

UNIVERSITY OF CAPE COAST

INTEGRATING TECHNOLOGY INTO TEACHING AND LEARNING IN
COLLEGES OF EDUCATION IN GHANA

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2012

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BY

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

NOVEMBER 2011

DECLARATION

Candidate's Declaration

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

Candidate's Signature..... Date:.....

Name: Issah Bala Abdulai

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.

Supervisor's Signature..... Date:.....

Name: Paul Ahiatrogah

ABSTRACT

The purposes of this study are: (a) to find out the extent to which teacher-trainees could be prepared for ICT integration into the Colleges of Education syllabuses in Ghana; (b) to find out some of the barriers that are militating against the integration of technology into the teaching and learning process.

A cross-sectional survey design was employed to collect data in three regions of the country. Data were collected from 120 student-teachers in three Colleges of Education using random sampling. The survey also included 150 tutors from the Colleges of Education who were randomly sampled during a marking section. Data were gathered through questionnaire from all participants. The quantitative data were analysed using frequency table. Percentages were used to answer research questions 1, 2, 4 and 5; while research question three (3) was analysed using qualitative analysis.

The results indicated that, in general, Colleges of Education in Ghana have not effectively integrated technology into the college curricula. In addition, to a large extent, tutors and student-teachers did not perceive themselves as having enough training to teach with computers. In response to the urgent need to integrate technology into Ghana's Colleges of Education curricula, it was recommended that, there should be an establishment of technology centres in the Colleges which will serve as training centres for tutors as well as centres for the acquisition of technology tool for teaching and learning purposes.

ACKNOWLEDGEMENTS

I would like to take this opportunity to express my sincere gratitude to all persons who have contributed in diverse ways, tangible or otherwise, to the completion of this project. Most significantly, I would like to acknowledge the contribution of my supervisor Mr. Paul Ahiatrogah whose insights have guided me to complete this dissertation.

DEDICATION

To my mother and all those who helped me through my education.

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CHAPTER ONE

INTRODUCTION

Background to the Study

The introduction of Information and Communication Technology (ICT) into classroom teaching and learning has been one of the issues much spoken about in Ghana. Even though many attempts have been made to integrate the technology into classroom teaching, research shows that little or nothing is being done to ensure a total integration of the technology into teaching and learning in Ghanaian schools. Most teachers are now learning to use the technology for themselves instead of using it to teach. Barnett (2000) observes that there is significant pressure on schools today to change due to economic, social, and political transformations. And in this, he says, they need new skills and approaches to learning.

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

and groupings. The report of this commission is what is now known as the Ghana ICT for Accelerated Development Policy (ICT4AD) (Republic of Ghana, 2003). The ICT4AD policy represents the vision of Ghana in the information era. It takes into consideration the targeted goals of key socio-economic development framework documents such as the Vision 2020. The ICT4AD policy statement therefore sets out the road map for the development of Ghana's information society and economy. It provides a basis for facilitating the socio-economic development of the country in the emerging information, knowledge and technological age. Promoting ICTs in education by deploying and exploiting the potential of ICTs in education is one of the 14 identified pillars of the ICT4AD policy. Government policy on ICT like the ICT for Accelerated Development (ICT4AD) was passed into law in 2004 by the parliament of Ghana.

The impact of technology integration on instructional strategies and learning, and the inherent barriers/challenges associated with this paradigm shift, in the Ghanaian context, need to be addressed and investigated further. Given the technology driven nature of our global, information based society, lack of technology integration skills among teachers in Ghanaian classrooms is a major concern in education today. The teacher-training programmes of Colleges of Education and teacher-training universities provide little opportunity for trainees to acquire skills necessary to integrate ICT into teaching.

The question of teacher preparation for integrating the technology into the paper-pencil classroom goes beyond the teacher and the technology. The onus rests with the policy makers, financiers and the implementers. Chisholm, Irwin

and Carey (1998) indicate that insufficient resources in the form of well-trained computer technology personnel and the capital to train them were the impediments to technology integration in education in Ghana.

Currently, there are 40 Colleges of Education with 38 being government's own and two private. The Colleges of Education are mandated to train teachers mostly for the basic level of education in Ghana. The Colleges of Education evolved from awarding teacher's certificate 'B' to certificate 'A' before advancing toward diploma for graduates who successfully complete the three year programme. For teachers to be able to efficiently integrate technology in their teaching and learning, it depends on the kind of training they receive during their training as teacher-trainees. But the question is, are the Colleges of Education training the would-be teachers to be able to integrate technology into their teaching and learning after they leave the colleges? Is there any policy at the Colleges of Education to prepare students in the integration of technology when they leave the school? Fortunately all the Colleges of Education in Ghana for now are running the same courses so things are done uniformly.

Statement of the Problem

A survey carried out by Mereku, Yidana, Hordzi, Tete-Mensah, Tete-Mensah, and Williams (2009) revealed that educators at all levels are not trained to use ICT for teaching and learning.

This opens up a Pandora Box containing much as to whether the problem is teachers' refusing to integrate technology or that they were not introduced to technology integration in the College of Education they attended hence they do

not have the skills to do that. If it is the latter, then the question is whether the institutions that are responsible for the training of teachers are failing in their responsibility. The fact is that the teacher is a reflection of the type of training he or she has gone through.

Purpose of the Study

This research seeks to find out the extent to which teacher-trainees are being prepared for technology integration by the colleges of education in Ghana. The research will further investigate the competence level of the teachers in the College of Education to integrate technology in their teaching themselves. It will also aim at finding out some of the barriers that are militating against the integration of technology.

The perception of teachers and teacher-trainees in the Colleges of Education about technology integration will also be solicited. The kind of professional development programme with regards to technology integration in the colleges will be identified and analysed by this study. This is to highlight the urgency of technology integration in our Colleges of Education lest we continue to produce teachers who may not fit into the new teacher-student concept.

Significance of the Study

Educators have consistently made various assumptions about the relationships between technology integration and student learning. Specifically, this study sought to provide evidence about the urgency of integration of computer use into instructional practices of Colleges of Education. Again, the

study will bring to light to all stakeholders of education on whether the nation's policy on ICT integration in the Colleges of Education in Ghana is going on well.

It will also give an insight to curriculum developers for the Colleges of Education as to whether there should be a reform of the colleges in order to adopt technology integration as a course or not. More so, it will provide some answers to whether the country's education is focused on integration of technology in the classroom.

Research Questions

1. What are the levels of technology integration in the Colleges of Education?
2. What are the factors working against the integration of technology in the Colleges of Education?
3. What curriculum changes have the policy makers made to ensure technology integration in the Colleges of Education?
4. What are the perceptions of the teachers and teacher-trainees regarding technology integration?
5. What kind of teacher professional development on integrating technology is going on?

Delimitation of the Study

The study is delimited to integration of technology into the teaching and learning in Colleges of Education.

Limitations of the Study

These are the factors that, in one way or the other, may have affected the outcome of the study.

1. I had planned to travel to all the marking centres, but due to time constraints I could not do that. If I were at the centers, I would have obtained a clearer understanding of the views of the respondents over there. I would have also explained certain items the respondents may have misunderstood from the questionnaire. This could have affected the result of the study.

2. It was difficult and it took time to get tutors as research assistants to assist in the administration of the questionnaire. Most of the tutors said that they would not get time to administer the questionnaires. The questionnaires may have been administered in a rush which could affect the results of the study.

3. The researcher could not access many studies that have been conducted on technology integration in Ghana. The researcher believes that it would have helped in explaining the essence of the findings if more studies were identified.

Definition of Terms

Student-teachers: refers to students who are being trained to become teachers after their completion of diploma course in basic education.

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

Technology integration: refers to the use of computer and computer based instruction in the teaching and learning.

College of education: this refers to the institutions which are responsible for training teachers for the basic level.

Information and communication technology refers to the combination of computer-based technologies and telecommunication technology for the purpose of gathering data or information, processing data, sharing and disseminating information from one place to another.

