UNIVERSITY OF CAPE COAST

ASSESSMENT OF THE INFORMATION AND COMMUNICATION

TECHNOLOGY READINESS OF COLLEGES OF EDUCATION

IN THE CENTRAL REGION OF GHANA

BY

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DECLARATION

Candidate's Declaration

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

Signature…………………………………………….Date………………………………..

Candidate's Name: CECILIA MENSAH

Supervisor's Declaration

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

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ABSTRACT

In their quest to produce teachers who can teach ICT as well as integrate ICT into the teaching and learning enterprise, the Ministry of Education and Sports has introduced ICT studies into the curricula of Colleges of Education. This study was meant to find out how resourced are the Colleges of Education in Central Region of Ghana in their duty to train future teachers who can teach ICT and also be able to integrate ICT in the education venture. The study also sought to find out what gains have been achieved so far, and also identify the challenges holding back the incorporation of ICT into teacher education. Descriptive survey was used for the study, and data was gathered through questionnaires and interviews. Stratified sampling and random sampling techniques were employed to select 43 tutors and 242 teacher trainees who responded to tutors' questionnaire and teacher trainees' questionnaire, respectively.

The study revealed that the use of ICT in the teaching and learning at the colleges was emerging. However, inadequate ICT hardware and infrastructure, software, and books were identified as some of the major challenges. Additionally, the colleges lacked tutors who are knowledgeable in techno-pedagogical skills on how to integrate ICT into teaching and learning. It was thus recommended that the government should provide the colleges with well-equipped ICT laboratories with the necessary hardware, software, high-speed Internet connections and other accessories that will facilitate the integration of ICT into teaching and learning. Furthermore, the ICT knowledge base of the tutors should be improved through regular professional development programmes so that the tutors are in a position to teach the teacher trainees how to integrate ICT into teaching and learning.

ACKNOWLEDGEMENTS

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LIST OF ABBREVIATIONS

AAU	Association of African Universities
AVU	African Virtual University
CAI	Computer Assisted Instruction
CAL	Computer Assisted Learning
CSIR	Centre for Scientific and Industrial Research
CT	Communication Technology
CTTC	Cyber Teacher Training Center
EFA	Education For All
GET	Ghana Education Trust
GIGO	Garbage In, Garbage Out
ICT	Information and Communication Technology
IT	Information Technology
ITB	Internet-Based training
NEPAD	New Partnership for African Development
NGT	Next Generation of Teachers
OLA	Our Lady of Apostle
SPSS	Statistical Package for Social Sciences
TESSA	Teacher Education for Sub-Saharan Africa
TTISSA	Teacher Training Initiative for Sub-Saharan Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UTDBE	Untrained Teachers Diploma in Basic Education

CHAPTER ONE

INTRODUCTION

Background to the Study

The rapid infusion of technology into schools requires a new generation of teachers who are able to use the new tools to enhance their own productivity and decision-making activities and who understand the importance of integrating technology into the teaching and learning process. The teacher is often the most important factor in the successful integration of Information and Communication Technology (ICT) into the school's instructional practices and curriculum. Generally, it is believed that without a well trained teacher who is knowledgeable and skilled in ICT, changes in the teaching-learning process and widespread effective uses of technology in learning are not likely to occur.

Adubifa (2001) defines ICT "as a diverse set of technological tools and resources used for creating, storing, managing and communicating information." These technologies include computers and their associated peripherals, software, the Internet, broadcasting technologies. ICT, probably the greatest revolutionary of the 20th century has changed the landscape of doing everything, with education not being an exception. It has been touted as potentially powerful enabling tool for educational change and reform. When used appropriately, ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality and also help make teaching and learning active process connected to real life.

In the case of a developing country like Ghana, ICTs have the potential for increasing access to, and improving the relevance and quality of education. It thus represents a potentially equalizing strategy for developing countries. That is why the government of Ghana in his own wisdom has introduced ICT into all facets of education, from the basic level to tertiary as part of the new educational reforms. Indeed, as a way to prove government's determination, the information technology (IT) policy framework for Ghana among other scopes and objectives states of the development of specific IT programmes such as the use of IT in teaching and learning and IT education targeted at improving the educational delivery system (Republic of Ghana, 2003). This and other issues have necessitated the training of teachers who will be capable of teaching ICT, as well as having the ability to integrate ICT into the teaching and learning enterprise.

In Ghana, as ICT use is emerging in schools, the need to have teachers with competencies in ICT is indispensable. According to Janssens-Bevernage, Cornille and Mwaniki (2005), as computer hardware and software become available to an increasing number of schools, more attention needs to be given to the capacity building of the key transformers in this process, teachers. The emergence of ICT in schools gives credence to the urgent need to give due attention to the teacher (both the professional teachers and the teacher trainees) with respect to the development of their ICT core skills and capabilities needed for their job. This among other reasons such as the underutilised ICT equipment in the schools because of teachers' incompetence in ICT, and the numerous merits that ICT in education avails are some of the likely reasons that informed the government and policy makers of Ghana to introduce ICT into the curricula of schools including the colleges of education.

The nagging questions about all these good intentions by policy makers are, how prepared, how ready, and resourced are the colleges of education vis-à-vis the availability of critical success factors such as, ICT hardware and infrastructure, software, communication equipment, curriculum, textbooks and ICT-competent tutors to enable this noble vision see the light?

This work therefore highlights on the need to integrate ICT in the teacher trainee programme. It will discuss the potentials of ICT in education in general with specific reference to the colleges of education. The research will among other concerns, discuss the issue of readiness as a prerequisite towards achieving the set objective of training a teacher who will be both capable to teach ICT as a subject and most importantly be able to use the tools that ICT avails to transform his/her teaching.

Statement of the Problem

Although the idea to produce 21st century teachers who are imbued with ICT-competencies is laudable, it needs a lot of well-conceived strategies, planning, efforts and resources that need to be continually assessed to ascertain their availability and adequacy. While national strategies for implementing ICTs in education are visionary, and with substance are appearing in teacher education, the truth is that the colleges of education may lack the necessary prerequisite resources to pragmatically implement them. It is due to this among others, that the need arises for researchers to constantly monitor, assess and evaluate educational undertakings to establish their state or readiness, so that the outcome could serve as inputs and guides for policy makers.

Whilst no one can deny the fact that the policy of introducing ICT in teacher education is laudable and has even chalked some modest success as the teachers who are graduating of late from the colleges of education had been introduced to ICT, what are yet to be measured, assessed and evaluated are concerns such as: with what equipment and software were they trained? How were they trained? Who trained them and were the trainers qualified? Were there adequate textbooks and curricula in place? Will the teacher trainee be capable to use ICT in their teaching endeavour as expected? Answers to some of these questions would enable policy makers to objectively assess if indeed the colleges of education are well disposed to offer the needed training. It will also guide educational policy makers to see their way and future direction clearer.

Moreover, because of the haste in which the ICT in teacher education programme was carried out, it appears adequate preparations such as provision of ample ICT infrastructure, educational software, curriculum, textbooks and ICT tutors capable of teaching the course competently were not put in place. Furthermore, currently there is little or no documentation on ICT facilities available in the colleges of education to enable policy makers to establish their readiness for the ICT in teacher education programme, or their need for ICT resources. Information on the state of affairs on any educational enterprise is essential for planning and direction. This is in line with what Getachew (2001) wrote that making sound investment decisions about ICT is a major challenge facing educational policy planners because the information needed to make appropriate decisions on the use of ICTs in distance education are limited (Bates, 1995; Romiszowiski, 1998; Sparks, 1984) cited in Getachew (2001).

Adubifa (2001) underscored the relevance of evaluating the state and use of ICT when he articulated that "each institution must be able to assess its current situation with regard to its capacity to use ICT in teaching and learning, research outreach and professional services, as well as to achieve administrative efficiency".

The fact that numerous organizations such as UNESCO and World Bank are involved in supporting Africa prepare their teachers for the information age, attests to the indispensability of teachers and the need to equip them with skills needed to carry out their chores. This therefore calls for a broad framework about the needs of African institutions to train teachers in the appropriate use of ICTs. However, according to UNESCO, there is no comprehensive framework of teacher training in ICT use in Africa and the few that exist have been mostly developed outside Africa (UNESCO, 2002). Similar sentiment was expressed by infoDev (2005), the Information for Development Programme when it observed in its report that no standard reference or methodology exists to evaluate ICT in education programmes.

Finally, due to the reality that globally, ICT in teacher education has come to stay because of its immense potentials, there is the pressing need to constantly monitor the colleges of education to ascertain if the prerequisites that make them whole to offer the programme are in place in order not to distort the splendid intent of the programme.

The question therefore is: How ready are Colleges of Education in Ghana to use Information and Communication Technology facilities in teaching and learning?

Purpose of the Study

The main purpose of the study is to assess the ICT readiness of colleges of education in the Central Region of Ghana in their duty to produce teachers who are capable to teach ICT, and also be able to utilize ICT as a tool and facilitator in teaching and learning at the basic level of the education ladder. The study aims at contributing to the knowledge base concerning what is known about ICT use in colleges of education in the Central Region of Ghana.

The specific objectives are to:

1.   Assess the availability and adequacy of ICT infrastructure.

2.   Assess the availability and adequacy of educational software.

3.   Assess the availability and adequacy of ICT textbooks and curricula.

4.   Ascertain if the tutors have received enough training to enable them to teach the ICT course.

5.   Ascertain if the tutors have received enough training to enable them to integrate ICT in their teaching and learning.

6.   Ascertain whether the specific objectives and vision for the introduction of the course such as making the teacher trainee computer literate are being met.

7.   Identify potential problems that inhibit the incorporation of ICT in the colleges of education programme.

Research Questions

In pursuance of the objectives of the study, answers were sought for the following research questions:

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1.	What is the degree of availability and adequacy of ICT infrastructure?

2.	What is the degree of availability and adequacy of educational software?

3.	What is the degree of availability and adequacy of textbooks on ICT and curricula?

4.	What is the extent of training that the tutors have undergone that have enabled them to teach ICT as a subject?

5.	What is the extent of training that the tutors have received that have enabled them to teach the teacher trainees how to integrate ICT tools into teaching and learning?

