more than half (53.7%) of the respondents were males, while the remaining 46.7% were females. Specifically, among the students, 93 (52.8%) were males and 83 (47.2%) were females, while there were 45 (55.6%) males and 36 (44.4%) females among the tutors.

Age of Respondents

Students and tutors were requested to indicate their ages. The age brackets were: “Less than 20,” “25 – 29,” “30 – 34,” “35 – 39,” and “At least 40” years. Table 3 presented the details.

Table 3: Ages Distribution of Respondents

	Students		Tutors		Total	
Age (in years)	No.	%	No.	%	No.	%
Less than 20	33	18.3	0	0.0	33	12.8
20 – 24	122	69.3	20	24.7	142	55.3
25 – 29	20	11.4	52	64.2	72	28.0
30 – 34	1	0.6	3	3.7	4	1.5
35 – 39	0	0.0	3	3.7	3	1.2
At least 40	0	0.0	3	3.7	3	1.2
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

From Table 3, majority (67.7%) of the respondents were between 20 and 24 year, and 40 (15.6%) were aged between 25 – 29 years. Among the student respondents, majority (69.3%) was aged between 20 and 24 years, while 33 (18.3%) were less than 20 years. Twenty representing (11.4%) were aged between 25 and 29. Only one of them aged above 30 years. The average age of the student respondents was 22.7 years. About 64% of the tutors were within 24 – 29 year group, while 20 (24.7%) aged between 20 and 24 years. Only 9 (11.1%) were at least 30 years.

The data also revealed that most (34.1%) students were in Level 200, 59 (33.5%) at Level 300, and 57 (32.4%) were in Level 100. This implied that majority of 119 (67.6%) students had spent at least two years in their respective colleges.

Status of Tutors in the colleges

The study asked the tutors to indicate their positions they held in their respective colleges. The positions included Heads of Departments (HODs), housemasters and housemistresses, and tutors. Table 4 presented the details of their responses.

Table 4: Status of Tutors

Status	Frequency	Percentage
HOD	6	7.4
Housemaster/mistress	62	76.5
Tutor	13	16.0
Total	81	100.0

From Table 4, majority of 62 (76.5%) tutors were housemasters and housemistresses. Again, 13 (16.0%) were only tutors and therefore had no additional responsibilities, while 6 (7.4%) were heads of departments (HODs) in the various colleges of education in the Region.

Duration of Service of Tutors

On the number of years that the tutors had been teaching in the sampled colleges of education in the Eastern Region, Table 5 summarized their responses. The year brackets were: 1 – 3 years, 4 – 6 years, 7 – 9 years, and at least 10 years.

Table 5: Duration of Service in the College

Duration (in years)	Frequency	Percentage
1 – 3	24	29.6
4 – 6	29	35.8
7 – 9	16	19.8
≥ 10	12	14.8
Total	81	100.0

From Table 5, most (35.8%) tutor had been in their respective colleges for 4 – 6 years. Twenty-four representing 29.6% had served between 1 and 3 years, while 16 (19.8%) of them had taught there for 7 to 9 years. Twelve representing 14.8% were in the colleges for at least 10 years. On the average, they had spent 5.7 years in their respective colleges. This implied that the tutors had spent enough years in their colleges to provide the needed information for the study.

Availability and Accessibility of ICT to students and Tutors

Research Question 1: How available and accessible are ICT facilities to students and tutors in colleges of education in the Eastern Region? The study sought to identify ICT facilities that are available in the various colleges and also to appraise how accessible they are to both students and tutors. Relevant questions

were asked in order to address this research questions. These included the number of computers available, and frequency of visit to the computer laboratory. Table 6 summarized the details on availability.

Table 6: Availability of Computers

	Students		Tutors		Total	
Number of Computers	No.	%	No.	%	No.	%
1 – 20	44	25.0	19	23.5	63	24.5
21 – 40	75	42.6	44	54.2	119	46.3
41 – 60	41	23.3	16	19.8	57	22.2
61 and over	16	9.1	2	2.5	18	7.0
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

Table 6 indicated that majority (46.3%) of respondents indicated that they had between 21 and 40 pieces of computers. Sixty-three representing 24.5% said that their computer laboratories had not more than 20 computers, while 57 (22.2%) indicated "41 – 60," and 18 (7.0%) said "61 and over." Computationally from Table 6, the average number of computers in the laboratory of each college was 32.8. Again, computationally, the tutor-computer ratio was 0.82:1, while that of student-computer was 16.6:1. This meant that while the available computers were adequate for the tutor, they were woefully inadequate for the students in the colleges.

On the number of hours that both students and teachers spent in the computer laboratories per day. Table 7 summarized their responses on the accessibility and time spent on computer.

Table 7: Time Spent in Computer Laboratories

	Students		Tutors		Total	
Hours	No.	%	No.	%	No.	%
None	50	28.4	36	44.4	86	33.5
1 hour	66	37.5	16	19.8	82	31.9
2 hours	53	30.1	16	19.8	69	26.8
3 hours	2	1.1	5	6.1	7	2.7
4 and above	5	2.9	8	9.9	13	5.1
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

It can be seen from Table 7 that majority (33.5%) of respondents claimed to have not spent any time in the computer laboratories in a day. Meanwhile, majority (61.4%) of them used between one to two hours per day, while the remaining (5.1%) spent at least 4 hours daily at the computer laboratory. Averagely, students and tutors who used the computer laboratories in the colleges spent 1.57hrs and 2.11hrs respectively. On the whole, the respondents used 1.71hrs in the laboratory daily.

On where the respondents most often accessed computer for professional use, they indicated many places like office, café, home among others. Table 8 summarized the details of their responses.

Table 8: Places for Professional Use of Computers

	Students		Tutors		Total	
Places	No.	%	No.	%	No.	%
Laboratory	50	28.4	36	44.4	86	33.5
Café	66	37.5	16	19.8	82	31.9
Office	53	30.1	16	19.8	69	26.8
Principal's Office	2	1.1	5	6.1	7	2.7
Home	5	2.9	8	9.9	13	5.1
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

Table 8 indicated that whilst most (33.5%) tutors accessed computer use at the colleges' laboratories, most (37.5%) students had theirs at the cafés. Interestingly, only few (9.9%) tutors use computers at home. Generally, most (33.5%) and 31.9% of the respondents had professional use of the computer at laboratories and cafés respectively. About 27% of them normally obtained computer practices from the office, while 13 (5.1%) said "Home." Only 7 (2.7%) said "Principal's Office." The data also revealed that 87.7% of the tutors had computers at home, while the remaining (12.3%) did not.