Organization of the Rest of the Study

The study was organized into five chapters. In chapter one, the background of the study, statement of the problem, the purpose of the study, research questions, significance of the study, limitations and delimitations of the study and organization of the study were stated. The relevant literature review was presented in chapter two. The literature review was based on the sub-constructs of the study. The methodology was outlined in chapter three. Results and discussions were presented in chapter four. Chapter five consisted of a summary of findings, conclusion, recommendations and suggestions for further investigation into the problem, based on the findings of this study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Overview

This chapter presents literature associated with the context of the study and establishes the basis on which the research questions are explored. As this study is to investigate the integration of technology in the Colleges of Education in Ghana, it is important to explore the current trends and themes that may influence the integration of technology in the Colleges of Education. The literature will discuss the following:

1. Theoretical framework
2. Importance of Technology Integration
3. Factors for Effective Integration of Technology
4. Factors affecting the Implementation of Technology in the Teaching and Learning Process
5. Perception of Teachers and Teacher-Trainees on Technology Integration
6. Level of Technology Integration and Curriculum Reform
7. Teacher Training and Professional Development

.Theoretical Framework

"Teacher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change" (UNESCO, 2002, p. 3). "Technology is changing more rapidly than ever before, causing more and more confusion about the best way to use it in schools" (Bailey, 1997, p. 57). Fabry and Higgs (1997) concluded that "If the integration of technology in the classroom in the next ten years is to look any different from the last ten, we must focus time, money, and resources in the areas that can have the greatest impact on our students, our teachers" (p. 393).

A task force of the National Council for the Accreditation of Teacher Education (NCATE) concluded that colleges are not properly preparing teachers to use technology in their teaching. The report stated, "Bluntly, a majority of teacher education programmes are falling far short of what needs to be done" (NCATE, 1997, p. 6).

Importance of Technology Integration

A critical element in technology integration is its relationship to teaching effectiveness. Lu and Molstad (1999) defined instruction as ". . . the process including all the activities purported to influence learners toward some predetermined goal" (p. 169). They cited ways technology can improve instructional effectiveness, including;

- 1) multimedia packages that allow teachers to interact with large groups, lead discussions, individualize instruction, and direct student attention to key details in the presentation;

- 2) telecommunication tools that allow teachers to communicate with students and other teachers, encouraging articulation of ideas and collaboration;
- 3) technology that enhances students' problem-solving ability; and
- 4) technology that motivates students to learn.

Teachers who use technology in their classrooms seem to change their instructional methods and attitudes (Jordan & Follman, 1993). The potential of technology to improve the quality of learning and teaching is undeniable. This potential has been indicated by numerous people.

Valdez (2004) observes that technology offers many opportunities to learning and that it has the potential to provide access to knowledge and learning resources to people in their own homes and work settings which until recently possible only in very large universities. Furthermore, he argues that technology has the potential to make everyone a producer of original knowledge that can be shared with the world at very little cost. On its effectiveness in classroom practices, Blankson (2004) observes that technology in education may promote new learning environments in which enquiry and problem solving increase student achievement.

Hansen (2003) highlights the importance of technology in teacher preparation, pointing out three benefits. First, technology can be a powerful tool for helping individuals achieve personal and shared goals. Second, technology alleviates human suffering and promotes social justice to help people make a difference in their worlds. Third, people must have knowledge and skills to evaluate and decide appropriate courses of action when confronted with problems.

In my view technology provides an excellent avenue for student motivation, exploration, and instruction in a multi sensory diverse world. Barron, Orwig, Ivers and Lilavois (2001) observe that the integration of technology into the school curriculum is no longer a luxury, rather “it is a means to survival in the future that will be driven and supported by technology” (p. 71).

Factors for Effective Integration of Technology

In this part, the general factors that are necessary for technology integration are presented. The philosophy, psychology, and model of technology integration are discussed to create a body of knowledge that will guide the evaluation of the technology integration in the Colleges of Education in Ghana.

Bettis (1998) points out the following factors to be considered by the teachers. These factors would vary depending, somewhat, on the context of the schools and the student/teacher:

1. Knowing and respecting the social and economic contexts within which to introduce technology. Social context involves knowing what students need of technology, what their parents and the society need. Economic context involves knowing the capability of investing in technology. Schools should operate in costs that are proportional to their capability. In other words, one should know the cost of technology and its operations. In the context of Ghana, the teachers need to know what Ghana’s expectations of Colleges of Education are and must translate the political social ideologies into education. Technology in education has to reflect such ideologies of the society and stakeholders (students and parents). At

the same time, stakeholders must know the economic status of how much is manageable to invest in education.

2. Getting priorities straight, which involves knowing what is to be taught, how to teach it and how to evaluate it.

In order for the school to be proactive regarding technology in the classroom, Williams (1998) argues that the school should have a technology plan, reviewing the curriculum to fit the technology needs in instruction and ensuring that the staff has the requisite skills. He argues for tapping school and community resources to ensure sustainable funding mechanisms. Barron, Orwig, Ivers and Lilavois (2001) report that to effectively use technology in the classroom, one requires new understandings, new approaches and new forms of professional growth.

These are some of the factors to consider when one is preparing the process of technology integration, but they give a very comprehensive picture that technology integration is an endeavour that requires a lot of inputs. These factors are basically very important as pre-requisites and supporting fundamentals in the real process of technology integration, which is more methodological. They provide a reflection on the philosophical, theoretical, and practical considerations that would enhance the quality and effectiveness of the implementation process.

Factors Affecting the Implementation of Technology in the Teaching and Learning Process

Several authors have written about factors affecting the implementation of technology integration. Kerr (1989) stated that “. . . the teacher’s world is substantially limited by powerful social and administrative pressures to teach in a particular way” (p. 5). In his article, Glenn supported Kerr by noting that the organizational structure of schools inhibits teachers’ efforts to learn about new technologies and resists innovation (Glenn, 1997).

In their review of several meta-analyses, Fabry and Higgs (1997) found that the major issues in the implementation and integration of technology in the teaching and learning process were: resistance to change, teachers’ attitudes, training, time, access, and cost. This is supported by a study by Smerdon, Cronen, Lanahan, Anerson, Iannotti and Angeles (2000) for NCES in which they found that the barriers to the use of the Internet and computers for instruction included lack of computers, lack of release time for teachers to learn how to use technology, and lack of time in the school schedule for student computer use. This was also supported by George (2000) who indicated that the primary obstacle in incorporating technology in the teaching and learning process is the lack of expertise, time, and funds. In Ghana’s Colleges of Education, factors like teachers’ timetable, nature of continuous assessment etc. may be some barriers that prevent teachers from integrating technology into their teaching.

Research has indicated that there are gaps or barriers in the implementation of technology integration even in developed countries Amy,

Baylor, and Ritchie (2002) argue that the way in which technology is used in the classroom is a critical measure of its success. They state that it is becoming increasingly clear that technology, in itself, does not directly change teaching or learning. Rather, the critical element is how technology is incorporated into instruction. They also comment that when students and teachers perceive computers as a separate subject, unassociated with the context of the lesson or classroom, the content or concepts studied are often left fragmented in the learner's mind. They suggest that technology integration requires teachers, no longer being the sole distributor of information, but also must alter their teaching processes.

Perception of Tutors and Teacher–Trainees of Technology Integration

Curtis, Kopera, Norris and Soloway (2004) claim that educators have long understood the benefit associated with technology and consistently stated that when thoughtfully and effectively used, it can greatly assist students. There was a significant division in the educational community between those who were interested in exploring the possibilities that such technology might open up the curriculum and those that considered it as a threat to good teaching (Panitz, 2000). Teachers will be less inclined to integrate technology in their classrooms if teacher education faculties do not model the integration of technology in their classrooms (Zehr, 1997). Perkins (1992) points out in his book *Smart Schools: Better Thinking and Learning for Every Child*, that “. . . students are learning and teachers are teaching in much the same way they did twenty or fifty years ago. In

the age of CDs and VCRs, communication satellites and laptop computers, education remains by and large a traditional craft” (p. 3).

Kerr (2005) points out that using technology in education has a bearing on the perceptions of what the process of education is and how it can be fostered and leads to the determination of how schools should be organized.

In a broader perspective, educational technology is grounded in promoting efficiency in learning, which in turn promotes efficiency and functioning performance in our daily lives. According to Bruess (2003), computer technology is permeating the educational arena and changing the way teachers teach and students learn. With technology, students are able to access different sources of knowledge by themselves. This trend deviates from the traditional approach of depending almost entirely on teachers or instructors. With this new trend, the process of education has taken on a new dimension which requires new approaches to the process of learning and teaching.