6.	What is the extent to which the colleges of education themselves integrate ICT in their teaching?

7.	What is the extent to which the visions of the introduction of the ICT in teacher education being met?

8.	What are the factors that are inhibiting the introduction of ICT in the teacher education programme?

Significance of the Study

1.	The study would help identify current ICT profile and set goals for the future as part of the strategic planning of colleges of education. Besides, it would provide a guide for the colleges to conduct a self-assessment of its readiness to train a teacher who can teach ICT and also be able to integrate ICT into teaching and learning.

2.	The study would also discuss and explore ways to adapt the current ICT in teacher education programme to a new standard.

3. Also, there is no doubt that the outcome of this study could lead to increase in knowledge acquisition in general, especially if the findings from the study reveal certain information concerning the status of ICT in colleges that hitherto were unknown.

4. The study would also identify and find solution to issues hampering achieving an ICT environment that would help train teachers.

5. The findings of this study can serve as input to the vision for ICT in teacher education.

6. Other researchers interested in the same or related topics would find this work relevant as a basis for further research.

Delimitation

The study assessed the ICT readiness of colleges of education in the Central Region of Ghana. The survey was thus limited to the colleges of education in the afore-mentioned region only.

The study was only concerned with the state of the ICT infrastructure and other immediate related essentials that are required for ICT in teacher education and not the adoption and diffusion of ICT for other ancillary functions such as the administration and management of colleges of education.

Definition of Key Terms

Information and Communication Technology (ICT)

ICT as used within this study means computers (either standalone or networked) and their associated peripherals such as printers, digital cameras, scanners, telejectors, software (system software, educational software, productivity software, etc) and communication technologies. Indeed, for purposes of this work it incorporates the whole of computing, multimedia, and telecommunication technologies, radio, televisions and other electronic audiovisual teaching and learning materials. The definition within this context thus goes beyond the traditional ICT definition that may limit itself to just only the electronic devices that facilitate processing, storage and disseminating or transmission of information.

Readiness

Readiness as used in this work means how prepared, organized, set, geared up, equipped, and resourced the colleges of education are for the responsibility of coming out with a teacher who can teach about ICT, and teach with ICT. It is concerned with the availability of the major prerequisite factors that go into enhancing and perfecting the delivery of ICT in the teacher education programme.

College of Education

It is an academic institution intended for teacher education. An institution set up and mandated by the Government of Ghana to train teachers for the basic schools.

Teacher Trainee

A teacher trainee is a person, that is a student who is undergoing training or tuition for a specified period at a college of education to become a trained teacher at the basic level.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter discusses both theoretical and empirical review of literature that are related to the topic under study. It is ordered under the following headings:

1.   Meaning of Information and Communication Technology.

2.   Profiles of the Colleges of education under this study

3.   The relevance of ICT in Teacher education.

4.   Factors affecting the Teaching of ICT in the Colleges of education.

5.   Empirical studies of ICT in Teacher education.

Meaning of Information and Communication Technology (ICT)

ICT is the convergence of Information Technology, Telecommunications and Data Networking Technologies into a single technology (ITA, 2006). It is a technology that merges computing with high-speed communication links carrying data, sound and video. ICT is a combination of two previously unrelated concepts, Information Technology (IT) and Communication Technology (CT). Information Technology is the term used to describe the equipment and software elements that allow users to access, retrieve, store, organise, manipulate and present information by electronic means. Communication technology is the term used to describe equipment, infrastructure and software through which information can be received and accessed, for example phones, faxes, modems, and digital networks. ICT is thus the result of the convergence of IT and CT technologies. ICT is therefore made up of personal computer hardware, their

associated peripherals and software; in-building network infrastructure; backbone infrastructure; external Internet connectivity; and other communication devices.

The AAU (2000) defines ICT as a shorthand for the computers, software, networks, satellite links and related systems that allow people to access, analyze, create, exchange and use data, information and knowledge in ways that, until recently were unimaginable. Succinctly put by Herselman & Hay (2003), ICT involves the electronic means of capturing, processing, storing and communicating information.

Application of ICT in Teaching and Learning

In the field of education, ICT can be understood as the application of digital equipment and software to all aspects of teaching and learning (finntrack, 2009). By this definition ICT encompasses equipment and materials such as computers and their accessories, software, communication equipment, televisions, LCD projectors, digital cameras, scanners and other audio and video equipment.

In this era, the utilization of ICT is not a preserve of any profession. Being versatile equipment, they find application in all spheres of life from simple uses such as word processors to complex process control applications in industries by adapting to different software modes. There is hardly any human activity today which is not affected by ICT in one way or the other. ICT equipment and applications are used in areas like production, health, education, management, agriculture, defence, crime detection among others, to complement the human efforts.

In the field of education, ICTs have been found to enhance educational process dramatically for traditional students and also open new possibilities for disabled students.

In addition to assisting both teachers and students in the teaching and learning activity, ICT also facilitates and enhances the work of educational administrators and managers.

ICT has had great influence with education. In the early 1980s with the advent of microprocessor that polarised microcomputers, teachers and students used drill and practice to enhance their teaching and learning. Then in the early 1990s when computers' multimedia capabilities were augmented, computer-based training with multimedia became the order of the day. However, educational materials on storage media such as CD ROMs were not easily updatable, so in the early part of the year 2000, Internet-based training became the order of the day. In the initial era of its introduction, Internet-based training (ITB) materials lacked good multimedia features because they were limited by both the speed of the processors and bandwidth size. Thus, ITB gave way to e-learning. Currently e-learning and its complementary learning management software are in vogue for educational purposes. It has extended further the boundaries of education from where the earlier applications left off to a higher pedestal, and like most ICT developments, the future direction of ICT in education is still advancing into ways very difficult to predict.

In general, ICTs have the capabilities of being accurate, being able to assist in decision-making and have large memory capacity that facilitates storage and retrieval. ICTs speed up the rate of execution of a job and thereby cut down costs, conserve time and resources. ICT enable few workers to get more work done than many could without computers, thereby cutting operating cost. ICTs are very reliable; hence they increase the quality of goods and services. Mammootty (n.d) collaborated the above when he also pointed out in his article on the impact of computer on society that, computers ensure more effective utilisation of human efforts, thus reducing cost of production.

In the area of education in particular, ICT's productivity software assists teachers to produce professional looking teaching and learning materials. The availability of interactive CD-ROMs learning materials have also extended the applications of ICT in education. Pupils and students are fascinated working with computers. The Centre for Science, Development and Media Studies of India revealed in a report that ICTs use in primarily computers are attracting children back to the schools in India. This disclosure obviously may not be an isolated case in India and will likely hold true in most developing countries if computers are made an integral part of their curricula.

Challenges to the use of ICT

Notwithstanding the capabilities of ICT, like any technology, it has its unpleasant sides. ICT hardware and software are costly to acquire or develop and maintain, thus making them not easily affordable. Their uses also require some level of appropriate training if maximum benefits are to be derived from their application. Moreover, the quality of human element involved in any ICT endeavour goes a long way to determine the accuracy or otherwise of the system. This is emphasized by a popular truism in ICT environment that 'Garbage in, Garbage out' (GIGO), stressing the point that the outcome or quality of the output is directly dependent on the quality of the input. Besides, for ICTs to be useful in teaching and learning, students must be highly motivated and proficient in computer operation. Furthermore, to a larger extent the capabilities of the ICTs are dictated by how well the user explores the hardware and software to facilitate his or her job, thus in situations where there is widespread ICT incompetence, then it stands to affirm that not much can be gained from the usage of ICTs. Other security concerns such as the vulnerability of information on computers to viruses, hacking, and cracking are

also real. There is also the perception that frequent and prolonged computer sessions may pose physical health risks (BBC, 2003).

In the classroom in particular, the following challenges of ICT should not be overlooked if its full impact is to be realized. It is undisputed that whilst the Internet has a wealth of knowledgeable academic materials, there are equally sizeable numbers of incorrect information on the net that can misinform the learner. ICT is also impersonal, and will not be able to address the learners' problems as a teacher would have done it. It also lacks the motivational force that teacher uses to encourage students. Also, ICT use may initiate students into unethical issues on the net such as cracking, hacking, plagiarism and have disregard for copyright materials. There is the tendency that during teaching students will be playing music, watching movies, going to pornography sites, e-chatting or even sending mails. These would cause distractions in classroom.

Profiles of the Colleges of Education under Study

Foso College of Education

Foso College of Education was established in November 1965 as one of the Ghana Education Trust (GET) schools. It was originally meant to be a secondary school but it has since functioned as an institution for the training of teachers for the basic level. In its forty-three years of existence, the college has had the privilege to run every teacher training programme that has been instituted by the Ministry of Education and the Ghana Education Service. The programmes include the following:

1. Two-Year Certificate `B'

2. Two-Year Post `B'

3. Four-Year Post Middle Certificate `A'

4. Two-Year Specialist Course in Agricultural Science

5. Three-Year Certificate `A' Specialist Course in Mathematics, Science, Agricultural Science, Home Science and Business Studies.

6. Three-Year Post Secondary Certificate `A' (Broad-based)

7. Two-Year Post-Middle Certificate `A' Modular

Currently, the college has received accreditation for tertiary status and it has been running the Diploma in Basic Education programme for both regular and serving pupil teachers since 2005. Besides, it is also one of the fifteen Colleges of Education mandated to train specialist teachers in science and mathematics for the Basic Schools in Ghana.

Komenda College of Education

Komenda College of Education was established in 1947 by the Methodist Church after government released the abandoned buildings and structures of the Royal Armed Force to the church for the purpose of training teachers. The College has gone through series of changes in terms of its academic and physical structures.

The college has at one time or the other offered one or more of the following courses:

1. Two-Year Certificate `B'

2 Four-Year Certificate `A'

3. Music and Art Specialization

4.   Two-Year Post-Sec Certificate `A'

5.   Three-Year Post-Sec Certificate `A' (General)

6.   Four-Year Post-Middle Certificate `A'

7.   Two-Year Post Middle Modular Course

8.   Three-Year Diploma Course

9.   Untrained Teachers in Basic Education (UTDBE) Programme.

Komenda College of Education has so far trained over five thousand teachers for the country.