Meanwhile, the study sought to find out how respondents get access to teaching and research software for use. The options included: provided by the college, personally purchased, donated by philanthropists, or by parents and Table 9 summarized the responses.

Table 9: Sources of Software

	Students		Tutors		Total	
Sources	No.	%	No.	%	No.	%
Provided by the College	90	51.1	17	21.0	107	41.6
Personally purchased	71	40.3	42	51.9	113	44.0
Donated by philanthropists	3	1.7	5	6.3	8	3.1
By parents	12	6.9	-	-	12	4.7
None	0	0.0	17	21.8	17	6.6
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

From Table 9, majority of 90 (51.1%) students relied on the college to procure teaching and research software for their use, while 71 (40.3%) claimed that they personally purchased their own software. On the part of the tutors, 51.9% personally purchased their software, and 17 (21.0%) used the ones secured by their institutions. On the whole, most (44.0%) respondents purchased their own educationally-oriented software for use. The data revealed that 70 (86%) of the tutors agreed that computers in the laboratories were connected to the internet as shown in Figure 2.

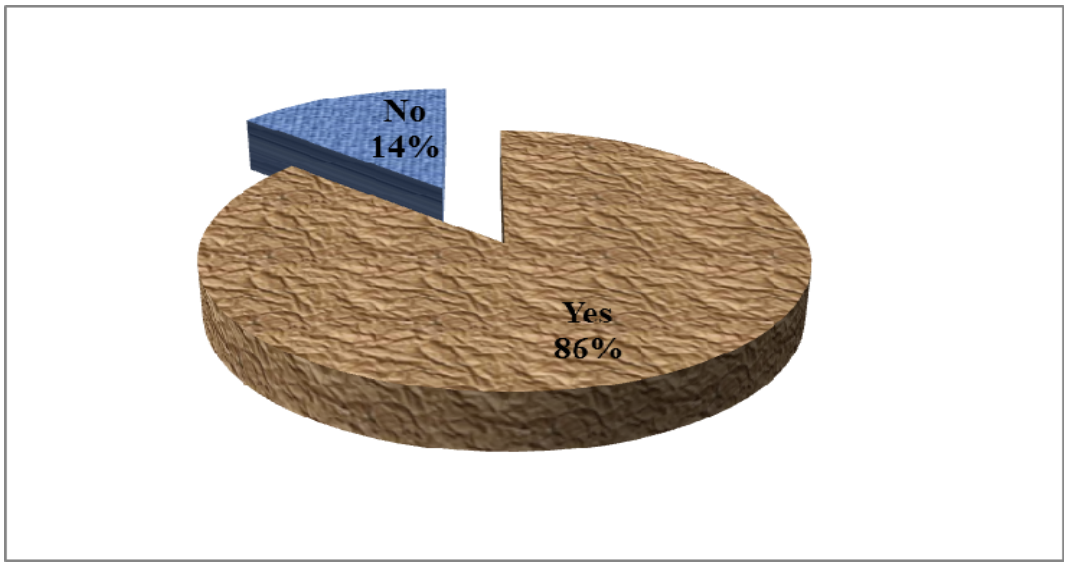

Figure 2: Hooking of Computers at the Laboratories to Internet

In response to the Research Question One, it can be deduced that although the ICT facilities (e.g. computers, internet, etc.) were available in the various colleges, there were generally inadequate especially for students' uses. This is because there is a poor student-computer ratio of 16.6:1, and the computer-user respondents spent, on the average, 1.71hrs per day at the computer laboratory. This is an indication that there is a limited access to computer by the respondents.

This agrees with the conclusion of Hennessy, Harrison and Wamakote, (2010) that most importantly, effectively introducing technology into schools is also largely dependent upon the availability and accessibility of ICT resources (e.g. hardware, software and communications infrastructure), and National Centre for Education Statistics (2000) that there is a correlation between availability of computers and computer use.

Proficiency of Students and Tutors in the use of ICT

Research Question 2: How proficient are students and tutors in the use of ICT in the colleges of education in the Eastern Region? The objective here was to

determine the proficiency of the respondents in the use of ICT facilities available to them. They were asked to rate their efficiencies in the following areas: e-mailing, web processing, classroom management, Microsoft Excel and PowerPoint Presentation, data storage, and desktop publishing using the 5-point Likert scale. Descriptive statistics were computed for the students' and tutors' responses, and summarized in Tables 10 and 11 respectively.

A glance at Table 10 revealed that the least and highest mean values were 2.07 and 3.40 respectively. With an average value of 3.40, 43 (24.4%) of the students claimed to exceptionally good at emailing personal communication and document preparation, while 89 (50.4%) said that they were somewhat good. Twenty-four representing 13.6% indicated "average," while 20 (11.4%) said that they were not good at. While 11 (6.2%) of them reported that they were not good at web-browsing for personal work, majority (93.8%) claimed they had at least some proficiency in that regards. This had a mean and standard deviation of 3.35 and 0.713 respectively.

Table 10: Proficiency of Students in ICT/Computer-based Technology

	Responses												
	EG		VG		G		A		NG				
Statements	No.	%	No.	%	No.	%	No.	%	No.	%	Mean	S.D	Total
Email for personal communication…….	43	24.4	48	27.3	41	23.1	24	13.6	20	11.4	3.40	0.464	176
Web browsing for personal work.	38	21.6	49	27.9	37	21.0	41	23.3	11	6.2	3.35	0.713	176
Internet/email for research and instruction.	37	21.0	51	29.0	34	19.3	34	19.3	20	11.4	3.29	0.886	176
Store of data.	39	22.2	44	25.0	3	17.0	37	21.0	26	14.8	3.19	0.400	176
Microsoft Word for word-processing and instruction.	22	12.5	38	21.6	54	30.7	32	18.2	30	17.0	2.94	0.761	176
Microsoft Excel/Access for class work and assignment.	14	8.0	27	15.3	41	23.3	47	26.7	47	26.7	2.51	0.810	176
The use of Subject-based instructional software.	8	4.5	32	18.2	34	19.3	43	24.4	63	35.8	2.36	0.771	176
Microsoft PowerPoint for presentation in class and seminars.	7	4.0	24	13.6	39	22.2	50	28.4	60	35.8	2.26	0.600	176
Desktop publishing.	10	13.2	88	24.2	48	13.2	82	22.5	98	26.9	2.24	0.942	176
SPSS for data analysis in class and research work.	6	3.4	17	9.7	38	21.6	38	21.6	77	43.8	2.07	0.432	176

Mean = EG – Exceptionally good (5); VG – Very good (4); G - Good (3); A - Average (2); and NG – Not good (1).