Al-Oteawi (2002) suggests that teachers need knowledge and skills that will enable them to improve their teaching, such as integrating IT within the curriculum in order to enhance learning and allow students to learn from different sources. Nevertheless, the concept of integration is not so straightforward one such that it is easy to practically implement it. In different environments it may be perceived differently. Different aspects need to be made clear and elaborated on when looking at technology integration in education. For instance, there is a distinction between acquiring technology and integrating technology. An institution may be well equipped technologically but poor in using that

technology (quantity does not always suggest quality). This means it is not enough to acquire technology; rather, the basis lies in the use of technology. (Fulton, Glenn, and Valdez (2004) argue that technologies can provide powerful tools for student learning, but their value depends upon how effectively teachers use them to support instruction.

Expounding on technology use, scholars highlight some aspects that define technology integration in learning and teaching. In essence, they indicate that it is not just using technology in curriculum; rather, it is how meaningful the technology is integrated (the approach). Earle (2002) points out that integration is not just a mere placement and use of hardware in the classroom; rather, technology must be pedagogically sound in the learning and teaching environment. He points out that education must go beyond information retrieval to problem solving, allowing for new instructional and learning experiences not possible without computers.

On his part, Kerr (2005) argues that although there is good evidence that using technology can effectively help students learn, many issues make a difference in the outcome. The issues he mentions include how easy the hardware is to use, how well it is supported in schools, how well organized are circumstances on which technology is brought to bear, how well designed is the software, how well prepared and confident a teacher is in his/her ability to work using technology in a technology-rich environment, how student learning will be appropriately assessed, and how ready parents and community are to accept new models of learning and assessment.

In my view most teachers' problem is conservatism in methodology. Some teachers are scared of losing their monopoly over knowledge so will tend to resist any change to a new way. Conservative teachers are afraid of the challenges to learning new tricks; but more so, the fact that the new ways of acquiring knowledge is empowering learners to pose challenges. To solve this problem conservative teacher should be coaxed through motivational strategies like providing computers as well as free training on how to use the computers. Most important, teachers should accept the grim fact that a teacher is a student forever

Level of Technology Integration and Curriculum Reform

Technology should be an integral part of teacher preparation programmes. Research shows that teachers tend to teach the way they were taught (Ball, 1990; Lortie, 1975). Teachers should not be taught *about* technology but *how to use* technology for constructing, organizing, and communicating knowledge (Barron & Goldman, 1994).

House (1979) argued that research on education and reform indicated that change could only happen on a large scale if it is supported by the socio-historical and political milieu at a certain point in time. In addition, for educational innovations to succeed, they require the close collaboration of the teachers involved. History of education reform has shown that innovations have failed dramatically when teachers input was either not incorporated or when teachers were not actively involved in the innovation (Means, 1994). Therefore, for successful integration of technology in Colleges of Education, it is essential that the organized body of teachers participates in the decision making process, as

well as in the design, implementation, and evaluation of programmes relating to this innovation. Technology has the potential to support curriculum and policy reform. However, reform efforts alone will not cause the necessary change. There is a reciprocal relation between reform and technology.

As Means (1994) argued, technology drives reform in education, but also “education reform makes a school ripe for technology” (p. xii). A long history of technology use in education shows that the first inclination is to use new technology in the same traditional ways as the old technology (Cuban, 1986; Means, 1994). Continuing old practices with new technology will neither change nor improve education. Old curricula and pedagogical approaches should be reformed, and if necessary replaced, to take advantage of the affordances of the new media.

Harasim (1996) argued that computer-mediated education facilitates educational approaches, which shifts the focus from “knowledge transmission to knowledge building,” (p. 205). Knowledge building results when learners interact, collaborate, discuss their ideas, form arguments, and negotiate meaning with their peers. When used appropriately, technology provides a more decentralized environment where students stake more control of the learning environment and become active constructors of knowledge while working on authentic tasks. Information technologies and computer networks shift the role of the teacher from knowledge transmitter to that of a facilitator who provides opportunities for interaction and meaning making to all learners.

Technologies are not deliverers of content, but tools that educators and students use to construct knowledge and share meaning. The use of technology and cultural tools to communicate, exchange information, and construct knowledge is fundamental in constructivism. Strategies for teaching and learning are not chosen to facilitate transfer of knowledge from the world to the learner's head, but to provide tools the learner will use to create meaning. Teachers should therefore, be trained to use computers in ways that will allow their students to construct knowledge.

Jonassen (1996) argued that technology-based learning occurs when students use computers as mind tools that enable them to represent what they know and organize their knowledge in meaningful ways. Mind tools are tools that aid and extend the user's thinking capabilities and can be used for knowledge construction and problem solving. Some examples of mind tools include computer conferencing, databases, spreadsheets, and hypermedia development tools. Examples of projects that students can engage in using technology are building websites, creating databases, authoring multimedia programs, and developing interactive CD-ROMs. Such conceptions of technology-based teaching and learning should drive the reform efforts of teacher preparation and in-service teacher professional development. If we adopt a constructivist approach to teacher education, evaluation practices need to be reformed as well. We cannot be teaching effectively following a student-centered constructivist approach and evaluate learning using solely standardized tests.

Constructivist environments promote the creation of multiple perspectives within a variety of contexts. There is not one correct understanding and there is not one correct way of solving a problem. Students are encouraged to utilize multiple ways of solving instructional problems and justify their solutions. The creation of multiple perspectives and viewpoints calls for multiple assessment methods. Using portfolios and authentic assessment are evaluation methods appropriate to evaluate constructivist learning (Duffy & Cunningham, 1996; Jonassen, 1992).

In addition, in a teacher education course, a variety of evaluation techniques can provide information about the learners' thinking processes, self-reflective skills, performance in completing real-world authentic tasks, and ability to identify technology solutions to instructional problems. Traditional tests can also be used but they should not be the only method of evaluation. Other evaluation techniques include the collection of students' projects and assignments, students' self-evaluations, reflective journals, and class presentations of sample lessons. When the teacher educator employs such evaluation techniques, she also models for prospective teachers appropriate evaluation strategies of constructivist learning.

Leading the call for a focus on computer integration is a recent study that accounts for the current status of teacher technology-training programmes across the United States (Moursund & Bielefeldt, 1999). Available equipment and beginner-level courses are thought to be sufficient for the purpose they serve but teachers still need more. The report recommends that computing instruction for

teachers be integrated throughout the curriculum rather than isolated classes. Also, that instruction should specifically focus on integration issues, methods and models. While this researcher supports the need for broadening instructional computing beyond the confined courses which have evolved from the early computer literacy courses (which can still be important for many populations today), there are other issues in the methodology of achieving integration. Recent studies have shown that most teachers do not learn to use computers from courses, seminars or workshops, in-service programmes or college courses (Galloway, 1997). It is interesting that one does not tend to find teachers using computers with students who do not also have a real commitment to using computers themselves in their personal and professional lives.

The majority of teachers today use computers with their students to varying degrees but very few (less than 10 percent) do so without also having a significant personal involvement with computing. Educators learn to use computers primarily on their own and it is unlikely that teachers will integrate computer technology into classroom instruction without the inclusion of personal and professional usage. It seems that planning models and integration programmes should consider these factors more heavily when addressing teacher training. Educators should emphasize the importance of a personal commitment from teachers who are learning to use computers or who intend to use computers in teaching. Integration has failed to the extent that teachers have failed to personally adopt the computer in their personal and professional lives. This must change for integration to succeed.

Most commonly today, efforts at integration focus on helping teachers to use computers with and for classroom children. This might be fine for non-beginners and teachers well established in using technology but does not work for limited users or beginners. Empower teachers with technical skills, computing knowledge and intuition, and critical thinking skills in using computer technology. This is a prerequisite to focusing on technology integration into classroom teaching.

While most administrators seem to think in terms of supporting technology directly for the classroom children, some do call for empowering teachers themselves. “Teachers should acquire technical skills and explore examples of compelling Internet-based lessons through a yearlong workshop series prior to developing their own Internet-based curriculum projects.” (McKay & McGrath, 2000, p. 120). Although in the minority among educators today, some do seem to prioritize competencies for teachers as actual users of technology for themselves.

In fact, Warner and Maureen (1999) specifically describe how teachers were inspired to bring their experiences to their own classrooms. They suggest that by developing electronic portfolios, teachers will learn important computing skills and knowledge that can directly impact integration into the classroom. “Teachers become frustrated with the process of teaching and assessing students with concepts they have not experienced themselves” (p. 87). Of course, this makes perfect sense and is quite insightful in understanding the importance of

teachers' knowledge and experience as a prerequisite to classroom computing integration.