OLA College of Education

Our Lady of Apostles College of Education commonly known as "OLA College of Education" was established in 1924 by the Missionary Sisters of Our Lady of Apostles, a Catholic Missionary Order whose primary objective is to educate and empower the African woman in every way possible, so that she will in turn promote good christian family life for a better society.

The college offers comprehensive and nationally approved teacher training curriculum which is both academic and professional. Various pre-service teacher training programmes have been run at different times to meet the teacher needs of this country. In 1975, the college embraced a new educational reform and introduced the three-year post-secondary teacher's for almost thirty years. In September 2002, OLA College of Education also adopted a new teacher education policy dubbed "in-in-out". This was

followed by the upgrading of teachers training college into diploma awarding institutions introduced in October 2004.

The Relevance of ICT in Teacher Education

The importance of ICT in teacher education cannot be underrated in today's knowledge society where Peter Drucker, a prominent social science and management consultant asserts that knowledge has pushed the traditional factors of production to secondary (McDermott, 1995). Teacher education in general and the training of the future teachers in particular is supposed to avail itself with the potentials that ICT offers in order to advance the right course of teaching and learning in the knowledge society.

In the educational transformational epoch that we find ourselves, ICT and teacher education have become inseparable. This is because on one side, the colleges of education are expected to play significant role by re-engineering their training programmes if their products are to be relevant to the society. The products of the colleges of education are to serve as agent or conduit of change through which the knowledge and use of ICT skills will diffuse in the society. On the other side, teacher education itself is supposed to benefit from the ICT technology by tapping the numerous ICT tools that enhance teaching and learning and extend the frontiers of teaching beyond the classroom. The reality is that colleges of education cannot help, but have to integrate ICT into teaching and learning, if they are to get a fair share of what ICT offers society. Colleges of education are expected to dictate the direction of how the new technology should be used in and for education. As put by UNESCO (2002), teacher education

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institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological changes.

ICT in the teacher education curriculum makes the teacher trainee ICT literate and also prepares him/her for the opportunities and the challenges that ICT affords in teaching in specific and education in general. Also, it offers the teacher trainee the opportunity to learn about ICT thereby acquiring ICT technological literacy. The teacher trainee will also be trained in teaching and learning with ICT, that is using technology to facilitate teaching and learning across the curriculum; and finally the teacher trainee would become skilled at teaching and learning through ICT, that is, integrating technological skills development with curriculum applications.

ICTs have also been used to improve access to and enhance the quality of teacher training in many places to achieve significant gains. For example, institutions such as the Cyber Teacher Training Center (CTTC) in South Korea are taking advantage of the Internet to provide better teacher professional development opportunities to in-service teachers. In China, large-scale radio and television-based teacher education has for many years been conducted by the China Central Radio and TV University, the Shanghai Radio and other providers across the country (Wikibooks, 2007).

Moreover, teacher education institutions and programmes have the critical role to provide the necessary leadership in adapting pre-service and in-service teacher education to deal with the current demands of society and economy. They need to model the new pedagogies and tools for learning with the aim of enhancing the teaching-learning process through ICT. Additionally, teacher education institutions and programmes must also give

guidance in determining how the new technologies can best be used in the context of culture, needs, and economic conditions of their country.

Teacher trainees who are trained with ICT are enriched with techno-pedagogical skills. In the words of Olakulehın (2007), pedagogy through the application of information and communications technologies has the advantage of heightening the motivation; helping recall previous learning; providing new instructional stimuli; activating the learner's response; providing systematic and steady feedback; facilitating appropriate practice; sequencing learning appropriately; and providing a viable source of information for enhanced learning. Besides, teachers who are trained with ICT system of instructional strategy would be able to kindle in the hearts of the learners a desirable attitude towards information technology tools in their entire way of life. Moreover, in the classroom the contribution of the information and communications technologies can be very useful tool for the development of skills as it provides effective training programmes which can be attributed to its capacity for stimulation, model-building and interactive adaptation. This usage applies not only to subjects like sciences and languages, but also to various aspects of professional courses like engineering and teacher training.

Factors Affecting the Teaching of ICT in the Colleges of Education.

The success or otherwise of the ICT programme at the colleges of education is made up of myriad of essential conditions which must be met else the desire to successfully integrate ICTs into teacher education programme would be a mirage. The following critical success factors which are in congruent with those that international

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bodies such as UNESCO (2002) and *infoDev* (2005) have recommended as essentials when applying new technology to teacher education are discussed.

1. Adequate access to technology

2. Availability of qualified tutors

3. Professional development for tutors

4. Continual support from policy makers and sense of advocacy

5. Availability of textbooks and other curricula

6. Technical assistance

Adequate Access to Technology

Adequate technology as used in this context is the sum total of all ICT equipment and their related accessories, software, and ICT infrastructure that gives connectivity to the Internet. Teacher trainees must have unrestrained access to ICT in their student teaching environments so that after completion they would not be found wanting. Access to tools for learning is very important in any endeavour, but it is more critical in situations where the learner is expected to impact the skills acquired to others. In such a situation any compromise on the quality of the trainee will have negative cascading effect on his/her subjects after the completion of his/her training. Studies such as that of Wongsothorn (1997) have shown that there is a great correlation between access to technology and degree of adoption of technology. Wongsothorn indicated that specialists agree that communication and information opportunities available today can spur development only when the user has access to the necessary technical equipment and infrastructure.

Availability of Adequate Qualified Tutors

Like all specialized fields, ICT needs to be taught by one who is a competent educator. Such a person should have both in-depth understanding of ICT skills and content knowledge to be able to use ICT effectively to make the curriculum interesting and appealing to students. He or she must be skilled in the use of technology for teaching and learning. The tutor must be able to apply technology in the presentation and administration of his/her coursework and facilitate the appropriate use of technology by their teacher trainees. The presence of adequate tutors therefore in the colleges of education with the above aptitudes will be a positive contributing factor towards integrating ICT in teacher education. Inexperienced and poorly prepared tutors will be a bane to the programme. A study conducted by Frome, Lasater, & Cooney (n.d) revealed that there is a strong relationship between teacher quality and students achievement.

Professional Development for Tutors

The ICT discipline is a dynamic and fluid field, therefore for maximum benefit to be derived from ICT in teacher education, there should be regular professional development for the tutors. For tutors' knowledge on the use of ICT to be abreast with time, educators must have continual access to professional development in support of technology use in teaching and learning. Professional development for tutors is important to provide regular access and knowledge to the technological changes. Professional development is not a one-time event, but should be focused on the needs of the tutors and sustained through periodic updates.

For a technology to be adopted and adapted, users of all types in an educational institution need to be trained religiously and proactively on their application so that its potency can be tapped. Without requisite skills to use information technology, the tutors cannot exploit the opportunities it offers. Teale (1997) pointed out that the gaps that prevent information technology from being fully utilised, both at management and at academic levels relate to knowledge, skill and desires. Wongsothorn (1997) also endorsed the importance of training and asserted that teachers, professors, technical staff and administrative staff must be given training that enables them to integrate new information and technologies into their respective professions, and to examine the multiplier effect with regard to their use.

Continual Support from Policy Makers and Sense of Advocacy

A capital-intensive project such as the introduction of ICT into the curriculum of teacher colleges of education would not be successful, if the proponents of the project fail to continually give it their backing to sustain it. There should be proactive leadership, management and political support, commitment to technology and sense for advocacy. No wonder Wongsothorn (1997) identified commitment by top management as one of the criteria to the success of ICT in education development in the knowledge-based society. In another dimension, Thomas and Kobayashi (1987), as mentioned in Bosu (2000) explained that when a new technology is on a rather massive scale, the underlying motivation is often if not always political. Teale (1997) expressed similar sentiment when he wrote that it is unlikely that academics are going to develop the skills required to integrate information technology into the teaching and learning process without a visible

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commitment from management. Support from the top is very crucial since they wield power and have influence to determine where finances should be allocated.

Availability of Textbooks and other Curricula

The accessibility and availability of textbooks and other materials either in electronic or hardcopy which serve as reference reading materials to students go a long way to contribute to the success of the programme. Textbooks as put by Hutchinson & Torres (1994) have a vital and positive part to play in the everyday job of teaching and learning. They indicated that textbooks and teacher education are complementary and mutually beneficial aspects of professional development. The absence of adequate and good referenced textbooks is a deterrent to the programme. Therefore to a larger extent, textbooks play significant role in any educational venture, and they must therefore be made available in their right quantities and time in the colleges of education, if indeed policy makers desire to achieve the targeted objectives.

Technical Assistance

Tutors and teacher trainee need technical assistance to use and maintain technology. The prime focus of the tutors should be on teaching and learning, not on maintaining and repairing the technology beyond basic troubleshooting procedures. When the technology does not function well, a learning opportunity is lost, tutors and teacher trainees' frustration grow and interest in the course suffers. Timely technical assistance is imperative for teachers and teacher trainees to feel confident that they can use technology in their teaching and learning. Therefore it is essential to have adept

technicians in the colleges to take care of that special need so that teachers and learners can concentrate on their job without dissatisfaction and anxiety.

Empirical Studies of ICT in Teacher Education

Through the examination of existing literature, projects initiatives and empirical studies, the dissertation explores the use of ICT in teacher education.

Situational reports on the use of ICT in teacher education in different countries in Africa such as those of UNESCO (2002) and Commonwealth of Learning in collaboration with others COL (2004) show that the various countries either on their own or in collaboration with some international agencies, have initiated projects that aim at integrating ICT in education. This is because ICT has been identified as a catalyst in educational development. However, inadequate ICT infrastructure, teachers' lack of knowledge on ICT, among others, are some of the main challenges being encountered. To this end, some strategic interventions such as providing the necessary infrastructure, building the ICT human capacity of in-service teachers as well as pre-service teachers are in progress to facilitate the ICT integration in teaching and learning in particular and education in general.