Again, 37 (21.0%), 51 (29.0%), 34 (19.3%) and 34 (19.3%) of the students indicated that were “exceptionally good,” “very good,” “good” and “average” respectively at internet and email for research and instruction. However, 20 (11.4%) were not good at that. This the students rated with mean and standard deviation of 3.29 and 0.886 respectively.

Other areas of high proficiency included the store of data (Mean = 3.19), Microsoft Word for word-processing and instruction (Mean = 2.94), and Microsoft Excel/Access for class work and assignment (Mean = 2.51). The study found that the students were generally not good at desktop publishing (Mean 2.24), and SPSS for data analysis in class and research work (Mean = 2.07).

It can be concluded from the above that the students were somewhat good at emailing, web-browsing/ internet, data storing, and Microsoft suits but very weak in desktop publishing and SPSS. The grand mean of the students’ proficiency in the ICT/computer-based technology was 2.76. This implied the students were “good” in the various components of ICT assessed.

A glance at Table 11 showed that the lowest and highest mean values were 3.12 and 2.15 respectively. With an average value of 3.21, 13 (16.0%) of the tutors claimed to be exceptionally good at web browsing, while 20 (24.7%) and 26 (32.1%) responded “very good” and “good” respectively. Again, 15 (18.5%) said that were averagely good at web browsing. However, the remaining (7.6%) reported of not being good at that.

Table 11: Proficiency of Tutors in ICT/Computer-based Technology

	Responses												
	EG		VG		G		A		NG				
Statements	No.	%	No.	%	No.	%	No.	%	No.	%	Mean	S.D	Total
Web browsing for personal work.	13	16.0	20	24.7	26	32.2	15	18.5	7	8.6	3.21	0.674	81
Email and word processing for personal communication and document preparation.	13	16.0	20	24.7	28	34.6	8	9.9	12	14.8	3.17	0.510	81
Internet/email for research and instruction.	16	19.8	19	23.5	14	17.3	18	22.1	14	17.3	3.06	0.713	81
Store of data.	9	11.1	25	30.9	15	18.4	16	19.8	16	19.8	2.94	0.672	81
Microsoft Word for word-processing and instruction.	7	8.6	25	30.9	15	18.4	18	22.2	16	19.8	2.89	0.600	81
Classroom management and student assessment/evaluation purposes.	7	8.6	22	27.2	14	17.3	23	28.4	15	18.5	2.79	0.901	81
Teaching and learning activities for your students.	6	7.4	16	19.8	15	18.5	25	30.9	19	23.5	2.57	0.466	81
Microsoft Excel/Access for class work and assignment.	3	3.7	16	19.8	14	17.3	27	33.3	21	25.9	2.42	0.710	81
Microsoft PowerPoint for presentation in class and seminars.	4	4.9	16	19.8	13	16.0	24	29.7	24	25.9	2.41	0.543	81
The use of Subject-based instructional software.	4	4.9	11	13.6	18	22.2	26	32.1	22	27.2	2.37	0.405	81
Desktop publishing.	2	2.5	16	19.8	7	8.6	25	30.9	31	38.2	2.17	0.885	81
SPSS for data analysis in class and research work.	2	2.5	16	19.8	10	12.3	17	21.0	36	44.4	2.15	0.555	81

Mean = EG – Exceptionally good (5); VG – Very good (4); G - Good (3); A - Average (2); and NG – Not good (1).

Similarly, a great majority of 69 (85.2%) tutor indicated that they had at least some level of proficiencies in emailing and word processing for their personal communication and document preparation. Again, 67 (82.7%) of them were good at using the internet/email for research and instructional purposes, while 14 (17.3%) were not. This they rated high with a mean value of 3.06. On the storing of data, only 16 (19.8%) were not proficient. Sixteen representing 19.8% were averagely good, 40 (49.4%) were somewhat good, while 9 (11.1%) were exceptionally good at data storage.

The data, however, portrayed that most tutors lacked the expertise in desktop publishing (Mean = 2.17), and the SPSS for data analysis in class and research work (Mean = 2.15). The grand mean for the tutors' proficiency in the ICT/computer-based technology was 2.70. The implication is that the tutors were just "good" in the above listed areas. This finding confirms a study by Iding, Crosby and Speitel (2002), who reported that overwhelmingly, teachers and pre-service teachers who reported using computers for their own personal use were at least moderately proficient with computers, have varying levels of access to computers in schools and individual classrooms, and were interested in learning more about technology for educational purposes. However, a finding by Walsh and Vannatta (2002) showed that teachers do not require proficiency in a large variety of technology application, for successful integration of ICT in teaching and learning but rather they need to feel comfortable and confident in instructional methods of ICT integration.

ICT Utilization Patterns by Students and Tutors

Research Question 3: What are the ICT/computer technology utilisation patterns of students' and tutors' in colleges of education in the Eastern Region? The study sought to find out the pattern of utilisation of ICT/computer technology by the students and tutors in the various colleges of education in the Region. It looked at the ownership of computer, "first use" of the computer for research, the use of computers for academic work at home, and the use of computers for academic work on campus by the respondents.

Table 12 presents the responses of both students and tutors on the ownership of a computer. As can be seen, more than half (56.8%) of the respondents had personal computers, while 111 (43.2%) did not have.

Table 12: Ownership of Computer by Respondents

	Students		Tutors		Total	
Responses	No.	%	No.	%	No.	%
Yes	75	42.6	71	87.7	146	56.8
No	101	57.4	10	12.3	111	43.2
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

Particularly from Table 12, majority (57.4%) of the students did not have their own computers. However, 75 representing 42.6% were not having. Meanwhile, among the tutors, a greater majority (87.7%) had personal computers. Only 10 (12.3%) had none. Also, most (31.1%) respondents acquired their initial ICT/computer skills through self-teaching and taken of formal courses, while 64 (24.9%) had theirs through self-teaching only. Others also had it by the assistance

of friends. Among those who had received some amount of ICT training, majority (51.1%) specialized in basic computer literacy (e.g. windows operations, how to run programmes), 33.5% had training in computer applications (e.g. word processing, spreadsheets, ppt. etc.), while 15.4% was trained in computer integration in classroom curriculum and instruction.