Sherry, Billig, Tavalin, and Gibson (2000) outline strategies for successful adoption of technology and integration into teaching. There is a strong focus on empowering the teacher as a learner and user of technology. Mentoring, specialists, online resources and more are suggested to effect development and progress in the teachers' skills and understanding of technology. Wilson (1997) maintains that if teachers fail to understand the value and relevance of information skills for themselves as learners, they'll be unable to develop those skills in their pupils.

Niederhauser, Salmen, and Fields (1998) outlines introductory technology coursework for pre-service teachers taking into account the importance of empowering teachers with understanding and technical learning experiences. Technological competency through constructivist methods is the goal for teachers. Ramey, Tomlin, Basista, and Slattery (1998) explain that differences in philosophy and approaches to teaching and learning between colleges of education and sciences contributes to difficulties in teacher training programmes. By sharing faculty between colleges their programmes seem to overcome such obstacles to reach the more conceptual realm of understanding and education over procedures and mere training.

Ghana's national development strategy (Government of Ghana, 1995) emphasizes the use of information and communications technology (ICT) to accelerate the socio economic development of the country. In furtherance of this

national goal, a national commission on ICT was set up in 2002 to develop a national ICT policy.

Teacher Training and Professional Development

Professional developments in a broad sense refer to the development of a person in his or her professional role. More specifically, “teacher professional development is the professional growth a teacher achieves as a result of gaining increased experience and examining his or her teaching systematically” (Glatthorn, 1995, p.41). Professional development includes formal experiences (such as attending workshops and professional meeting, mentoring etc) and informal experiences (such as reading professional publications, watching television documentaries related to an academic discipline, etc.) (Ganser, 2000).

Teacher professional development is the tool by which policy makers convey broad visions, disseminate critical information, and provide guidance to teachers. It is the instruction provided to teachers to promote their development in a certain area like technology, reading instruction, subject mastery, etc. (Gaible & Burns, 2005). Hassel (1999) considered professional development as the process of improving staff skills and competencies needed to produce outstanding educational results for students. According to Olivia and Pawlas (1997) professional development is a programme of activities planned and carried out to promote the personal and professional growth of teachers.

Cheung and Cheng (1997) also indicated that teachers should be aware of the importance of developing themselves strategically in order to achieve their personal goals and school mission and be able to formulate their own professional

development plan. It is important to remind oneself that the majority of novice teachers begin their career in a teaching environment with little or no professional assistance while he is expected to carry a full educational load immediately. Some new teachers may teach disciplines that differ from their area of specialization. They may be asked to teach in some fields for which they are ill prepared and receive little support, and are not evaluated based on proper criteria to improve their teaching. In fact, it is not only novice teachers that require guidance in these areas but there are also veteran teachers whose knowledge of teaching methods should be updated. However, research shows that teachers tend to teach the way that they were taught (Ball, 1990). Actually, school teachers need professional development opportunities in order to grow professionally.

Professional development of teachers plays an important role in the current global movement of educational reforms. A major study carried out by the National Foundation for Improvement of Education of the US National Education Association concluded (after interviewing over 1,000 teachers) that professional development is no longer viewed as separate from the teaching job, but must be built into the daily, weekly and year long job of teaching (Jegade & Taplin, 2000). Professional development is essential for teachers to develop the content knowledge and skills they need to succeed in their classroom. By improving their skills and knowledge, teachers become better prepared to create the most effective curriculum and instructional design (Vrasidas & Zembylas, 2004). It seems that attending high quality professional development programmes is crucial to the future of teachers. What is apparent in most of the recent policy initiatives in

education is an attempt to re-think the teaching profession by introducing significant changes in the way that teachers are trained.

The existing teacher training programmes are prepared in a wide range of activities including teachers' orientation, conferences, workshops and seminars, symposiums, courses, print publications, videotaping services, teacher consultations, teaching excellence centers, school teaching awards, research and training seminars. However, due to missing ingredients in the existing programmes of efficient training, those programmes try to be revitalized. In spite of the importance of professional development in teacher training, traditional methods of professional development of teachers and instructors have come under severe attacks as inadequate, inappropriate and out of tune with current research about how teachers learn and how expertise is developed (Fullan, 1995; Liberman, 1995; Guskey & Huberman, 1995).

Dass (1998) disagrees with the traditional form of professional development of teachers in which everything is packaged into an afternoon, or a full day in-service session which seems to be designed as a "quick-fix for teachers" inadequacies and incompetence. Sykes (1996) also regards conventional professional development of teachers as sorely inadequate. The main point is that learning does not end at the conclusion of a workshop. Teachers need continuous support to implement the skills and concepts learned in professional development programmes. Therefore, teacher trainings' previous models may be inadequate to satisfy the expectations and challenges to teacher preparation which has emerged from new educational initiatives.

Furthermore, from time to time those programmes lack the necessary coordination with both the existing curriculum and the realities of the classroom in order to meet the new challenges. As Liston and Zeichner (1990) stated, in some programmes, trainees are exposed to weak courses focusing on pedagogy and student discipline rather than on subject matter and educational research. In other programmes, the course-ware focuses solely on a liberal arts curriculum, providing no knowledge about the mechanisms that underlie the processes of teaching and learning and no practical preparation for teaching.

In fact, professional development programmes for teachers should be more than a range of training workshops, meetings, and in-service days. It is a process of learning how to put knowledge into practice. According to Ruohotie (2006) and also Herrington and Herrington (2006), the development of the required professional key qualifications can be supported and enhanced so that teacher training and staff development must utilize and enhance the development of authentic learning environments.

Few training programmes have the resources to address all stages of career development for teachers. Paying less attention to teachers' development programmes gives rise to those programmes that are limited to occasional conferences or workshops, rather than a systematic on-going professional development. That is why the traditional teacher training sessions cannot stand up to the expectations and challenges that emerge from new educational initiatives. As Lieberman (1995) stated "today, 'quick-fixes' or 'single-shot workshops', or even 'weekend seminars', are no longer acceptable. Rather, professional

development has come to be seen as a set of mutually reinforcing conditions that would need to be considered, understood and built over time”(p 591). For successful phases of implementation, teacher training activities that address the core areas of teaching are required to be extended. The aim is to provide continuing support for teachers as they develop new skills and understandings in their teaching career.

Romano (2003) argues that empowering teachers with technology is one of the basic pre-requisites that can make technology more useful to the students. In his perception of computers in education, he observes that computers allow teachers to provide each member of the class with an increased number of individualized learning experiences based on the learner’s needs rather than teacher availability. Computers allow learners to phase into directing their own learning experiences particularly at a higher level. Whitehead, Jenson, and Boschee (2003) argue that appropriate professional development for faculty, staff, and students is critical to the success of linking technology to the curriculum. They argue that one of the keys to successful staff development is to have teachers teach other teachers. They highlight ideas from the US experience that have proven effective in staff development at the local level as project-based approach, flexible scheduling, school/college/university partnership, college and university pre-service programmes, staff development consortium, and staff development cooperatives.

Cooley (2001) argues that staff development is one of the last best hopes for educational improvement. He says that the reality of improvement and change

remains closely related to human resource development and that those who seek to improve education must first focus on enhancing teacher and administrator skills through planned, coordinated, ongoing staff development. He details a model of staff development, the teachers-as-trainers model. This is a site-based staff development programme that emphasizes faculty and staff empowerment, accountability, responsibility, and ongoing support. It consists of four interrelated phases: developing a needs assessment, core team selection and planning, delivery of training, and personnel and program evaluation.

This is similar to the School and Cluster Based In-Service-Training (INSET) organized by Ghana Education Service; NGO's and subject associations in Ghana. In-Service-Training (INSET) is a variety of activities and practices, in which teachers become involved in order to enrich their knowledge, improve their skills in teaching and also enable them to become more efficient on the job. School- Based INSET (SBI) is a type of INSET which is organized at the school level by the teachers in a particular school. SBI is organized to solve some special needs or deficiencies identified by the teachers themselves or by leadteachers. On the other hand, Cluster-Based INSET (CBI) is the type of INSET which is organised when a number of schools come together to form a cluster to share ideas on good practices.

Bradshaw (2002) indicates the need for staff development. He argues that teachers must have new knowledge and develop new skills and attitudes before they can teach others about technology and integrate technology into their classroom instruction in meaningful ways. He points out models of staff development that were identified in research by Joyce and Showers (1995). They

include training of trainers' model, model classroom technology training centers, resource centers, networked labs and cyber campuses, and a portable lab using laptop computers.