ICT has been seen as an enabler in the teaching-learning enterprise. In view of this, a wide range of programmes and projects on ICTs in Education in Africa have activities that involve one or more African countries in varying numbers. These range from high-level intergovernmental, multi-stakeholder programmes such as the NEPAD e-schools initiative, to institutions focused on networking African schools and universities such as the African Virtual University (AVU). Most of these initiatives such

as those of Teacher Education for Sub-Saharan Africa (TESSA), and Teacher Training Initiative for Sub-Saharan Africa (TTISSA) are specifically geared towards ICT in teacher education as a strategy to enhance the quality of teaching and learning in schools. However, the impact of most of these initiatives have not been felt just because the underlying factors that should have assured of their success were not given prior attention.

In their work on fostering ICT use in teacher education in African, Auerswald & Magambo (2007) wrote that the Dakar framework for action identified the use of ICT as one of the strategies for achieving Education For All (EFA) goals. It was strategized that in order to achieve EFA there is the need to educate all teachers, as there is growing imbalance between the output of trained teachers and the demand as the basic provision of ICT facilities are expanding in developing countries.

Cuban (1996) used the following statistics to illustrate how computers and their use in the classroom have increased significantly in the United States since the early 1980's because of their importance as a facilitator in teaching and learning:

> In 1981, 18 percent of schools had computers; in 1991, 98 percent had them. In 1981, 6 percent of schools used computers for instruction; by 1991, 98 percent did so. In 1981, there were on average 125 students per computer, in 1991, there were 18. In 1985, students used computers in school labs just over 3 a day; in 1989, it was 4 hours a day (p. 8).

Extrapolation from the above statistics could suggest that the usage of ICT in the classroom is now ubiquitous. In a related study in ICT in education, Getachew (2001) focused on the access and utilization of ICTs in distance education and identified some possible problem areas in the use of ICT in distance education as the inaccessibility of the ICTs to students, cost-related problems, and user unfriendliness of some ICT facilities and software, among others.

The role of microcomputers and their communication accessories in education is changing rapidly as technology continues to grow. Over 20 years ago, Borke (1985) quoted in Raven and Welton (1988) asserted that computer use in education is a highly dynamic technology. He further stated that 25 years from that time computers will become the dominant delivery in education. Present applications of ICT in the field of education have vindicated Borke's prediction. As the use of computers in education continues to evolve as is evident now, it is important to know how resourced, prepared and ready the institutions that have been tasked to produce teachers are, so that the right remedial measures are put in place, if the situation is not desirable.

The issue of readiness is also of concern to UNESCO (2002) when they declared that in planning to integrate ICTs into teacher education, it is important for teacher education institutions to understand the level of readiness of the institution to integrate technology into the teacher education curriculum. The teacher education programme or institutions must know the benchmarks, standards and guidelines for ICTs in teacher education. It is also important that they have access to tools that help the institution assess its level of readiness or progress toward infusing ICTs into the teacher education programme (UNESCO, 2002).

The issue of integrating ICT in education continues unabated, that is why in its quest to assist teachers integrate technology in pedagogy, UNESCO is preparing pre-service teachers to thoughtfully use technologies for teaching and learning. This is the aim of the Next Generation of Teachers (NGT) NET Project, which is designed to assist teacher education institutions in the Asia-Pacific and other regions. The NET project will offer teachers education on how and when to best use technologies for teaching and

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learning, through training which is integrated in all national pre-service teacher training

institutions (UNESCO, Bangkok 2005).

CHAPTER THREE

METHODOLOGY

This chapter examines the techniques and procedures of data collection. It discusses the research design, the population, the sampling method and the research instrument used for the collection of data. The chapter also highlights on the data administration and collection, as well as the data analysis and processing.

Research Design

This research is a descriptive survey which sought to determine the ICT readiness of the colleges of education in the Central Region of Ghana. The researcher found descriptive survey design apt since this study involves collecting data to answer questions concerning the current status of the subject of the study. Gay (1992) has it that "a descriptive study determines and reports the way things are." (p. 217). In order to analyse the problem under study therefore questionnaires were used to elicit information.

The study mainly used qualitative techniques to obtain information for the topic under study which were then analysed quantitatively. Wikipedia, the free online encyclopaedia defines qualitative method as a research method that deliberatively gives up on quantity in order to reach a depth in analysis of the object studied. Qualitative method uses different techniques such as focus groups, text analysis, participant observation and participation (Qualitative, 2005).

Quantitative method on the other hand, according to the wikipedia is concerned with numbers and anything that is quantifiable. They are therefore to be distinguished

from qualitative methods (Quantitative, 2005). Counting and measuring are common forms of quantitative methods. With quantitative method the result of the research is a number, or a series of numbers. These are often presented in tables, graphs or other forms of statistics.

The prevailing method is to use one method in conjunction with the other. Using qualitative methods, it is often possible to understand the meaning of the numbers produced by quantitative methods. In other words, using quantitative methods, it is possible to give precise and testable expression to qualitative ideas.

Population

The study comprised two target populations, namely; tutors of colleges of education, and teacher trainees in the Central Region. With regard to the tutors, the target population of 160 was also used as the accessible population. This figure was made up of 52, 45, and 63 from Foso College of Education, Komenda College of Education and OLA College of Education, respectively. Concerning the teacher trainees, the target population totalled 2480, comprising first, second and third year teacher trainees of the three colleges of education. The break down was 910, 800, and 770 from Foso College of Education, Komenda College of Education and OLA College of Education, correspondingly. However, the accessible population narrowed in to only the second year students because the first year students had spent less than one year in school and the researcher felt they were not in a position to objectively respond the research instrument. The third years too were not accessible since they were out of their colleges doing their one year mandatory off-campus teaching practice. Thus with regard to the students the

accessible students became 817 made up of 300, 262, 255 from Foso College of Education, Komenda College of Education and OLA College of Education respectively.

Table 1: Target and Accessible Population

College of Education	Tutors		Teacher Trainees	
	Target	Accessible	Target	Accessible
Foso	52	52	910	300
Komenda	45	45	800	262
OLA	63	63	770	255
TOTALS	160	160	2480	817

Sample and Sampling Techniques

Because of inadequate resources and time constraint, stratified sampling and random sampling techniques were used to select samples for the study. To ensure guaranteed desired representation of the relevant subgroups, stratified sampling was used to select the sample for the two different population types. Gay (1992) wrote that stratified sampling is the process of selecting a sample in such a way that identified subgroups in the population are represented in the sample in the same proportion that they exist in the population.

Dillon, Madden & Firtle (1993) justified the unbiased nature of simple random sample when they wrote that it guarantees that every sample of a given size as

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well as every individual in the target population has equal chance of being selected. According to Gay (1992), a point in of favour random sampling is that it is required by inferential statistics, which is very important since inferential statistics permit the researcher to make inferences about populations based on the behaviour of the samples.

Pertaining to this study, determining sample size was a very important issue because samples that are too large may waste time, resources and money, while samples that are too small may lead to inaccurate results. The size of the samples was therefore based on Krejcie and Morgan (1970) table for determining sample size from a given population. The accessible populations for the study were 160 and 817 for tutors and teacher trainees respectively. The researcher decided to use 33% in each instance as sample settling with 60 for tutors and 270 for teacher trainees.

Having identified the population and determined the desired sample sizes, the researcher adopted the following process to select the samples for the teacher trainees. For each of the subgroup (college of education) within the population group, the researcher listed all members of the subgroup and assigned consecutive numbers to them. The researcher selected an arbitrary starting point from a table of random numbers and read the appropriate number. If the number corresponded to number assigned to an individual in the population, that individual was added to the sample, else, it was ignored. This process was repeated until the required number of subjects for the subgroup has been selected. It was expected that the responses, views and answers to the questionnaire of the sample would be true and fair representative of the entire population they represented.

Instrumentation

The main research instrument used was questionnaire which was complemented with structured interviews where each interviewee is presented with exactly the same questions in the same order so that questions are answered within the same context. Two types of questionnaires were used, namely; tutors' questionnaire (Appendix A) and teacher trainees' questionnaire (Appendix B). The construction of the questionnaires was mainly composed of closed, pre-coded questions to give structure to the information gathered. This is in credence with what Sarantakos (1998) wrote that pre-coded questions have the advantage of being easy to administer, to code and to answer.

The tutors' questionnaire consisted of 26 items grouped under 6 sections. Section A asked about respondent's biographic information. The items in section B solicited information regarding the ICT infrastructure and other essentials. Section C sought to get answers about the nature of the ICT programme, whilst Sections D enquired about their ICT competencies. Section E solicited questions relating to their perception about the ICT programme. Finally, section F requested the respondents to identify from a list of items those that constituted constraints in the ICT in teacher education programme.

A 23-item questionnaire arranged under 6 sections was designed to solicit information from the teacher trainees. Section A consisted of biographic and general questions such as the name of their college of education, age, sex, and the programme they were pursuing. Section B asked questions relating to their ICT infrastructure and other essentials necessary for the ICT in teacher education. The items in Section C sought information to ascertain the nature of the ICT programme. Sections D enquired about the ICT tutors competencies, whilst Section E was about the teacher trainees' perception

about the programme. Lastly, section F asked the students to identify from a list of items those that constituted limitation in the ICT in teacher education programme.

Data Administration and Collection

The data for the study were obtained mainly from primary sources and supplemented with those from secondary sources. Allen (1999) wrote that primary data collection is necessary when a researcher cannot find the data needed in secondary sources. The primary data was collected within 3 weeks in May 2008. Altogether, 43 tutors out of the 60 sample size, representing 72% responded to the tutors' questionnaire. In the case of the teacher trainees, the response rate was 90% as 242 out of the sample size of 270 answered the questionnaire.

Prior to the collection of the primary data, the questionnaires were pre-tested with some tutors and teacher trainees at the OLA College of Education in Cape Coast. This was done to enable the researcher to ascertain how the respondents understand the questions, accept suggestions for improvements, and fine-tune the instrument where necessary.

As stated by Gay (1992), validity is the degree to which a test measures what it is supposed to measure. Therefore, in order to achieve high degree of content validity, the researcher made her Supervisor and some ICT experts thoroughly review the questionnaires. This was to make sure that the questionnaire items were necessary for the topic under study, and also in their correct proportions.