The study also delved into where (stage/level of education) the respondents had their first touch of the computer. Table 13 summarized their responses.

Table 13: Stage of 'First Use' of Computer

	Students		Tutors		Total	
Stage	No.	%	No.	%	No.	%
Basic	30	17.0	-	-	30	11.7
Secondary	101	57.4	-	-	101	39.3
Tertiary	45	25.6	-	-	45	17.4
Undergraduate	-	-	52	64.2	52	20.2
Graduate	-	-	20	24.7	20	7.8
New staff member	-	-	3	3.7	3	1.2
Experienced staff member	-	-	3	3.7	3	1.2
None	-	-	3	3.7	3	1.2
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

Table 13 shows that majority (57.4%) of the students had their first computer touch in the secondary school level, while 45 (25.6%) had theirs at their present schools. Thirty representing 17.0% had their practices with the computer far back

in the basic school. On the part of the tutors, majority (64.2%) had the opportunity during their undergraduate days, while 20 (24.7%) had theirs at the graduate level. Interestingly, three presenting 1.3% of the tutors had never touch the computer yet. The study further reveals that the level/stage of 'first use' of the computer by the students had no statistically significant association with proficiency since the Chi-square tests showed χ^2 (8, N = 176) = 10.072, $p > 0.05$, while the reverse was true among the tutors since χ^2 (16, N = 81) = 29.587, $p < 0.05$.

On the frequency of computer use for profession work both at home and on campus, the respondents were provided four options such as very often, often, seldom, and none. Table 14 provided the responses given.

Table 14: Frequency of Computer Use among Respondents

	Students		Tutors		Total	
Responses	No.	%	No.	%	No.	%
Very often	19	10.8	14	17.3	33	12.8
Often	56	31.8	29	35.8	85	33.1
Seldom	61	34.7	26	32.1	87	33.9
None	40	22.7	12	14.8	52	20.2
Total	**176**	**100.0**	**81**	**100.0**	**257**	**100.0**

From Table 14, most (34.7%) students indicates that they used the computer seldom, while 56 (31.8%) said "often." Nineteen representing 10.8% indicated "very often," while a large number (40) of them said "none." Among the tutors, majority (53.1%) of them responded "very often" and "often" used the computer. Clearly, majority of the respondents somehow used the computer for

their professional work either at home or on campus or both. Table 15 summarizes the results on how often the respondents use computer application. Areas covered included web browsing, games, Word processing, and downloading from the internet.

Table 15: Frequency of Use of Computer Applications

Statement	Students (Mean)	Tutors (Means)
Browsing the internet	3.00	2.73
Playing games	2.72	2.14
Word processing	2.59	2.47
Downloading from the internet	2.36	2.78

It can be seen from Table 15 that on the part of the students, they normally used the computer to browse the internet, play games, process word documents, and download from the internet in that order. Contrarily, the tutors more frequently used the computer to download from the internet, browse the internet, process word documents, and play games. Therefore, this affirms the study conducted by Hernandez-Ramos (2005) of K-12 schools in Santa Clara County, California in the heart of Silicon Valley, which revealed that exposure to technology in teaching preparation programmes, knowledge of software applications, and constructivist beliefs were found to be positively related to more frequent use of technology by teachers, both for themselves and their students.

Barriers to the Use of ICT Tools in the Colleges

Research Question 4: What are the barriers to the utilisation of computer and internet as ICT tools in the Eastern Region? The objective here was to identify the key barriers to integrating ICT/computer-based technology in the colleges of education in the Region. The study computed frequencies, percentages, means and standard deviations for all thirteen items. The details are presented in Tables 16 and 17 for the students and tutors respectively.

From Table 16, it can be seen that the main barrier to integrating ICT/computer-based technology, on the part of the students, in the classroom was the inadequacy of computers for their use as majority (54.5%) of them responded that this was a great deal of problem, while 70 (39.8%) also agreed to some extent that this phenomenon posed a challenge to the use of ICT in the colleges in the Eastern Region. However, 10 (5.7%) of them were in disagreement. This barrier was rated with the highest mean value of 4.03 and a standard value of 0.715. Again, with regards to "Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT," a greater majority (93.2%) agreed that it was a problem, while 12 (6.8%) said "never." This statement had an average value of 3.96 and variability of 0.811.

Table 16: Students' Views on Barriers to Integrating ICT/Computer-based Technology in Colleges

	Responses												
	GD		M		S		L		N				
Statements	No.	%	No.	%	No.	%	No.	%	No.	%	Mean	S.D	Total
Inadequate computers for the number of students on campus.	96	54.5	34	19.3	12	6.8	24	13.6	10	5.7	4.03	0.715	176
Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT.	92	52.3	31	17.6	19	10.8	22	12.5	12	6.8	3.96	0.811	176
Inadequate computers for the number of staff members on campus.	64	26.4	39	22.2	41	23.3	24	13.6	8	4.5	3.72	0.443	176
Teaching time schedules prevent maximum utilisation of ICT/computer technology.	50	28.4	49	27.8	40	22.7	26	14.8	11	6.3	3.57	0.332	176
Hardware is unstable and always dysfunctional.	53	29.5	37	21.0	33	18.8	35	19.9	19	10.8	3.39	0.744	176
Students pay a lot of money to use computers off-campus.	49	27.8	43	24.4	34	19.4	26	14.8	24	13.6	3.38	0.686	176
Problems of unreliable communication connectivity/ network access.	46	26.0	39	22.2	39	22.2	33	18.8	19	10.8	3.34	0.607	176
Inadequate professional training for students to support ICT use.	48	27.3	37	21.0	33	18.8	34	19.3	24	13.6	3.29	0.344	176
Present curriculum makes no provision for ICT/computer integration for the classroom.	35	19.9	30	17.0	41	23.3	31	17.6	39	22.2	2.95	0.772	176
Difficult to experiment with ICT application.	30	17.0	25	14.2	48	27.3	38	21.6	35	19.9	2.87	0.550	176
Inability to cope with ICT/computer complexities.	31	17.6	23	13.1	46	26.1	41	23.3	35	19.9	2.85	0.621	176
Students pay a lot of money to access computers on campus.	20	11.4	20	11.4	17	9.6	35	19.9	84	47.7	2.19	0.811	176
ICT/Computer technology is irrelevant to the course I study.	24	13.8	10	5.7	26	14.9	25	14.4	89	51.1	2.17	0.885	174

Mean = GD – Great deal (5); M – Much (4); S - Sometimes (3); L - Little (2); and N – Never (1).