According to Mitchen, Wells, and Wells (2003), in order to assist the development of effective teacher training regarding technology integration, the United States Department of Education created a programme called Preparing Tomorrow's Teachers to Use Technology. Under this programme, there were funded grants to help K-12 teachers' professional development. This implies that one strategy is to establish a special programme and special fund for technology teachers so as to sustain technology integration at different levels. Howard and Wedmann (2004) argue that past experience has shown that the traditional workshop model for delivering of professional development does not often result in changes in actual practice. They suggest the pre-service teacher educational model as the best.

There are different models of professional development that can be used for teachers to sustain technology integration. One of the features that characterize a good model for technology integration is keeping teachers informed of the current trends in technology and new methods of teaching their respective subjects. The nature of technology integration, as part of the general curriculum, will depend on the factors within the system itself. For developing countries like Ghana, the factor of resources will play a key role in determining the professional development model to adopt.

Summary of Literature Review

This chapter has reviewed the literature relating to the integration of technology context, along with materials related to contemporary issue in education and technology adoption and use. The research questions were developed to assist in the conceptual organization of this review. It summarizes the broad areas that were then addressed in the body of this chapter. The first part dealt with the conceptual framework. From here the chapter continues by examining the importance of technology integration. It again talked about factors for effective integration of technology. Factors affecting the implementation of technology in the teaching and learning process were also examined. Furthermore, the chapter examined the Perception of tutors and students regarding technology integration. It then looked at the level of technology integration and curriculum reform in the Colleges of Education. The chapter concluded with the examination of the level of teacher training and professional development in the Colleges of Education towards technology integration.

CHAPTER THREE

METHODOLOGY

Overview

This study aimed at investigating and evaluating the nature of technology integration by students and tutors at the Colleges of Education in Ghana. This chapter focuses on research methodology and presents the research design and data analysis procedures. It covers the methods that were used to collect data and the rationale for choosing the methods, instruments, setting, population, and sample. Data analysis includes procedures that were used to make meanings that enabled the interpretations in respect to the research questions.

Research Design

The design for this research is a cross-sectional survey. A survey is an attempt to collect data from members of a population in respect to one or more variables (Gay & Airasian, 2003). Close-ended surveys were administered to a sample of research participants and collected by the researcher after completion. A cross-sectional survey was used because information were collected at one point in time. According to Martyn (2009), a cross sectional-survey takes a snapshot of a population at a certain time, allowing conclusions about phenomena across a wide population to be drawn.

A survey was the chosen method for this study for two main reasons: (a) the study required collection of data from a large number of persons located over a wide geographical area--therefore, administering survey instruments (primarily questionnaires) to these participants was the most efficient means of collecting required data, and (b) since one of the primary aims of the study was to gather various perspectives to describe and make inferences regarding the state of teacher training programmes in Ghana, data collection methods used in surveys are especially suited for the type of data required for this study.

Population

The target population for this study comprised of tutors in the Colleges of Education across Ghana and student-teachers in three colleges in Ghana. There were approximately 150 tutors used in the study. In addition, 120 student-teachers who participated in this study were in the final year of their three-year teacher training program.

Sample and Sampling Procedure

The sample of this research was derived from tutors and students in various Colleges of Education in Ghana. To have a more representative sample of the population to participate in the study, tutors were selected across the 40 Colleges of Education. During a marking section, the participating tutors were stratified based on the subject they were marking. Random sampling was used to select tutors from each subject group across the colleges. In all 150 tutors were selected to be part of the study. The reasons for this sampling procedure were as follow;

(a) a manageable sample size would be easy to collect, analyze and interpret

(b) equal representation of the 40 colleges

(c) equal representation of teachers from different subject backgrounds;
and

(d) easy accessibility of teachers from different subjects areas. One hundred (120) final year students from 3 colleges namely, Fosu College of Education, Kibi Presbyterian College of education, Kibi and St. Louis College of Education, Kumasi were then selected to fill a questionnaire on their perception on the integration of technology in the colleges of education. Kibi Presbyterian College of Education was selected because it was the researcher's college but the rest of the colleges were selected because they were marking centres at the time data were being collected. The students were randomly selected to fill the questionnaire.

Instruments

The researcher employed a survey method to collect, tabulate and analyze the data. The instruments used for collecting data in this research were questionnaire and document analysis.

Questionnaire

Questionnaire is a data collection tool in which a set of written questions are presented to be answered by the respondents in written form. A written questionnaire can be administered in such different ways as:

- sending questionnaires by mail with clear instructions on how to answer the questions and asking for mailed responses;
- gathering all or part of the respondents in one place at one time, giving oral or written instructions, and letting the respondents fill out the questionnaires; or
- hand-delivering questionnaires to respondents and collecting them later.

The questions can be either open-ended or closed (with pre-categorised answers). Most of the questions on the questionnaire were close-ended with just a few being open-ended.

The questionnaire was used to gather data on the level of technology use by tutors, the perception of the tutors and students on technology integration, factors affecting the integration of technology and tutors professional development as well as, the level of technology integration in the Colleges of Education in Ghana. In all, 58 items were given to tutors to fill based on the research questions, while the students filled 10 items on their perception on technology integration.

The first section of the tutors' questionnaire was designed to include questions on participant information 1-6. The second section consisted of 12 items formatted as likert-type statement to which participant responded with a rating of 1-3 (3 indicating agree, 2 indicating undecided and 1 indicating disagree). This was to assess the degree of perception of tutors on the integration of technology. The third section was on level of technology integration of tutors and this consisted of 15 items. It was formatted as likert-type statement to which

participant responded with a rating of 1-3 (3 indicating always, 2 indicating sometimes and 1 indicating never). The fourth section was about tutor's professional development and consisted of 13 items. The last section on the tutors' questionnaire was about factors working against technology integration and that had 11 items formatted as likert-type statement to which participant responded with a rating of 1-3 (3 indicating agree, 2 indicating undecided and 1 indicating disagree). The last item asked teachers about their general view on technology integration in the colleges of education.

The students' questionnaire consisted of the students' information and 10 items on their perception on the integration of technology in teaching and learning.

An initial draft of the questionnaire that contained items to be included in the survey was reviewed by my supervisor. An initial pilot study was conducted using a convenience sample of 20 tutors and 20 students from Kibi Presbyterian College of Education. The results were hand tabulated by the researcher to check preliminary results, check the appropriateness of standard measure, determine potential areas of concern, and to identify questions that would require further clarification.

Document Analysis

Document analysis is a method of qualitative research that involves studying different documents or parts of documents in order to gain a deep understanding of the issue being researched. Patton (2002) indicates that document analysis includes studying excerpts, quotations, or entire passages from

organizational, clinical, or program records, memoranda and correspondences, official publications and reports, personal diaries, and open-ended responses to questionnaires and surveys. The researcher analysed existing documents pertaining to how the colleges of education intend to integrate technology. Existing Introduction to Communication Technology (ICT) syllabi were examined to determine the extent to which these included components that expose student-teachers to ways in which technology can be incorporated into their teaching.

Validity

Hall and Hall (2004) argue: “Because the research, through its interim and final report, is aimed at an audience who will be able to use its findings, the research methods need to be understandable and credible” (p. 97). Lincoln and Guba (1985) offer four criteria through which trustworthiness may be achieved as: true value, applicability, consistency, and neutrality. These, they argue, are the determinant of validity of research in a naturalistic approach, which is qualitative research.

To assess the content validity of the questionnaires, three procedures were used:

(1) a panel of experts was asked to review the questionnaires and provide feedback on content relevance and clarity, (2) a pilot test of each instrument was administered to a small group of participants similar to those who participated in the study, and (3) The researcher used different groups of people that is, tutors

from different subject areas to find the same information. At the same time the groups of people were from different Colleges of Education.

Reliability

The final set of items was tested for reliability using an internal consistency method, Cronbach's Alpha coefficient, (Cronbach, 1990), which yielded reliability coefficients of 0.827 and 0.805 for negative and positive items, respectively. Both of these values are higher than the 0.8 criterion which is regarded as internally reliable (Bryman & Cramer, 1997).

Data Collection Procedures

A pilot survey was conducted at Kibi College of Education which involved 20 tutors and 20 students. The tutors were sampled after a staff meeting and it took them 10 minutes to fill the questionnaire.