Furthermore, to ensure that the questionnaires consistently measure what they should measure, the researcher did her best to make the questionnaire items as

unambiguous as possible. Moreover, the questionnaires were administered at times when the respondents were not tired or felt unmotivated. The afore-mentioned reduced errors of measurements and thus ensured high reliability. Having pre-tested the instrument, the researcher administered the questionnaires to the various categories of respondents.

Data Processing and Analysis

The responded questionnaires were coded and subsequently inputted into a Statistical Package for Social Sciences (SPSS) template that had been designed in consistent with the research instrument. The descriptive nature of the study made the researcher use descriptive statistical tools for the analysis of the data. The analysed data were then interpreted in relation to the research questions.

CHAPTER FOUR

RESULTS AND DISCUSSION

In this chapter, the findings, analyses and discussions of the research have been presented in relation to the research questions. The tutors' questionnaires are presented first, followed by the teacher trainees' analyses.

Analysis of Tutors' Questionnaire

Socio-Demographic Profile of Respondents

The personal data of the tutors involved in the study have been analysed in Tables 2 and 3. Frequencies and simple percentages were used in representing the biographic data of the respondents.

Distribution of Tutors by Sex

Responses with regard to the sex of the respondents are depicted in Table 2.

Table 2: Distribution of Tutors by Sex   (N - 43)

Sex	Freq.	%
Male	32	74.4
Female	11	25.6
Total	43	100.0

Source: Fieldwork, 2008

As shown in Table 2, almost 75% of the respondents were male tutors, and about a quarter (25.5%), females. It was important that the random sampling include female tutors. The inclusion of females was vital because as indicated by Hall (1984), women guess more accurately whether they are criticizing someone or discussing their divorce. Their perception about the topic under study is crucial because the Ghanaian society has affirmed females as indispensable people whose interest and views are taken into consideration in societal matters.

Rank of Tutors

Responses about rank of the respondents are presented in Table 3.

Table 3: Distribution of Tutors by Rank   (N - 43)

Rank	Freq	%
Director	4	9.3
Asst. Director	11	25.6
Prin. Supt.	24	55.8
Snr. Supt	4	9.3
Total	43	100.0

Source: Fieldwork, 2008

The rank or status of the respondents ranged from Senior Superintendent to Director. According to Musaazi (1977), status influences people's behaviour in organization. Table 3 reveals that about 35% of the respondents were in ranks of Director

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and Assistant Director, and the remaining 65% being Principal Superintendents and Senior Superintendents. This distribution depicts the fact that the questionnaires were responded to by tutors with varying degrees of service, experience and responsibilities.

ICT Infrastructure

In this section, questionnaire items whose responses will enable the investigator to ascertain the degree of the availability and adequacy of ICT infrastructure are analysed.

Networked or Standalone Computers

Table 4: Networked or Standalone Computers   (N - 43)

Responses	Freq	%
Networked	31	72.1
Standalone	12	27.9
Total	43	100.0

Source: Fieldwork, 2008

The responses in Table 4 suggest that not all the computers in the colleges under study are networked as 27.9% of the respondents indicated that the computers are not networked. It is imperative that the management of the colleges make frantic effort to network the computers in their laboratory so as to benefit from the merits associated with networking of computers such as: facilitating sharing and transferring of files; facilitating the sharing of ICT resources; ensuring the implementation of security control measure;

and aiding centralized software management are achieved. The truth is that the capabilities of personal computers are seriously underutilized when they are not hooked onto a network.

Computer Technicians

Table 5: Availability of Computer Technicians   (N - 43)

Responses	Freq	%
Yes	-	-
No	43	100.0
Total	43	100.0

Source: Fieldwork, 2008

Table 5 reveals that the colleges do not have computer technicians. This situation is most unfortunate since it implies that the tutors may be frustrated in using the computers as they may be compelled to spend some teaching times on servicing malfunctioning computers. The colleges should employ and assign computer technicians to the computer laboratories so that they take care of the maintenance of the computers so as to free tutors from the stress of servicing of broken down computers and installation of software. This will enable the tutors to concentrate on their core duties of teaching.

Connection to Internet and speed of Internet

Table 6: Connection to Internet and Speed of Internet

	Yes (%)	No (%)	Total
Is lab connected to the Internet?	35 (81.4)	8 (18.6)	39 (100)
Is the speed of the Internet OK?	8 (20.5)	31 (79.5)	39 (100)

Source: Fieldwork, 2008

Table 6 depicts that most colleges are on the Internet as indicated by over 81% of the respondents. It is however anticlimax that majority of the respondents were not satisfied with the speed of the Internet. Naturally with the 256kbps Internet connections that these colleges have, one cannot but agree with the respondents about their dissatisfaction with the speed of the Internet. It is hoped that the colleges would have access to faster Internet because according to Malta National Statistics Office (2004) faster bandwidth connectivity satisfy innovative ICT needs and applications.

Complementary Materials

The questionnaire items whose responses inform the investigator about the availability of educational software, the availability of curriculum for ICT and the availability of approved textbooks are examined in Table 7. It is equally important to ascertain the state of the above-mentioned materials since without them the hardware alone are ineffective.

Table 7: Complementary Materials

Item	Yes (%)	No (%)	Total
Availability of Educational Software	15 (34.9)	28 (65.1)	39 (100)
Availability of Curriculum for ICT	39 (90.7)	4 (9.3)	43 (100)
Availability of Approved Textbooks	23 (53.5)	20 (46.5)	43 (100)

Source: Fieldwork, 2008

The responses to the items in Table 7 above are indicative of the state of the availability of other supplements for the ICT programme. The responses suggest that the Ministry of Education has made curriculum by way of syllabus available to the colleges. This is a good sign of the ministry's commitment to the programme. However the marginal and average figures recorded for the availability of educational software and approved textbooks respectively do not augur well for the development of ICT in schools as their absence will not let the objectives of the programme to be achieved.

Formal Training in ICT and the Adequacy of the Training

Table 8: Formal Training and the Adequacy of the Training

Item	Yes (%)	No (%)	Total
Formal Training in ICT	30 (69.8)	13 (30.2)	43 (100)
Adequacy of the Training	6 (20.0)	24 (80%)	30 (100)

Source: Fieldwork, 2008

When the question was asked if the tutors had received training on the fundamentals of ICT, almost 70% of the respondents answered in the affirmative. It is desired that tutors are trained and prepared well to acquire in-depth knowledge on ICT to be able to teach the subject satisfactorily. However, in response to the adequacy of their training, just a trivial 14% of the tutors who have had training were convinced that the training was adequate, implying majority of tutors felt deficient to teaching ICT as a course.

Training in the Integration of ICT in Teaching and the Adequacy of the Training

Table 9: Training in the Integration of ICT in Teaching and the Training Adequacy

Item	Yes (%)	No (%)	Total
Training in the Integration of ICT	32 (74.4)	11 (25.6)	43 (100)
Adequacy of the Training	-	32 (100)	32 (100)

Source: Fieldwork, 2008

Not much can be derived from ICT in education, if tutors knowledge about ICT is only limited to computer fundamentals and literacy. It is against this that the researcher quizzed tutors on whether they have received training on how to integrate ICT in the teaching and learning enterprise. Though almost three-quarters of the respondents indicated they have undergone training in that direction, they were quick to point out that the training was inadequate. This revelation is unfortunate since if the tutors are not in a position to integrate ICT in the classroom, then the much-touted ICT in education will be a mirage.

Adequacy of ICT infrastructure and Complementary supporting resources

Table 10: Adequacy of ICT infrastructure and Complementary Supporting Resources

Are ICT infrastructure/resources adequate?	Freq	%
Yes	-	-
No	43	100

Source: Fieldwork, 2008

All the respondents unanimously responded that the ICT infrastructure by way of the hardware, software, Internet access as well as supporting resources like books are grossly inadequate for the maximum benefit of the ICT in teacher education to be felt. This revelation though unfortunate, should guide policy makers to make available at the colleges of education the requisite resources.

ICT and Improvement in Teaching

Table 11: ICT and Improvement in Teaching

Has ICT improved Teaching?	Freq	%
Yes	17	39.5
No	26	60.5

Source: Fieldwork, 2008

Table 11 discloses the responses when the tutors were asked to indicate if ICT has improved teaching. About 40% of them informed that ICT has improved teaching. This mediocre figure may be attributed to a lot of adverse factors such as tutors' low competence in ICT as a result of inadequate training, inadequate ICT infrastructure and the lack of the needed software. This revelation is unfortunate since ICT has been introduced in the colleges among other rational to achieve enhanced teaching, so if this prime objective is not being achieved, then policy makers and stakeholders have to put in place the appropriate remedial measures.

Constraints in the use of ICT

The outcome of the utilization of ICT in the teaching and learning enterprise is influenced by, or is a function of myriad of complimentary factors. Table 12 summarises the factors that the respondents indicated as constraints that are inhibiting the use of ICT in the colleges. The concerns of the tutors are very important because according to Mohrman, Lawler, and Ledford (1996) the introduction of new programme will yield optimal results when employees are treated as major stakeholders in an organization.

Table 12: Constraints in the use of ICT   (N - 43)

Constraints	Yes (%)	No (%)	Total
ICT Hardware	37 (86.0)	6 (14)	43 (100)
Educational Software	43 (100)	-	43 (100)
Internet Connectivity	35 (81.4)	8 (18.6)	43 (100)
ICT Textbooks	39 (90.7)	4 (9.3)	43 (100)
Tutors ICT Skills	41 (95.3)	2 (4.7)	43 (100)
ICT Technical Assistance/Support	39 (90.7)	4 (9.3)	43 (100)
Support from Policy Makers	41 (95.3)	2 (4.7)	43 (100)

Source: Fieldwork, 2008

The tutors identified the factors in Table 12 as some of the challenges of the application and use of ICT in the colleges of education.

ICT Hardware

A well-equipped computer laboratory is a prerequisite to the teaching of ICT and integration of ICT in the classroom. Computer hardware and their complementary peripheral are indispensable elements in ICT in education, no wonder 86% of the respondents alleged that ICT are real needs and their limited numbers constitute a threat

and a bane to the quest to incorporate ICT in the teaching and learning at the colleges of education.