Another challenge identified by the students was the inadequate number of computers for the staff of the colleges (Mean = 3.72, SD = 0.443). Majority (93.7%) of them also indicated that their teaching time schedules prevented maximum utilisation of ICT on campus, while the remaining (6.3%) thought otherwise. On "hardware is unstable and always dysfunctional Store of data," 53 (29.5%), 27 (21.0%), 33 (18.8%), and 35 (19.9%) of them responded "great deal," "much," "somewhat," and "little" respectively. However, 19 (10.8%) of them disagreed with the above assertion. The least challenges, according the students, were as follows: "ICT/Computer technology is irrelevant to the course I study, (Mean = 2.17; SD = 0.885)" "students pay a lot of money to access computers on campus (Mean = 2.19; SD = 0.811)," and "inability to cope with ICT/computer complexities (Mean = 2.85; SD = 0.621)."

Thus, the main barriers identified by the students included inadequate computers for them and staff, inadequate computer peripherals (such as projectors, printers and scanners), teaching time schedules, and dysfunctional hardware. This supports the views of Bitner and Bitner (2002) that barriers to ICT can be centred on the support networks that are available to the school. These include support from the teachers, the administration, technical service and students as well.

Similarly from Table 17, on the part of the tutors, all of them (100.0%) somewhat agreed that inadequate computers for the number of students on campus was a key barrier to their inability to use ICT in teaching. This statement was rated with an average value of 4.09 and a standard deviation of 0.794. About

96% of them also identified the inadequacy of computers for their own use as another key barrier. Also, overwhelming majority (96.3%) of them revealed that there were inadequate computer peripherals for effective use of ICT. This "barrier" was rated with a mean value of 4.00.

With a mean value of 3.81, majority (95.5%) of the tutors said that inadequate college financial support to develop instructional materials impeded their quest to use ICT in the classrooms. In addition, 96.3% of them reported that many teaching staff members were not sure of how to integrate ICT/ computer technology in the classroom. Seventy-seven representing (95.1%) blamed this on the unfavourable teaching-time schedules. Difficult to experiment with ICT application (Mean = 3.00), and ICT/ computer technology is irrelevant to the course I teach were not serious challenges to the integration of ICT to teaching and learning in the colleges of education in the Region.

In conclusion, the inadequacy of computers in the colleges was identified as a key barrier to the use of ICT. This finding corroborates the findings of National Centre for Education Statistics (2000) that a total of 78% of teachers surveyed cited limited access to computers as a barrier to effectively using computers in their classes. Of this total, 38% thought "not enough computers" was a "great barrier" to using technology in their classes, and Beacker (2000) who found that in the United States of America only about one third of the teachers use computers on regular basis, although majority has a computer in their classroom.

Table 17: Tutors' Views on Barriers to Integrating ICT/Computer-based Technology in Colleges

	Responses												
	GD		M		S		L		N				
Statements	No.	%	No.	%	No.	%	No.	%	No.	%	Mean	S.D	Total
Inadequate computers for the number of students on campus.	36	44.4	25	30.9	11	13.6	9	11.1	0	0.0	4.09	0.794	81
Inadequate computers for the number of staff members on campus.	39	48.1	20	24.7	13	16.0	6	7.4	3	3.7	4.06	0.800	81
Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT.	38	46.9	17	21.0	16	19.8	8	9.9	2	2.5	4.00	0.912	81
Inadequate college financial support to develop instructional materials.	31	38.2	21	25.9	16	19.8	9	11.1	4	4.5	3.81	0.445	81
Many teaching staff members are not sure of how to integrate ICT/ computer technology in the classroom.	28	34.6	22	27.2	19	23.5	9	11.1	3	3.7	3.78	0.690	81
Teaching time schedules prevent maximum utilisation of ICT/computer technology.	26	32.1	20	24.7	18	22.2	13	16.0	4	4.9	3.63	0.956	81
Present curriculum makes no provision for ICT/computer integration for classroom teaching and learning.	26	32.1	23	28.4	12	14.8	9	11.1	4	4.9	3.54	0.613	81
Inadequate technical support.	20	24.7	24	29.6	18	22.2	12	14.8	7	8.6	3.47	0.911	81
Inadequate professional training for students to support ICT use.	17	21.0	22	27.2	24	29.6	15	18.5	3	3.7	3.43	0.459	81
Problems of unreliable communication connectivity/ network access.	15	18.5	29	35.8	18	22.2	13	16.0	6	7.4	3.42	0.400	81
Inability to cope with ICT/computer complexities.	13	16.0	16	19.8	22	27.2	26	32.1	4	4.9	3.10	0.776	81
Difficult to experiment with ICT application.	14	17.3	11	13.6	29	35.8	20	24.7	7	8.6	3.00	0.611	81
ICT/computer technology is irrelevant to the course I teach.	15	18.5	29	35.8	18	22.2	13	16.0	6	7.4	2.07	0.555	81

Mean = GD – Great deal (5); M – Much (4); S - Sometimes (3); L - Little (2); and N – Never (1).

He continued that only a small minority of secondary school academic classes use computers significantly for (i) students acquiring information, (ii) analyzing ideas, and (iii) demonstrating and communicating content understanding in science, social studies, mathematics, and other academic work. He justified this by saying that scheduling problems, pressure of curriculum coverage, and convenient access to computers accounted for this situation.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter gives the overview of the entire work. The chapter contains the summary of findings, conclusions drawn from the study and recommendations made for easy integration of ICT/computer-based technology in the classroom for effective teaching and learning. Again, it presents suggestions for further studies.

Summary

Overview of the study

The study examined tutors' and students' utilisation of ICT and its effects on effective teaching and learning in colleges of education in the Eastern Region. It specifically sought to address the following issues:

1. Available and accessible of ICT facilities to students and tutors in colleges of education in the Eastern Region.
2. Proficiency of students and tutors in the use of ICT in the colleges of education in the Eastern Region.
3. ICT/computer technology utilization patterns of students' and tutors' in the colleges of education in the Eastern Region.
4. Barriers to the utilisation of computer and internet as ICT tools in the Eastern Region.