The students were sampled at their various stations where they were undertaking their teaching practice. The results were hand tabulated by the researcher to check preliminary results, check the appropriateness of standard measure determine potential areas of concern, and to identify questions that would require further clarification. After he was satisfied with the pilot survey, he then moved on to administer the main survey.

In order to get a fair representation, a questionnaire was administered to college tutors who have gathered to mark the colleges' end of semester examination at various centers. The centers were St Louis College of Education, Kumasi; Wesley College of Education, Kumasi; Saltpong marking centre and Fosu College of Education, Fosu. The reason for this is that tutors from all the

colleges were assembled at the various marking centers and also it provided opportunity to get response from tutors of different subject areas. In all 30 questionnaires were sent to each of the centers for distribution to the teachers. The total numbers of questionnaire distributed to tutors added up to 150. This was done with the help of some colleague tutors at the various centers.

In order to find the perception of students regarding integration of technology in the Colleges of Education, the researcher administered questionnaire to final year students of Kibi Presbyterian College of Education, St Louis College of Education, and Fosu College of Education who were back from their one year out-segment programme. The reason for choosing the final year students was that they had gone through the system and were in the best position to give the needed response to the questionnaire. In all these, the questionnaires were hand-delivered to participants in their respective locations. The respondents handed the questionnaire back to the researcher and his assistants after completing them. Descriptive statistics were used to evaluate and report the results. Percentages were used to answer research questions 1, 2, 4 and 5.while research question 3 was analysed using document analysis.

Data Analysis Procedure

Data analysis involves examining the assembled relevant data to determine how the respondent answered the research question(s). Yin (1994) indicates that data analysis consist of examining, categorizing, tabulating or otherwise recombining the evidence to address the initial preposition on the study. According to Merriam (1998), data analysis is the process of making sense out of

data involving consolidating, reducing, and interpreting what people have said and what the researcher has seen and read. Patton (2002) defines data analysis as the process of transforming information into knowledge. He writes that in qualitative evaluation, the process involves two tasks: the description of beliefs and values of the participants and the physical setting, and the interpretation that includes putting findings together, drawing inferences, and attaching significance to them.

The data collected from the questionnaires and document analysis was analyzed using qualitative and quantitative analysis. The data gathered from the questionnaire were used for the quantitative analysis which included descriptive statistics. All the responses of the participants were summed up and percentages were assigned to the responses. But the documents analysis which was qualitatively data gathered were subjected to content analysis.

Research question 1

What are the levels of technology integration in the Colleges of Education?

To answer this research question, the number and percentage of tutors who always or never undertook an aspect of integration in their college were computed for 150 college tutors sampled. Data gathered were analyzed and used to corroborate or refute data gathered from another source.

Research question 2: What are the factors working against technology integration in the Colleges of Education?

To answer this research question, the number and percentage of tutors who agreed or disagreed to factors that militate against technology integration in their colleges were computed for 150 college tutors sampled. Data gathered were analyzed and used to corroborate or refute data gathered from another source.

Research question 3: What curriculum change has the policy makers made to ensure technology integration in the Colleges of Education?

To answer this research question, the researcher conducted a content analysis of the syllabi of the Introduction to Information and Communication Technology (ICT). A deductive approach was used to gather data to answer the research question.

Research question 4: What are the perceptions of both tutors and student-teachers regarding technology integration?

To answer this research question, the number and percentage of tutors who concurred (agreed) or were in disagreement (disagreed) with aspects of perception among both tutors and student-teachers regarding technology integration were computed for 150 college tutors as well as 120 student-teachers sampled. Data were examined and percentage of tutors as well as student-teachers who perceived themselves as prepared or not prepared to teach with technology reported.

Research question 5: What kind of professional development programmes regarding technology integration is going on in the Colleges of Education?

To answer this research question, the number and percentage of tutors who responded to various items regarding aspect of professional development concerning technology integration in the college were computed for 150 college tutors sampled. Data gathered were analyzed and used to corroborate or refute data gathered from another source.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter gives details about the results and discussions of the results. The purpose of the study was to find out the extent to which teacher-trainees are being prepared for technology integration by the Colleges of Education in Ghana. It was also to find out the level of technology integration in various Colleges of Education in Ghana. Document analysis and questionnaire were the major tools used in collecting data for this study.

Background Characteristics of Respondents

Information was collected in respect of the gender of respondents. The result is represented in Table 1.

Table 1: Gender of Participants

Respondents	Male	Female	Total
Tutors	105(70%)	45(30%)	150(100%)
Student-Teachers	72(60%)	48(40%)	120(100%)
Total	177(66%)	93(34%)	270(100%)

In Table 1, 105 (70%) of the respondents were male tutors while 45 (30%) were female tutors. The table further shows that 72 (60%) were male student-teachers while 48 (40%) were female student-teachers. This gives indication that there were more males than females in the sample of both tutors and student-teachers.

Data were gathered about the age of respondents. The result is shown in Table 2.

Table 2: Age of Participants

Age	Frequency	Percentage
Under 25	66	25.1%
26-30 years	69	26.4%
31-40	62	23.8%
45-50	37	14.2%
50 and above	27	10.3%
Total	261	100

The analysis in Table 2 shows that 66 (25.1%) of the respondents were under 25 years of age, 69 (26.4%) were between 26-30 years, 62 (23.8%) were between 31-40 years, 37 (14.2%) were between 45-50 years and 27 (10.3%) were 50 years and above. This shows that majority of the tutors sampled were between 26- 30 years while few of the participants were 50 years and above. Nine (9) respondent did not give information on their age.

In the study of this nature, it is important to take into consideration the teaching experience of respondents. Data collected in this regard is shown in Table 3.

Table 3: Participants' Teaching Experience

Teaching experience	Frequency	Percentage
Less than 1 year	9	6%
1-5 years	18	12%
6-10 years	45	30%
10 and above	78	52%
Total	150	100

The result in Table 3 indicates that 78 (52%) of the respondents had 10 years and above experience, 45 (30%) had 6-10 years experience, 18 (12%) had 1-5 years experience and 9 (6%) had less than one year experience. The response shows that most of the tutors sampled had over 10 years experience in teaching in the Colleges of Education.

Information was also gathered on the roles that respondents play in the colleges. The result is reflected in Table 4.

Table 4: Participants' Roles in the Colleges

Position	Frequency	Percentage
Form tutor	90	60%
Tutors serving as administrators	15	10%
Head of departments	45	30%
Total	150	100

Table 4 shows that 90 (60%) of the respondents were form tutors, 45 (30%) head of department and 15 (10%) were tutors serving as administrators. The responses from the participants show that majority of the tutors sampled were form tutors.

Data were also collected on the subjects taught by respondents. The result is shown in Table 5.

Table 5: Subjects Taught by Participants

Subject	Frequency	Percentage
ICT	18	12%
English Language	18	12%
Social studies	18	12%
Ghanaian Language	18	12%
Education	18	12%
Science	18	12%
Mathematics	18	12%
Vocational skills(others)	12	8%
Music/HIV	12	8%
Total	150	100

In Table 5, 18 (12%) of the tutors taught ICT, English Language, Social Studies, Ghanaian Language, Education, Science, and Mathematics respectively while 12 (8%) respondents taught Vocational Skills and Music/HIV respectively.

The various subjects of specialization of the student-teachers sampled were collected and the data collected is shown in Table 6.

Table 6: Student-Teachers' Area of Specialization

Subject	Frequency	Percentage
General agriculture	18	19.1%
Science and mathematics	21	22.3% %
Home economics	15	16%
Arts	12	12.8%
P.E	18	19.1%
Early childhood	10	10.6%
Total	94	100

Table 6 portrays the following as the student-teachers area of specialization: 21 (22.3%) specialized in Science and Mathematics, 18 (19.1%) also specialized in General Agriculture and P. E respectively while 15 (16%) specialized in Home Economics. The data further shows that 12 (12.8%) specialized in Arts and 10 (10.6%) specialized in Early Childhood Education. Twenty-six (26) student-teachers did not state their subject of specialization. Information on the institutions used for the study was also gathered and presented in Table 7.

Table 7: College Attended by Student-Teachers

College	Frequency	Percentage
Kibi Presbyterian College of Education	30	26.8%
Wesley College of Education	25	22.3%
Fosu College of Education	27	24.1%
St. Louis College of Education	30	26.8%
Total	112	100

From Table 7, 30 (26.8%) of the respondents attended Kibi Presbyterian College of Education and St. Louis College of Education respectively, 27 (24.1%) also attended Fosu College of Education while 25 (22.3%) attended Wesley College of Education.