However, if the quantity of personal computers that the colleges have at their disposal which adds up to 160 in relation to the students numbering 2480, which put the ICT to teacher trainee ratio to 1: 16 is anything to go by then there is acute inadequate of ICT in the colleges. Adequate ICT hardware has to be in place if the desired goals and objectives of ICT in education are to be attained.

Educational Software

The availability of adequate hardware alone cannot facilitate the inclusion of ICT in the classroom if the matching materials like educational software and curriculum are not made available. Educational software is the programme for a specific subject area that tutors can use to facilitate the preparation, delivery of lessons and learning. Educational software in the form of Computer Assisted Instruction (CAI) and Computer Assisted Learning (CAL) are indispensable to enhance and facilitate teaching and learning. It is in that direction that a whopping 100% of the respondents pointed out that educational software are needs and thus their unavailability as it exists now in the colleges constitute a constraint to the ICT in teacher education.

Internet Connectivity

The Internet with its mass of unparalleled educational resources and courseware has become an indispensable tool in teaching and learning. Internet has wide range of easy-to-use tools for teaching, learning and collaboration online. Thus, the telecommunication facilities that provide the connectivity are significant and have direct impact in teaching and learning in the colleges of education. However, because the state of telecommunication infrastructure in the country as a whole is not the best, the quality of the Internet connections is also affected. Therefore, it was not accidental when over 81% of the respondents divulged that Internet connectivity is a limitation. The good news however is that government has already initiated moves to have telecommunication infrastructure pervasive in the country. In that direction, fibre cable network backbone is being laid across the breadth and length of Ghana to facilitate communication in general and ICT deployment in the schools in particular.

ICT Textbooks

According to Warren (1981), a textbook is printed instructional material in bound form, the contents of which are properly organized and intended for use in schools. Zahorik (1991) as quoted in Laws & Horsley (n.d), wrote that the availability of textbooks in schools appears so consistently associated with higher levels of students achievement that they are worthy of close scrutiny as instruments of effective learning. However, this study revealed that there is no approved ICT textbook for the course, as none of the textbooks being used by the students has been endorsed by the Ministry of Education. Thus it was in order that over 90% of the respondents disclosed that ICT

textbooks are necessity to maximum ICT utilization in the classroom. The good intention of the ICT in the classroom will go down the drain if appropriate books and other course materials based on the curriculum are not made available in the colleges.

Tutors ICT Skills

Without tutors with the prerequisite ICT skills, not much can be garnered by the students with ICT in the classroom. Tutors are the agent of change of any educational innovation, thus a to a larger extent they determine the success or otherwise of it. Tutors need to be given the necessary training and capacity building in order to have the competence required of them. Thus it was not surprising that over 90% of the respondents saw training as a critical factor and their absence or inadequacy constitutes a constraint. Successful educational initiatives mandate teachers to receive thorough training. Insufficient training may result in teachers who are unable and unwilling to teach ICT and integrate ICT in their teaching because they lack the skills required of them.

ICT Technical Assistance/Support

Technical assistance in the form of the availability of help desk and technicians to service or repair malfunctioning computers and install software is essential if tutors are to feel motivated to utilize ICT in the classroom. Tutors are frustrated and waste a lot of teaching times if they are the same people who also have to repair broken down computers and install software. That is why respondents in excess of 90% see the

unavailability of ICT technicians in their colleges as a constraint in the execution of their job.

Support from Management and Policy Makers

A very critical success factor in most undertakings, especially capital-intensive project such as ICT is the support the implementers receive from top management and policy makers. This is because top management wield power, influence and they determine where resources should be allocated. It is on the basis of the above among others, that Ghanaians expect a massive increase in ICT deployments because of the President Kuffour's special initiative in ICT. It is therefore no wonder that over 95% of the respondents disclosed that support from management and policy makers is important if the ICT initiative in the college of education is to thrive.

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Analysis of Teacher Trainees' Questionnaire

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Socio-Demographic Analysis of the Teacher Trainees

The socio-demographic data analysis of the teacher trainees was done along the following lines: the respondents' college of education, sex, age, and programme they were pursuing.

Distribution of Respondents by their Colleges

The distribution of respondents by their colleges is summarized in Table 13.

Table 13: Distribution of Respondents by Colleges   (N - 242)

College of Education	Freq	%
Foso	72	29.7
Komenda	80	33.1
OLA	90	37.2
Total	242	100.0

Source: Fieldwork, 2008

As shown in Table 13, 29.7.%, 33.1% and 37.2% of the respondents were from Foso College of education, Komenda College of education and OLA College of education respectively. It is believed that the distribution will help give the true picture of the ICT status of the colleges of education in the Central Region.

Distribution of Respondents by Sex

Responses with regard to the sex of the respondents are depicted in Table 14.

Table 14: Distribution of Respondents by Sex   (N - 242)

Sex	Freq	%
Male	97	40.1
Female	145	59.9
Total	242	100.0

Source: Fieldwork, 2008

Distribution of Teacher Trainees by Sex

Responses with regard to the sex of the respondents are presented in Table 14. The Table reveals that 97 (40.1%) of the respondents were males and 145 (59.9%) were females. It was expected that there would be more female respondents than males, because whilst Foso College of Education and Komenda College of Education are co-educational colleges, OLA College of Education is a females' college.

Distribution of Students by Age

The distribution of students by age is tabulated in Table 15.

Table 15: Distribution of Students by Age   (N - 242)

Age	Freq	%
Below 21	22	9.1
21- 30	215	88.8
31- 40	5	2.1
Total	242	100.0

Source: Fieldwork, 2008

The distribution of students by ages they were studying is depicted in Table 15. As it was anticipated, majority of the students, accounting for almost 89% were between the ages of 21 to 30 years. About 9% and 2% were below 21 years and above 31 years respectively.

Distribution of Students across Programmes

The distribution of students across programmes is presented in Table 16.

Table 16: Distribution of Students Across Programmes   (N - 242)

Programme	Freq	%
Visual Arts	22	9.1
Business	15	6.2
Sciences	146	60.3
General Arts	59	24.4
Total	242	100.0

Source: Fieldwork, 2008

Table 16 reveals that more than half of the respondents, that is 60.3% were reading the science subjects of elective science, agriculture science and home science. Those studying visual arts as well as business subjects constituted less than 10% in each instance, whilst about a quarter of the respondents were specializing in general arts. It is believed that the research will be enriched with views from students pursuing varying programmes of study.

ICT Infrastructure

In this section, questionnaire items whose responses enable the investigator ascertain the state of ICT infrastructure are analysed.

ICT Facilities

In order to establish the nature of the ICT facilities in the colleges, some series of questions were posed. The results are summarised in Table 17.

Table 17: ICT Facilities

Responses	Yes (%)	No (%)
Does your College have Computer Lab?	242 (100.0)	-
Are the computers linked to the Net?	156 (64.6)	86 (35.5)
Is speed of the net satisfactory?	76 (31.4)	166 (68.6)
Are the ICT infrastructure adequate	44 (19.2)	198 (81.8)

Source: Fieldwork, 2008

The results in Table 17 reveal that all the colleges under study have computer laboratory. However, it appears not all the computers are connected to the Internet as indicated by 35.5% of the respondents. This revelation is not encouraging as students need to have access to computers linked to the net so that they can have access to the mass of academic materials on the net. Another discouraging disclosure is the nature of the speed of net. Over two-thirds of the respondents were not satisfied with the speed of the Internet. Slow and unstable bandwidth are deterrent to the use of the net, thus resources should be sought to have high speed broadband in place. Respondents were generally not satisfied with the adequacy of the ICT infrastructure. This disclosure is not surprising given that the total number of personal computers in the colleges under study totalled just 160 in relation to the 2480 students population.

Complementary Materials

This part seeks to analyse and discuss the questionnaire items whose answers could be used to make generalization about the availability of others supporting materials needed besides the core ICT infrastructure. Supporting materials such as educational software, textbooks and curriculum needed for the ICT in teacher education were evaluated. The results are shown in Table 18.

Table 18: Complementary Materials

Responses	Yes (%)	No (%)
Does your college have educ. Software?	77 (31.8)	165 (68.2)
Is ICT Curriculum Available?	136 (56.2)	106 (43.8)
Does your college have approved ICT textbooks?	116 (47.9)	126 (52.1)

Source: Fieldwork, 2008

The responses, which are summarised in Table 18, give an indication that the related materials such as educational software and textbooks are either not available or adequate. The non-availability and inadequacy of these essential elements do not spur ICT in education. This is supported by Knierzinger, Rosvik & Schmidt (2002) who identified four key elements in an ICT development project in education as: Curriculum, Software, Teacher Training and Hardware. They went on to say that successful projects integrate these four elements so that teachers know what they are doing, what educational outcomes are expected, have the skills to use the appropriate software and have access to hardware and communications resources, when required.

Forms of Teaching ICT

The use of ICT in the education can take different forms, each meant to achieve different objective. Table 19 gives a picture of how ICT is employed in teacher education in the colleges under investigation.

Table 19: Forms of Teaching ICT

Item	Yes (%)	No (%)
Is ICT taught as a course?	242 (100)	-
Are students taught how to-integrate ICT in teaching?	132 (54.5)	110 (45.5)
Do tutors use ICT to present classes?	83 (34.3)	159 (65.7)

Source: Fieldwork, 2008

A whooping 100% of the respondents agreed that ICT is being taught as a course. However, about 55% of them were of the view that they were being taught how to use ICT to teach, that is, the integration of ICT in the teaching and learning undertaking. It is expected that the curriculum of the ICT for the college of education will be split into different areas, so that the different objectives of the introduction of ICT in the teacher trainee programme are achieved. In this respect, it is expected that students are also taught how to use ICT or integrate teaching and learning. Teaching students about the ICT is good, but the emphasis should be on how the teacher trainees can use ICT to enhance teaching and learning.

ICT Competencies of Teacher Trainees

Table 20 summarises the responses of students when they were questioned about their ICT competencies in ICT.