The study reviewed related and relevant literature under the following sub-headings: theoretical framework of technology of educational technology and

educational technology, the rationale for the use of ICT in schools, the effect of ICT on the curriculum, effect of ICT on students, the effect of ICT on learning, the effect of ICT on the roles of the teacher, the effect of ICT on the learning environment, gender, age and ICT, supporting management with ICT and the barriers to ICT integration in the colleges of education.

To achieve the above stated objectives, a descriptive design was adopted. All tutors and students in all the six colleges of education comprising the SDA College of Education – Asokore, Abetifi Presbyterian College of Education – Abetifi, Kibi Presbyterian College of Education – Kibi, Presbyterian College of Education – Akropong, Presbyterian Women's College of Education-Aburi, and Mount Mary's College of Education-Somanya, were targeted for the study. A sample size of 270 respondents including 180 and 90 students and tutors respectively was determined for the study. However, 257 (made up 176 students and 81 tutors) were randomly selected from all the colleges and involved in the study. This indicated that the study attained a coverage rate of 95.2%. In addition, two different sets of questionnaires were designed for the two categories of respondents.

Before the main study, a pilot-testing was conducted in Komenda College of Education in Central Region of Ghana. The data gathered were analysed and it emerged that some questions were irrelevant or ill-structured. All irrelevant questions were subsequently deleted, while ambiguous ones were modified. The main study data were analysed using descriptive statistics such as frequencies and percentages, means and standard deviations using the SPSS. Statistical tables and

graphs were also drawn using the Microsoft Excel, and the results were discussed to address the research questions posed. It emerged that majority of 138 (53.7%) respondents were males. The averages of the students and tutors were 24.7 and 26.9 years respectively. Majority of the students had spent at least 2 years in school, while on the average; a tutor had spent 5.7 years in the college.

Key Findings

The following main findings came to light from the study:

1. ICT facilities (e.g. computers, internet, etc.) were available but inadequate for students' use since the student-computer ratio was 16.6:1. Again there were limited access to the use of computers and internet. The laboratories 86 (33.5%), cafés 82 (31.9%) and offices 69 (26.8%) served as the main avenues for accessing ICT services by the respondents. The respondents spent, on the average, 1.71hrs per day at the computer laboratory.
2. Most of the respondents were found to be proficient in emailing, web-browsing/ internet, data storage, and Microsoft suits. However, the respondents were not proficient in the SPSS and desktop publishing.
3. Although 146 (56.8%) of the respondents had personal computers, they hardly or do not use them at all. Again, majority of 101 (57.4%) students began using the computer in the Senior High school level, 64.2% of their tutors started at the undergraduate level. The stage of 'first use' of computer had much impact on the proficiency of the tutors; but not on the students.
4. The main barriers to the successful integration of ICT/ computer-based technology in the colleges were inadequate computers especially for the students,

and inadequate computer peripherals (such as projectors, printers, scanners, etc.), conflicting teaching-time schedules, and dysfunctional hardware.

Conclusions

A number of conclusions could be drawn from the findings of study:

Although the tutors had enough ICT facilities (e.g. computers, internet, etc.) appeared to be adequate for the tutors per their numbers, the same could not be said in the case of the students. This caused many of them to patronize cafés since there appeared to be a limited access to ICT facilities. Again Tutors and students were somewhat had proficiency in basic computer skills such as E-mailing, web-browsing, data storage, and Microsoft suits. They however, lack knowledge in applications like the SPSS and desktop publishing.

The acquisition of a personally computer does not guarantee one's usage because although majority of the respondents had personal computers most of them hardly or do not use them at all. Again, if students could take their computer lessons seriously from the SHS level, their proficiency could be increased thereafter. The identified barriers to the successful integration of ICT/ computer-based technology in the colleges could be surmounted by procuring adequate number of computers and accessories especially for the students.

Recommendations

Recommendations for practice

Based on the findings and conclusions, the following recommendations and suggestions are made for possible implementation:

1) Ghana Education Service and other relevant stakeholders should urgently provide colleges of education especially in the Eastern Region with adequate number of computers. This will improve the student-computer ratio thereby increase access.
2) The government and all stakeholders of the colleges of education must make financial provision to support the development of instructional materials in the various colleges.
3) Provision must be made on the teaching-time tables of the colleges to make adequate time for both students and tutors to have computer practice. This will improve their proficiencies.
4) Training should be given by the Ministry of Education to the tutors of the colleges of education in particular on how to effectively integrate ICT in the teaching and learning processes in the colleges of education.

Suggestions for Further Studies

Due to resource constraints, the study could not cover all aspects of ICT utilisation and its effects on effective teaching and learning. Therefore, the study suggested that the scope should be expanded to cover all colleges of education in the country.

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APPENDICES

(Appendix A)

QUESTIONNAIRE FOR TUTORS

Tutors' and Students' Utilisation of ICT in the Colleges of Education

The purpose of this study is to collect information on the extent of use of ICT by Tutors and Students in the Colleges of Education to facilitate effective and efficient teaching and learning. I will therefore, be happy if you will provide frank answers to the questionnaire items. Please, read each question carefully and answer according to your true opinion. You are fully assured of the confidentiality of all information provided on this paper.

Section A: Background Information

Instruction: please kindly tick (√) or fill the appropriate response to each item.

1. Name of College: ……..
2. Department: ……..
3. Gender: **a.** Male [ ] **b.** Female [ ]
4. Age: **a.** 20-24 [ ] **b.** 25 – 29 [ ] **c.** 30 – 34 [ ] **d.** 35 – 39 [ ] **e.** 40 and above [ ]
5. Status: **a.** Head of Department [ ] **b.** Tutor [ ] **c.** Housemaster/mistress
6. How many years have you spent in this College?
   a. One to Three years [ ]
   b. Four to Six years [ ]
   c. Seven to Nine years [ ]

d. Ten years and above [ ]

Section B: Availability and Accessibility of ICT Facilities

Instruction: please kindly tick (√) the appropriate response to each item.