Analysis of Main Data

Research question 1

What are the levels of technology integration in the Colleges of Education?

Item 1 of the questionnaire sought information concerning the level of technology integration in the colleges of education. Data collected in this respect are presented in Table 8.

Table 8: Level of Technology Integration

Sn	Aspect of integration	Response			Total
		Always	Sometimes	Never	
1	Use of technology in communication	106(74.1%)	19(13.3%)	18(12.6%)	143(100%)
2	Use of word processing (Ms-word) for document preparation	101(72.1%)	6(4.3%)	33(23.6%)	140(100%)
3	Use of spreadsheet(Ms-excel) for students assessment & evaluation	39(26.0%)	29(19.3%)	82(54.7%)	150(100%)
4	Use of presentation software	33(22.0%)	16(10.7%)	101(67.3%)	150(100%)
5	Use of technology for instruction and course management	30(20.0%)	21(14.0%)	90(60.0%)	150(100%)
6	Use of internet for research	81(54.0%)	36(24.0%)	33(22.0%)	150(100%)
7	Use of subject-based instructional software	24(16.0%)	12(8.0%)	102(68.0%)	150(100%)
8	Use of database software(Ms-access) for classroom management	18(12.0%)	51(34.0%)	69(46.0%)	150(100%)

From Table 8, it is evident that most of the tutors, that is, 106 (74.1%) always used technology for communication while 18 (12.6%) never used technology for communication.

Table 8 also shows that 101 (72.1%) of the tutors always used Ms-Word for document preparation while 33 (23.6%) never used ms-word for document preparation. Table 8 again, shows that 82 (54.7%) of the tutors never used Ms-excel for student assessment and evaluation while 39 (26%) always used Ms-excel for student assessment and evaluation. The Table further gives evidence that 101 (67.3%) of the tutors never used Ms PowerPoint for lesson presentation while 33 (22%) always used Ms PowerPoint for lesson presentation. Table 8 further suggests that majority of the tutors 90 (60%) never used technology for instruction and course management while 30 (20%) always used technology for instruction and course management. Table 8 also suggests that almost 81 (54%) always used the internet for research while 33 (22%) have never used the internet for research.

Further analysis of the data shown in Table 8 revealed that 102 (68%) of the tutors never used subject-based instructional software while 24 (16%) always used subject-based instructional software. On the use of database software (Ms Access), the table suggests that 69 (46%) of the tutors never used database software while 18 (12%) always used database software for classroom management.

The result of this analysis on the level of technology integration in the Colleges of Education shows that most of the tutors in the colleges use the

following technology facilities; computers for communication, Ms Word for document preparation and internet for research. The research reveals that tutors hardly use the following technology facilities; Ms Excel for assessment and evaluation, Ms PowerPoint for lesson presentation, subject-based instructional software and database for classroom management. Tutors inability to use presentation, database and assessment as well as evaluation tools may mean that they have low skills in the use of those technologies or they do not appreciate the importance of the tools in the modern teaching and learning process.

Teachers cannot only use word processing and internet to engage their students and gather materials but can also use technology to present lecture, assessment and evaluation as well as classroom management. PowerPoint allows teachers to insert pictures, audios, videos maps graph and charts etc. that engage learners beyond just a lecture off of an overhead outline. Ms Excel allows the teacher to compute or record students' performance in examination for easy assessment and evaluation. Ms Access also allows the teacher to keep records on students for effective classroom management.

As stated by Goddard (2002), teachers that adapt technological change in their classroom also set example to their students who will have to deal with changes in their lives. If tutors in the colleges of education fail to use presentation, evaluation and assessment as well as classroom management tools in their teaching, then student-teachers who will be teachers after they complete their course will also not use them.

Research question 2**What are the factors working against technology integration in the Colleges of Education?**

Item 2 of the questionnaire was used to gather information on the participants' views on factors working against technology integration in the Colleges of Education. Data collected are shown in Table 9.

Table 9: Participants' Response on the Factors Working against Technology Integration

Sn	Factors	Responses			Total
		Disagree	Undecided	Agree	
1	Knowledge in the use of computers	36(24%)	6(4%)	108(72%)	150(100%)
2	Training in technology integration	39(26%)	3(2%)	108(72%)	150(100%)
3	Availability of necessary equipment(projector/PC)	48(32%)	0(0%)	102(68%)	150(100%)
4	Conduciveness of classroom for integrating technology	90(60%)	15(10%)	45(30%)	150(100%)
5	Time for technology integration	99(66%)	21(14%)	30(20%)	150(100%)
6	Administrative support for integrating technology	36(24%)	9(6%)	105(70%)	150(100%)
7	Access to the internet	54(39.1%)	9(6.5%)	75(54.3%)	138(100%)
8	Availability of good instructional software for subjects taught	33(22%)	9(6%)	108(72%)	150(100%)
9	Ability to design instructional software	45(30%)	0(0%)	105(70%)	150(100%)

From Table 9, 108 (72%) of the respondents agreed that their limited knowledge in the use of computers prevent them from integrating technology while 36 (24%) disagreed that their limited knowledge is a barrier. Similarly, 108 (72%) have no training in the integration of technology into teaching while 39 (26%) disagreed. Again, 102 (68%) agreed that availability of necessary equipment is a barrier to technology integration while 48 (32%) disagreed. It can further be noticed from Table 9 that 90 (60%) of the tutors disagreed that the classroom is not conducive for integrating technology but 45 (30%) agreed.

As much as 99 (66%) disagreed that time is a factor that prevent them from integrating technology into their teaching while 30 (20%) agreed. Also, 105 (70%) said they agreed that they have no administrative support to integrate technology while 36 (24%) disagreed. seventy nine. (79) representing 54.3% of the tutors agreed that access to the internet is a barrier but 54 (39.1%) disagreed. In the same vein, 108 (72%) of the tutors agreed that lack of good instructional software for the subject taught is a barrier to integrating technology but 33 (22%) think otherwise. Furthermore, 105 (70%) of the tutors agreed that tutors inability to design their own instructional software is a barrier to integrating technology but 45 (30%) respondents disagreed.

The study shows that the factors that are working against the integration of technology in the colleges are limited knowledge in the use of computers and lack of training for tutors in the integration of technology. A worldwide survey conducted by Pelgrum (2001), of internationally represented sample of schools

from 26 countries, found that teachers' lack of skills and knowledge is a serious obstacle to using ICT in primary and secondary schools.

Current research has shown that the level of this barrier differs from country to country. In the developing countries, research reported that teachers' lack of technological competence is their main barrier to the acceptance and adoption to ICT (Pelgrum, 2001; Al-Oteawi, 2002).

The result also suggests that the tutors do not have access to equipment like projector and computer in the classroom. This is also a barrier to technology integration.

Schulman (2004) indicated that a great deal of accumulated evidence has identified obstacles that impede teachers' ability to adopt and integrate technology into their teaching. These obstacles include the lack of time, expertise, access, resources, and support. All the factors mentioned by Schulman are consistent with the result of this study except lack of time. The results of the study give evidence that time is not a factor working against the integration of technology in the colleges. This is understandable since the tutors are really not integrating technology into their teaching.

Most of the tutors reported that they do not have administrative support to integrate technology in their teaching. There is enough evidence that teachers do not have access to the internet for the purpose of integrating technology. The study further provides evidence that tutors can not design their own instructional software. The result again shows that tutors do not integrate technology in their teaching because of the subject they teach.

Research question 3

What curriculum change has the policy makers made to ensure technology integration in the Colleges of Education?

Item 3 of the questionnaire sought to find out whether there were courses related to technology integration taught in the colleges of education.

The researcher analysed the course content of the ICT course mounted in the colleges of the education and the information gathered is presented in Table 10.

Table 10: ICT Second Semester Course Outline for Colleges of Education

Unit	Topics	Sub – Topic
Unit 1	Computer Components II	Input Devices – What is input? What are input devices? Examples – Keyboard, pointing devices, touch screens, optical scanner, Digital cameras, handheld device. Description, features of these devices. Output Devices – What is output? Common Types of output generated by computer. What are output devices? Monitors, Impact printers, Non-impact printers. Examples Description and features
Unit 2	Communication and the Internet	What is Communication? Communication Networks – Components of Basic Communication System, Digital and Analog Signals. Brief description of Local Area Network in school – Wireless classroom, Benefit of computer network in education. What is the Internet? How the Internet Works. ISP, Connecting to internet, Address. Services on the Internet – Email, WWW, searching for information
Unit 3	Multimedia in the Classroom	What is Multimedia? – Text, Graphics, Animation Audio, Video.