Table 20: ICT Competencies of Teacher Trainees

Item	Yes (%)	No (%)
Can teacher trainee teach ICT as a subject?	151 (62.4)	91 (36.4)
Can teacher trainee integrate ICT in your teaching/learning?	94 (38.8)	148 (61.2)

Source: Fieldwork, 2008

Table 20 discloses that over 62% of the respondents indicated they are skillful enough to teach ICT at the basic level. However, just about 39% of the respondents divulged that they can integrate ICT in their teaching based on what they are being taught in the colleges of education. The figures recorded in Table 20 is in consonant with those of Table 19 where it was disclosed that students were mainly being taught about ICT than on how to integrate ICT into teaching and learning. This has translated itself into the situation where students have revealed that they are in a position to teach about ICT more than to integrate ICT in the classroom to achieve the objectives of lessons.

ICT and Quality of Teacher Training

In general, ICT is seen as an enabler in teaching. It is one of the reasons that motivated educational planners and policy makers to introduce ICT in the teacher

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education curricula. Table 21 depicts the respondents' view on whether ICT has improved the quality of their training.

Table 21: ICT and Quality of Teacher Training   (N - 242)

Has ICT Improved quality of Training	Freq	%
Yes	160	66.1
No	82	33.9
Total	242	100.0

Source: Fieldwork, 2008

It is indeed encouraging to learn from table 21 that as much as two-thirds of the students indicated that ICT in the colleges has improved the quality of their training notwithstanding the inadequacies of the ICT resources. This revelation is not surprising as ICT is perceived to be a facilitator in teaching and learning. It is thus anticipated that when problems hampering the programme are identified and attended to, maximum benefits can be derived from the ICT in teacher education programme.

Constraints in using ICT

Table 22 summarises factors the teacher trainees deem as limitations to the use and integration of ICT in the colleges of education.

Table 22: Constraints in Using ICT

Constraints	Yes (%)	No (%)
ICT Hardware	181 (74.8)	61 (25.2)
Educational Software	172 (71.1)	70 (28.9)
Internet Connectivity	174 (71.9)	68(28.1)
ICT Textbooks	170 (70.2)	72(29.8)
Tutors ICT Skills	157 (64.9)	85 (35.1)
ICT Technical Assistance/Support	160 (66.1)	82(33.9)
Support from Policy Makers	171 (70.7)	71 (29.3)

Source: Fieldwork, 2008

ICT Hardware

Computer hardware is sine qua non in ICT in teacher education if the desired goals are to be accomplished. Without adequate ICT hardware, students are denied hands-on experience that consolidates the theories learnt. However, given the low figures recorded for computers in the colleges of education, one can justifiably agree with the teacher trainees when they indicated that computers and their accessories are constraints to the ICT programme.

Educational Software

The personal computers available require more than the normal productivity software such as word processing software and spreadsheet software if the aims of the ICT in teacher education is to be attained. The initiative more importantly requires appropriate subject-based educational software that teacher trainees can use to prepare lessons and simulate teaching. The teacher trainees also need to know how to use and incorporate educational software in the teaching and learning endeavour.

The truth however is that, the relevant software for the programmes are not available in the schools, that is why the students justifiably identified it as a need. It is therefore heartening to read from Friday October 31, 2008 edition of the Daily Graphic that Centre for Scientific and Industrial Research (CSIR) is collaborating with some universities to develop software for teaching of the science subjects in Ghana (Tetteh, 2008). It is expected that when this project takes off, locally developed software for teaching will be accessible for teaching and learning.

Internet Connectivity

The Internet has become so indispensable in life that it has been 'labeled' as the third utility after water and electricity. In the field of education, it has turned out to be so vital because of its repository of wealth of academic materials. Thus, the non-availability of Internet connectivity is a bane to ICT utilization in an educational enterprise such as teachers' educational institution. It is therefore not out of ordinary that more than 71% of the respondents indicated Internet connectivity is an indispensable need and its deficiency

in the form of low bandwidth as is being experienced in the colleges of education is a hindrance to the use of ICT in education.

ICT Textbooks and Curricula

Traditionally, books are the means of spreading, preserving, and sharing information and knowledge. Their significance in teaching and learning is vital, and the absence of approved books is for the ICT in teacher education is adverse. These may be some of the compelling reasons why over 70% of the teacher trainees indicated that the non-availability and inadequacy of books pose challenge to the ICT in teacher education.

ICT Skills of Tutors

Tutors are one of the core agents in the ICT initiative who transform the dreams and vision of the policy makers into reality. However, their ability to succeed in that direction depends largely on their competence to deliver. It in this direction and against the background that the tutors indicated that their know-how in teaching and incorporating ICT is low that influenced almost 65% of the teacher trainees to identify deficiency in the ICT skills of tutors as a challenge to the success of the ICT in teacher education programme.

ICT Technical Assistance/Support

ICT technical assistance in the form of the availability of computer technicians to install software and attend to malfunctioning computers is indispensable in the ICT in teacher education endeavour. It is in view of that the over 66% of the teacher trainees

indicated that ICT technical support is a need and its absence constitutes a constraint. The management of the colleges of education should do their best to have ICT technicians attached to the ICT laboratory to ensure the availability of computer services.

Support from Policy Makers

Support from policy makers and management commitment is key to success in any capital-intensive project. Without support from policy makers, the implementation of any new initiative would be seriously compromised. Thus, the success or otherwise of this venture will to some extent be influenced by the level of support and the political will of policy makers to make it succeed. According to Wilms, Hardcastle, and Zell (1994, p.108)

> People will follow management's direction. Whatever management does, and in what direction they push, and how hard they push dictates where a company eventually goes.

Thus, the teacher trainees were right when almost 71% of them identified support from policy makers and top management as a vital success factor which if not forth coming can affect the fortunes of the ICT programme.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to ascertain the ICT readiness of the Colleges of Education in the Central Region with the introduction of ICT in the teachers' colleges of education curricula. It was mainly a descriptive survey intended to provide answers to the following research questions:

1. What is the degree of availability and adequacy of ICT infrastructure?

2. What is the degree of availability and adequacy of educational software?

3. What is the degree of availability and adequacy of textbooks on ICT?

4. What is the extent of training that the tutors have undergone that have enabled them to teach ICT as a subject?

5. What is the extent of training that the tutors have received that have enabled them to teach the teacher trainees how to integrate ICT tools into teaching and learning?

6. Do the tutors themselves integrate ICT in their teaching?

7. Are the visions of the introduction of the ICT in teacher education being met?

8. What are the factors that are inhibiting against the introduction of ICT in the teacher education programme?

Summary of Research Procedures

Two different types of questionnaire were used to seek information from the two target groups, that is; Tutors and Teacher Trainees. The questionnaire items were mainly close-ended ones.

Altogether, 43 tutors across the colleges of education understudy, made up 32 males and 11 females answered the tutors' questionnaire. With regard to ranks, they involved 9.3% Directors, 25.5% Assistant Directors, 55.8% Principal Superintendents and 9.3% Senior Superintendents.

Pertaining to the teacher trainees, a total of 242 students comprising 29.7%, 33.1% and 37.2% from Foso College of Education, Komenda College of Education and OLA College of Education respectively responded to the questionnaire. They were made up of 40.1% males and 59.9% females reading various programmes in general arts, visual arts, business and the sciences.

The study was largely a descriptive one and quantitative methods utilizing mainly frequencies and percentages were used to analyze the data collected. The analyses were represented in the form of tables.

Summary of the Study

The findings of the study were discussed along the research questions. The following findings were enumerated based on the Tutors' and Students' questionnaires:

1. Woefully inadequate ICT hardware for ICT in teacher education make any meaningful impact.

2.   Very limited bandwidth for Internet access to facilitate online utilization of educational materials.

3.   Based on the low number of computer hardware as well as the low bandwidth available in the colleges, both tutors and students indicated that the ICT infrastructure were inadequate and they were not satisfied with the ICT infrastructure available in the colleges.

4.   Both tutors and students were in concert about the unavailability of educational software needed for the programme.

5.   The study learnt that there were no approved textbooks for the programme.

6.   Majority of the tutors revealed that because the training they had been given was inadequate, they were not in a position to teach ICT as a subject and also integrate ICT in their teaching.

7.   It was also discovered that the students were being taught about ICT than how to integrate ICT in teaching and learning.

8.   Notwithstanding the teething problems that this new initiative had experienced, both tutors and students hinted that the modest facilities at their disposal have improved the quality of teaching and learning.

9.   Greater number of the students also indicated their ability to teach ICT at the basic level but their incapability to integrate ICT significantly in the teaching and learning at the basic level of education.

10.   The study found out a litany of challenges to the developments and use of ICT in the colleges of education. The prime ones were:

      i.   ICT Hardware

ii.   Educational Software

iii.   Internet Connectivity

iv.   ICT Textbooks and Curriculum

v.   ICT skills of Tutors

vi.   ICT Technical Assistance and Support

vii.   Support from Policy Makers

Conclusion

From the findings of the study, the following conclusions can be drawn:

1.   The use of ICT in the teaching and learning enterprise at the colleges of education is emerging.

2.   Lack of ICT infrastructure and appropriate software were hampering the utilization of ICT in the colleges of education.

3.   The injection of the necessary hardware, software, textbooks, and equipping the tutors with the required competencies would help progress the utilization of ICT for teaching and learning.

4.   The ICT competencies of most of the tutors were deficient to harness ICT for teaching. This was because training programmes organized for the tutors were too short and inadequate to produce any remarkable results.

5.   The teacher trainees have acquired some knowledge about ICT but slight practical knowledge and little or no techno-pedagogical skill on how to integrate ICT into their professional practice.

6   The colleges of education had no computer technicians who attended to the broken down ICT equipment. Malfunctioning computers that were beyond the abilities of the ICT tutors were serviced by outsiders for a fee.

Recommendation for Practice

Taking into consideration the findings and conclusions, the ensuing recommendations are made to the Ministry of Education and Sports and other educational policy makers to ensure that the desired objectives of introducing ICT into the colleges of education curricula are accomplished:

1. There is the urgent need for the colleges of education to have well-equipped ICT laboratories with the necessary software and accessories to facilitate the integration of ICT in teaching and learning.

2. Because of the indispensability of the Internet in today's educational endeavour, the colleges of education should make resolute efforts to have bigger bandwidth to provide high speed of their Internet access.