1. How many computers are in the college's laboratory?

   a. 1– 20 [ ]

   b. 21 – 40 [ ]

   c. 41 – 60 [ ]

   d. 60 and above [ ]

2. Is the computer laboratory connected to the internet?

   a. Yes [ ]

   b. No [ ]

3. How many hours in a day do you use the computers at the laboratory?

   a. 1hr [ ] b. 2hrs [ ] c. 3hrs [ ] d. 4hrs and above [ ] e. None [ ]

4. Among the various options below, where do you **most often** access the computer for professional use?

   a. At the laboratory [ ]

   b. At the café [ ]

   c. At my office [ ]

   d. At the principal's office [ ]

   e. At home [ ]

5. How do you get access to teaching and research software for use?

   a. Provided by the college [ ]

b. Personally purchased [ ]

c. Donated by philanthropists [ ]

d. None [ ]

Section C: Proficiency in ICT/ Computer based Technology Use

Instruction: please kindly tick (√) the appropriate response to each item.

How best would you describe your level of competence in the use of ICT/Computer-based technology in the following areas?

Please, rate your competency of use as follows: Exceptionally Good (5), Very Good (4), Good (3), Average (2), Not Good (1).

Statements	**Exceptionally Good**	**Very Good**	**Good**	**Average**	**Not Good**
6. Email and word processing for personal communication and document preparation					
7. Web browsing for personal work					
8. Classroom management and student assessment/evaluation purposes					
9. Teaching and learning activities for your					

students.					
10. Microsoft Word for word-processing and instruction.					
11. Microsoft Excel/Access for instruction and course management.					
12. Microsoft PowerPoint for presentation in class and seminars.					
13. SPSS for data analysis and research work.					
14. Internet/E-Mail for research and instruction.					
15. Use of subject-based instructional software.					
16. Store of data					
17. Desktop publishing					

Section D: ICT/Computer Technology Utilisation Pattens

Instruction: please kindly tick (√) the appropriate response to each item.

The purpose of the following questions is to gather information about individual computer/ ICT adoption, initial use, and support systems. Please select the response that best represents your experience, opinion or situation.

18. Do you own a personal computer?

    a. Yes [ ]

    b. No [ ]

19. How did you acquire your initial ICT/computer skills?

    a. Self-teaching [ ]

    b. Formal courses [ ]

    c. From a college [ ]

    d. From a friend [ ]

    e. Both self-teaching and formal courses [ ]

20. At what stage of your professional practice/development did you first use computers on campus?

    a. As an undergraduate student [ ]

    b. As a graduate student [ ]

    c. As a new faculty member [ ]

    d. As an experienced faculty member [ ]

    e. Have not used computers at all in my career [ ]

21. How often do you use computers for professional work at home in a day?

a. Very Often [ ]

b. Often [ ]

c. Seldom [ ]

d. None [ ]

22. How often do you use computers for professional work on campus?

a. Very Often [ ]

b. Often [ ]

c. Seldom [ ]

d. None [ ]

Please indicate how often you carry out the following applications using the computer.

Statement	**Very frequently**	**Frequently**	**Sometimes**	**Never**
23. Word processing				
24. Playing games				
25. Browsing the internet				
26. Downloading from the internet				

27. On the average, how many hours do you spend using a computer per day?

a. 1hr [ ] **b.** 2hrs [ ] **c.** 3hrs [ ] **d.** 4hrs and above [ ]

e. None [ ]

28. Which of the following best describes the level of technology training that you have had in the past five years?

    a. No training

    b. Basic computer literacy (windows operations, how to run programmes)

    c. Computer applications such as word processing, spreadsheets, PowerPoint, etc

    d. Computer integration in classroom curriculum and instruction

29. How would you describe your level of use of computer-based technology for teaching and learning? Please, select only one level.

    a. **Low** (I am able to perform basic functions, but I still require help on a regular basis.)

    b. **Moderate** (I am competent in a number of computer applications for instruction.)

    c. **High** (I am proficient in using a wide variety of computer technologies for instruction)

Section E: Barriers to Integrating ICT.

Instruction: please kindly tick (√) the appropriate response to each item.

How would you rate the following barriers as a major factor to integrating ICT/ computer technology in colleges of education from A Great Deal to Never? A Great Deal (5), Much (4), Somewhat (3), Little (2) and Never (1)

Statement	Great Deal	Much	Somewhat	Little	Never
30. Teaching time schedules prevent maximum utilisation of ICT/ computer technology for teaching and learning.					
31. Many teaching staff members are not sure of how to integrate ICT/ computer technology in the classroom.					
32. Inadequate computers for the number of staff members on campus.					
33. Inadequate computers for the number of students on campus.					
34. Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT for teaching and learning.					
35. Present curriculum makes no provision for ICT/ Computer					

integration for classroom teaching and learning.					
36. Inadequate college financial support to develop instructional materials.					
37. Problems of unreliable telecommunication connectivity/ network access.					
38. ICT/Computer technology is irrelevant to the course I teach.					
39. Inadequate technical support.					
40. Inadequate professional training to support ICT use.					
41. Inability to cope with ICT/computer complexities.					
42. Difficult to experiment with ICT/computer applications.					

(Appendix B)

QUESTIONNAIRE FOR STUDENTS

Tutors' and Students' Utilisation of ICT in the Colleges of Education

The purpose of this study is to collect information on the extent of use of ICT by Tutors and Students in the Colleges of Education to facilitate effective and efficient teaching and learning. I will therefore, be happy if you will provide frank answers to the questionnaire items. Please, read each question carefully and answer according to your true opinion. You are fully assured of the confidentiality of all information provided on this paper.

Section A: Background Information

Instruction: please kindly tick (√) or fill the appropriate response to each item.

1 Name of College: ……..

2 Programme: ……..

3 Gender: **a.** Male [ ] **b.** Female [ ]

4 Age: **a.** Less than 20 [ ] **b.** 20 – 24 [ ] **c.** 25 – 29 [ ] **d.** 30 and above [ ]

5 Level …….

Section B: Availability and Accessibility of ICT Facilities

Instruction: please kindly tick (√) the appropriate response to each item.

1. How many computers are in the college's laboratory?

   a 1– 20 [ ]

   b 21 – 40 [ ]

   c 41 – 60 [ ]

d 61 and above [ ]

2. How many hours in a day do you use the computer at the laboratory?

   a. 1hr [ ] b. 2hrs [ ] c. 3hrs [ ] d. 4hrs and above [ ] e. None [ ]

3. How many times in a week do you have access to the computer laboratory?

   c. Ones a week [ ] **c.** Thrice a week [ ]

   d. Twice a week [ ] **d.** Four and above [ ]

4. Among the various options below, where do you **most often** access the computer for academic use?

   f. At the laboratory [ ]

   g. At the café [ ]

   h. At my office [ ]

   i. At the principal's office [ ]

   j. At home [ ]

5. How do you get access to teaching and research software for use?

   a. Provided by the college [ ]

   b. Personally purchased [ ]

   c. Donated by philanthropists [ ]

   d. By parents [ ]

Section C: Proficiency in ICT Use

Instruction: please kindly tick (√) the appropriate response to each item.

How best would you describe your level of competence in the use of ICT/Computer-based technology in the following areas?

Please, rate your competency of use as follows: Exceptionally Good (5), Very Good (4), Good (3), Average (2), Not Good (1)

Statements	**Exceptionally Good**	**Very Good**	**Good**	**Average**	**Not Good**
6. Email for personal communication.					
7. Web browsing for personal work.					
8. Microsoft Word for word-processing and instruction.					
9. Microsoft Excel/Access for class work and assignment.					
10. Microsoft PowerPoint for presentation in class and seminars.					

11. SPSS for data analysis in class and research work.					
12. Internet/E-Mail for research and instruction.					
13. The use of Subject-based instructional software.					
14. Store of data					
15. Desktop publishing					

Section D: Patterns of ICT/Computer Technology Use

The following questions to gather information about individual computer/ ICT adoption, initial use, and support systems. Please select the response that best represents your experience, opinion or situation.

16. Do you own a personal computer?

    a. Yes [ ]

    b. No [ ]

17. In which level in your education did you FIRST USE the computer for research (e.g. retrieving information, data analysis, collection of data, etc)?

    a. Basic [ ]

    b. SHS [ ]

c. Tertiary [ ]

18. How did you acquire your initial ICT/computer skills?

a. Self-teaching [ ]

b. Formal courses [ ]

c. From a college [ ]

d. From a friend [ ]

e. Both self-teaching and formal courses [ ]

19. How often do you use computers for academic work at home?

a. Very Often [ ]

b. Often [ ]

c. Seldom [ ]

d. None [ ]

20. How often do you use computers for academic work on campus?

e. Very Often [ ]

f. Often [ ]

g. Seldom [ ]

h. None [ ]

Please indicate how often you carry out the following applications using the computer.

Statement	**Very frequently**	**Frequently**	**Sometimes**	**Never**
21. Word processing				
22. Playing games				

23. Browsing the internet				
24. Downloading from the internet				

25. On the average, how many hours do you spend using a computer per day?

    a. 1hr [ ] **b**. 2hrs [ ] **c.** 3hrs [ ] **d.** 4hrs and above [ ] **e.** None [ ]

26. Which of the following best describes the level of ICT/ technology training that you have had in the past five years?

    a. No training

    b. Basic computer literacy (windows operations, how to run programmes)

    c. Computer applications such as word processing, spreadsheets, PowerPoint, etc

    d. Computer integration in classroom curriculum and instruction

27. How would you describe your level of use of ICT/computer-based technology for teaching and learning? Please, select only one level.

    a. Low (I am able to perform basic functions, but I still require help on a regular basis.)

    b. Moderate (I am competent in a number of computer applications)

    c. High (I am proficient in using a wide variety of computer technologies)

Section E: Barriers to Integrating ICT/ Computer based Technology

Instruction: please kindly tick (√) the appropriate response to each item.

How would you rate the following barriers as a major factor to integrating ICT/ computer technology in colleges of education from A Great Deal to Never? A Great Deal (5), Much (4), Somewhat (3), Little (2) and Never (1)

Statement	**Great Deal**	**Much**	**Somewhat**	**Little**	**Never**
28. Teaching time schedules prevent maximum utilisation of ICT/ computer technology.					
29. Inadequate computers for the number of staff members on campus.					
30. Inadequate computers for the number of students on campus.					
31. Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT.					
32. Present curriculum makes no					

provision for ICT/ Computer integration for the classroom.					
33. Students pay a lot of money to access computers on campus.					
34. Students pay a lot of money to use computers off-campus.					
35. Problems of unreliable telecommunication connectivity/ network access.					
36. Inadequate professional training for students to support ICT use.					
37. Hardware is unstable and always dysfunctional					
38. ICT/Computer technology is irrelevant to the course I study.					
39. Inability to cope with ICT/computer complexities.					
40. Difficult to experiment with ICT applications.					

(Appendix C)

RELIABILITY

/VARIABLES=College Department Gender Age Status Yrspent Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q24 Q25 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q33 Q34 Q35 Q36 Q37 Q38 Q39 Q40 Q41 Q42

/SCALE('ALL VARIABLES') ALL

/MODEL=ALPHA

/ICC=MODEL(MIXED) TYPE(CONSISTENCY) CIN=95 TESTVAL=0.

Reliability

[DataSet1] E:\TUTOR'S PILOT.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	10	100.0
	Excluded[a]	0	.0
	Total	10	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.786	48

Intraclass Correlation Coefficient

	Intraclass Correlation[a]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.071[b]	.024	.234	4.671	9	423	.000
Average Measures	.786[c]	.541	.936	4.671	9	423	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. Type C intraclass correlation coefficients using a consistency definition-the between-measure variance is excluded from the denominator variance.

b. The estimator is the same, whether the interaction effect is present or not.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

(Appendix D)

RELIABILITY

/VARIABLES=College Programme Gender Age Level Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14 Q15 Q16 Q17 Q18 Q19 Q20 Q21 Q22 Q23 Q 24 Q25 Q26 Q27 Q28 Q29 Q30 Q31 Q32 Q33 Q34 Q35 Q36 Q38 Q39 Q40

/SCALE('ALL VARIABLES') ALL

/MODEL=ALPHA

/ICC=MODEL(MIXED) TYPE(CONSISTENCY) CIN=95 TESTVAL=0.

Reliability

[DataSet1] E:\STUDENT'S.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	24	96.0
	Excluded[a]	1	4.0
	Total	25	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.741	44

Intraclass Correlation Coefficient

	Intraclass Correlation[a]	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.061[b]	.029	.131	3.863	23	989	.000
Average Measures	.741[c]	.568	.869	3.863	23	989	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. Type C intraclass correlation coefficients using a consistency definition-the between-measure variance is excluded from the denominator variance.

b. The estimator is the same, whether the interaction effect is present or not.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

Thank You For Your Time!!!