3. ICT trainings and professional development that will equip the tutors with the core skills and focus on their needs such as on how to integrate ICT in teaching and learning should be organized on regular basis and sustain through periodic updates. It is believed that the promises and possibilities of technology enhanced teaching and learning are unlikely to be explored in meaningful ways in the colleges of education unless there is effective human capacity development to train tutors with technology integration.

4. The Universities should introduce courses on how to integrate ICT in teaching and learning to undergraduate students reading education programmes.

5. Teacher Trainees should be introduced to the wealth of online courseware on the Internet.

6. The colleges should employ adept ICT technicians to be solely responsible for the maintenance issues at the ICT laboratories so that the tutors and learners can concentrate on their job without dissatisfaction and anxiety.

7. The colleges of education should equip their classrooms with projectors and Internet access to facilitate the assimilation of ICT into teaching and learning.

8. Tutors should have access to the Internet access so that they can use it effectively for their preparations for lessons.

9. There should be provision of backup power systems to ensure continuous power supply should the main supply goes off.

10. ICT user policy should be designed by the Ministry of Education and enforced at the colleges of education so that ICT facilities are used in regulated manner to achieve maximum benefit. ICT user policies are essential in that they provide the framework for defining how a network is used beneficially.

Suggestion for Future Study

The study could be replicated in other colleges of education in the country so that the results could be generalized as what pertains in Ghana.

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APPENDIX A

TUTORS' QUESTIONNAIRE

THE ICT READINESS OF COLLEGES OF EDUCATION IN THE CENTRAL REGION OF GHANA

The purpose of this questionnaire is to assess how ready, prepared, or resourced your college in relation to the incorporation of ICT in the trainee teacher curricular.
You are assured of the confidentiality of your responses, so I would be most grateful if you could answer the questions as candid as possible.
Thank you.

Instruction: Please mark 'X' in the appropriate box.

SECTION A: BIOGRAPHIC DATA

1. Teacher Training College: 1 [ ] Fosu   2 [ ] Komenda   3 [ ] OLA

2. Sex: 1 [ ] Male   2 [ ] Female

3. Age (as at your last birthday):
        1 [ ] 21-30   2 [ ] 31-40   3 [ ] 41-50   4 [ ] 51-60

4. Length of service in the G.E.S:

        1 [ ] 1-10   2 [ ] 11-20   3 [ ] 21-30   4 [ ] 30+

5. Rank: 1 [ ] Director   2 [ ] Asst Director   3 [ ] Prin Supt   4 [ ] Snr. Supt.
             5 [ ] Supt.   6 [ ] Asst. Supt.   7 [ ] Others (Specify) ………………….

SECTION B: ICT INFRASTRUCTURE

6. Does your college have computer laboratory for teaching and learning?
        1 Yes [ ]   2 No [ ]

7. Are the computers …..
        1 [ ] Stand Alone   2 [ ] Networked computer   3 [ ] Not Applicable

8. Does your college have computer technicians?
        1 Yes [ ]   2 No [ ]   3 Not Applicable [ ]

9. Are the computers connected to the Internet?

          1 Yes [ ]   2 No [ ]   3 Not Applicable [ ]

10. Is the speed of the Internet connection satisfactory?

          1 Yes [ ]   2 No [ ]   3 Not Applicable [ ]

11. Does your college have educational software for the ICT programme?

          1 Yes [ ]   2 No [ ]   3 Not Applicable [   ]

12. Is there a curriculum for the ICT in education programme?

          1 Yes [ ]   2 No [ ]

13. Does your college have G.E.S. approved Textbooks?

          1 Yes [ ]   2 No [ ]

SECTION C: NATURE OF THE ICT PROGRAMME

14. Are the students being taught ICT as a course (subject)?

          1 Yes [ ]   2 No [ ]

15. Are the students being taught how to use the tools of ICT for teaching and learning, that is

    how to integrate ICT into teaching and learning ?

          1 Yes [ ]   2 No [ ]

16. Do you use ICT to prepare and deliver your lessons?

          1 Yes [ ]   2 No [ ]

SECTION D: TUTORS' TRAINING IN ICT

17. Have you received any formal training on how to teach ICT as course (subject)?

          1 Yes [ ]   2 No [ ]

18. Was the training adequate to facilitate teaching?

          1 Yes [ ]   2 No [ ]   3 Not Applicable[ ]

19. Have you received any formal training on how to integrate ICT into teaching?

          1 Yes [ ]   2 No [ ]

20. Was the training adequate to facilitate teaching?

          1 Yes [ ]   2 No [ ]   3 Not Applicable[ ]

SECTION E: PERCEPTIONS ABOUT THE PROGRAMME

21. Do you consider the ICT infrastructure (hardware, educational software, Internet
     connection), textbooks etc adequate for the ICT in teacher educational programme?
           1 Yes [ ]   2 No [ ]

22.   Do you think ICT has improved your quality of teaching?
           1 Yes [ ]   2 No [ ]

23.   Do you think that after completion of their course the trainee teachers can teach
ICT at the
      basic level?
           1 Yes [ ]   2 No [ ]

24. Do you think that after completion of their course the trainee teachers can integrate
ICT into
      teaching and learning at the basic level?
           1 Yes [ ]   2 No [ ]

SECTION F: ICT CONSTRAINTS AND NEEDS

25. What key constraints have you identified in the ICT in teacher education programme?
      (Tick as many as applicable)
 1   Hardware: 1 Yes [ ]   2   No [ ]
 2   Educational Software   1   Yes [ ]   2   No [ ]
 3   Internet Connectivity   1   Yes [ ]   2   No [ ]
 4   ICT Textbooks   1   Yes [ ]   2   No [ ]
 5   Tutors' ICT Skills   1   Yes [ ]   2   No [ ]
 6   Support from Policy Makers: 1   Yes [ ]   2   No [ ]
 7   Technical Assistance   1   Yes [ ]   2   No [ ]
 8   Others (Specify):……………………………………………………………………

26. Kindly write in the space provided below any suggestions that can lead to the
improvement in the ICT in teacher education programme?

………………………………………………………………………………………………….

………………………………………………………………………………………………..

Thank you

TEACHER TRAINEES' QUESTIONNAIRE

THE ICT READINESS OF COLLEGES OF EDUCATION IN THE CENTRAL REGION OF GHANA

The purpose of this questionnaire is to assess how ready, prepared, or resourced your college is as it relates to the incorporation of ICT in the trainee teacher curricular.
You are assured of the confidentiality of your responses, so I would be most grateful if you could answer the questions as candid as possible.
Thank you.

Instruction: Please mark 'X' in the appropriate box.

SECTION A: BIOGRAPHIC DATA

1. Teacher Training College: 1 [ ] Fosu   2 [ ] Komenda   3 [ ] OLA

2. Sex: 1 [ ] Male 2 [ ] Female

3. Age (as at last birthday):
          1 [ ] 11-20   2 [ ] 21-30   3 [ ] 31-40   4 [ ] 41-50

4.   What programme are you pursuing?
     1 [ ] Visual Arts   2 [ ] Business   3 [ ] Science/Agric/Home Sci   4 [ ] General Arts
     5 [ ] Other (Specify) …………………………..

SECTION B: ICT INFRASTRUCTURE

5. Does your college have computer laboratory for teaching and learning?
          1 Yes [ ]   2 No [ ]

6. Are the Computers …..
          1 [ ] Stand Alone   2 [ ] Networked computer   3 [ ] Not Applicable

7. Are the computers connected to the Internet?
          1 Yes [ ]   2 No [ ]

8.   Is the speed of the Internet connection satisfactory?
          1 Yes [ ]   2 No [ ]

9. Does your college have educational software for the ICT programme?
       1 Yes [ ] 2 No [ ] 3 Not Applicable [ ]

10. Do you have access to or use educational teaching/learning software
       1 Yes [ ] 2 No [ ]

11. Is there a curriculum for the ICT in education programme?
       1 Yes [ ] 2 No [ ]

12. Does your college have G.E.S. approved ICT Textbooks?
       1 Yes [ ] 2 No [ ]

13. Do you consider the ICT infrastructure (hardware, educational software, Internet connection), textbooks etc adequate for the ICT in teacher educational programme?
       1 Yes [ ] 2 No [ ]

SECTION C: NATURE OF THE ICT PROGRAMME

14. Are you being taught ICT as a course (subject)?
       1 Yes [ ] 2 No [ ]

15. Are you being taught how to use the tools of ICT for teaching and learning, that is how to integrate ICT into teaching and learning ?
       1 Yes [ ] 2 No [ ]

16. Do your tutors use ICT to present your classes?
       1 Yes [ ] 2 No [ ]

SECTION D: TUTORS' ICT COMPETENCIES

17. Do you think you have tutors who have adequate knowledge on how to teach ICT as a course (subject)?
       1 Yes [ ] 2 No [ ]

18. Do you think you have tutors who have adequate knowledge on how to integrate ICT into teaching and learning ?
       1 Yes [ ] 2 No [ ]

SECTION E: PERCEPTIONS ABOUT THE ICT IN EDUCATION PRGRAMME

19. Do you think the training you have had at the college would enable you to teach ICT as subject at the basic level after the completion of your programme?
       1 Yes [ ] 2 No [ ]

20.   Do you think the training you have had at the college would enable you to integrate ICT in your teaching at the basic level after the completion of your programme?

       1 Yes [ ]   2 No [ ]

21.   Do you think ICT has improved you quality of your trainee teacher programme?

       1 Yes [ ]   2 No [ ]

SECTION F: ICT CONSTRAINTS AND NEEDS

22. What key constraints have you identified in the ICT in teacher education programme? (Tick as many as applicable)

1	Hardware:	1 Yes [ ]	2 No [ ]
2	Educational Software	1 Yes [ ]	2 No [ ]
3	Internet Connectivity	1 Yes [ ]	2 No [ ]
4	ICT Textbooks	1 Yes [ ]	2 No [ ]
5	Tutors' ICT skills	1 Yes [ ]	2 No [ ]
6	ICT Technical Assistance/Support	1 Yes [ ]	2 No [ ]
7	Support from Policy Makers	1 Yes [ ]	2 No [ ]
8	Others (Specify):…………………………………………………………		

23.   Kindly write in the space provided below any suggestions that can lead to the improvement in the ICT in teacher education programme

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Thank you