Table 10 continued

		Multimedia Software & Interactive Multimedia. What is Multimedia Applications? – CBT, Electronic Books, Electronic Newspapers, Entertainment, Information Kiosks, WBT, CAI, Drill – Practice Software, Educational Games Tutorials etc. Media Elements – text, graphics, animation, Audio video, Educational Software for Basic Schools and JSS. Creating Multimedia Application – obtaining graphics, creating and presenting multi – media. The importance of multimedia application.
Unit 4	Education and Technology Integration	What is Technology? Integration of Technology into the Curriculum – Integration Technology into the Curriculum, Changing Instructional Strategy, Barrier to Technology Integration, Strategies for Teaching with Technology, Planning for Technology in the Classroom.
Unit 5	Productivity Software Applications	Spreadsheets Software – Examples, Uses, Features and Practical Work Database Software – Examples ,Uses Features and Practical Work Graphic & Multimedia Software – Examples, Uses, features and practical work Educational Software – Examples, Uses, Features and Practical Work

Table 10 provides the course content of Introduction to Information and Communication Technology (GNS 221) for the Colleges of Education in Ghana.

An analysis of the current course outline for the entire Diploma in Basic Education Programme suggests that there is no significant curriculum change to integrate technology into the teaching and learning of Colleges of Education. There is no single aspect of technology integration in the course outline for all the courses except Introduction to ICT.

The topics covered under introduction to ICT are not enough to prepare the teacher-trainees to be able to integrate technology effectively into their teaching after the training. Moreover, it makes the other teachers not to participate in the technology integration of the curriculum since there is no topic in their subject that will make them do so. Scheffler and Logan (1999) conducted a study to identify technology related competencies that were important for teachers. The results of the study showed that making technology an integral part of curriculum and instruction was of the greatest importance for teachers.

At Arizona State University, the teacher preparation programmes for both in-service and pre-service teacher training in mathematics methods make extensive use of an interactive multimedia program called Mathedology (Technology Based Learning & Research, 1998).

Leading the call for a focus on computer integration is a recent study that accounts for the current status of teacher technology-training programs across the United States (Moursund & Bielefeldt, 1999). Available equipment and beginner-level courses are thought to be sufficient for the purpose they serve but teachers still need more. The report recommends that computing instruction for teachers be integrated throughout the curriculum rather than isolated classes. Also, that instruction should specifically focus on integration issues, methods and models.

Research question 4**What are the perceptions of teachers regarding technology integration?**

Item four of the questionnaire sought to find out the perception of tutors and student- teachers on technology integration in teaching.

Table 11 displays the results and analysis of the responses of tutors regarding their perceptions on technology integration.

Table 11: Perception of Tutors on Technology Integration

Sn	Aspect of perception	Response			Total
		Disagree	Undecided	Agree	
1	Computers are valuable tools and can improve quality of education	0(0%)	0(0%)	150(100%)	150(100%)
2	Teachers should know how to use computers in their classroom	10(7.1%)	3(2.1%)	128(91%)	141(100%)
3	Teachers need more training	3(2%)	3(2%)	144(96%)	150(100%)
4	I enjoy using new tools for instruction	3(2%)	6(4.0%)	129(86%)	150(100%)
5	Textbook will be replaced by technology tools in the future	45(33.3%)	0(0%)	90(66.7%)	135(100%)
6	Role of a teacher to change because of technology	12(8%)	3(2%)	135(90%)	150(100%)
7	A better teacher with technology	18(12.0%)	12(8%)	120(80%)	150(100%)
8	Access to internet	3(2%)	3(2%)	144(96%)	150(100%)

Table 11 continued

9	The need for more software that are curricular-based	9(6%)	0(0%)	141(94%)	150(100%)
10	The need for more technical support to keep computers working	3(2%)	9(6%)	138(92%)	150(100%)
11	Student time on the internet is time well spent	48(32%)	21(14%)	87(54%)	150(100%)

Analysis from Table 11 indicates that all the respondents 150 representing (100%) agreed that computers are valuable tools and can improve the quality of education. Table 11 also shows that 128 (91%) respondents agreed that teachers should know how to use computers in the classroom while 10 (7.1%) disagreed. It is again obvious from Table 11 that 144 (96%) of the respondents agreed that teachers need more training with technology while 3 (2%) disagreed. Further analysis from Table 11 also suggests that 129 (86%) tutors agreed that they enjoy using new tools for instruction while 3 (2%) disagreed. It is further observed from Table 11 that 90 (66.7%) of the tutors agreed that textbook will be replaced by technology in the future while 45 (33.3%) disagreed. As shown in Table 11, 135 (90%) of the tutors agreed that the role of the teacher will change due to technology while 12 (8%) respondents disagreed.

On the other hand, 120 (80%) of the tutors agreed that they will be better teachers with technology but 18 (12%) disagreed. Table 11 also indicates that 144 (96%) tutors agreed that they need access to the internet but 3 (2%) disagreed. One hundred and forty one (141) representing 94% tutors agreed that they need software that are curricular-based but 9(6%) disagreed. Majority of the tutors, that

is, 138 (92%) agreed they need technical support to keep computers working while 3 (2%) disagreed. Most of the tutors 87 (54%) agreed that student time on the internet is time well spent but 36 (32%) disagreed.

The researcher gathered data on the perception of student-teachers regarding technology integration and the result analyzed in Table 12.

Table 12: Responses of Student-Teachers on their Perception Regarding Technology Integration

Sn	Aspect of perception	Disagree	Responses		Total
			Undecided	Agree	
1	Learnt how to use technology from the college	96(80%)	6(5%)	18(15%)	120(100%)
2	Enjoyed lessons taught with the use of technology	78(72.2%)	6(5.6%)	24(22.2%)	108(100%)
3	Use technology in my teaching	90(75%)	5(4.22%)	25(20.8%)	120(100%)
4	I have specific skills in technology to teach my subject of specialization	88(80.7%)	2(1.8%)	19(17.4%)	109(100%)
5	Technology use in the classroom makes me a better teacher	30(25%)	10(8.3%)	80(66.7%)	120(100%)
6	Purchased computer to use in integrating technology in my Teaching	71(59.2%)	17(14.2%)	32(26.6%)	120(100%)

Table 12 continued

7	Need more training on how to integrate I.T. in teaching	17(16.7%)	8(7.8%)	77(75.5%)	102(100%)
8	Have the ability to use Ms PowerPoint in presenting lesson	85(73.9%)	10(8.7%)	20(17.3%)	115(100%)
9	Have knowledge and skills in the use of Ms access	80(74.8%)	4(3.7%)	23(21.5%)	107(100%)
10	Make enough use of the internet as a teacher	40(33.3%)	6(5%)	74(61.7%)	120(100%)

The analysis in Table 12 shows that most of the student-teachers, 96 (80%) disagreed that they have not learnt how to use technology from the college while 18 (15%) agreed that they have learnt how to use technology in teaching. Most of the respondents 78 (72.2%) disagreed that they enjoyed lessons taught with technology while 24 (22.2%) agreed that they enjoy lesson taught with technology. The Table further gives evidence that 90 (75%) of the respondents disagreed that they will use technology in their teaching as in-service teachers but 25 (20.8%) of the respondents agreed that they will use technology in their classroom as in-service teachers.

The data in Table 12 shows that 88 (80.7%) respondents disagreed that they have specific skills about how to use technology to teach content effectively in their subject of specialization but 19(17.4%) agreed that they have specific skills about how to use technology effectively to teach content in their subject of specialization. Majority of the respondents, 80 (66.7%) agreed that the use of

technology in the classroom would make them better teachers while 30 (25%) respondents disagreed. Table 12 again, gives evidence that 71 (59.2%) respondents disagreed that they have purchased computer to use for the purpose of integrating technology in their teaching while 32 (26.6%) respondents agreed that they have purchased computer to use for the purpose of integrating technology in their teaching. Seventy seven respondents (77) representing 75.5% agreed that there is the need for more training on how to integrate technology in teaching but 17 (16.7%) disagreed.

In Table 12, it is revealed that 85 (73.9%) respondents disagreed that they have the ability to use Ms PowerPoint in presenting lesson while 20 (17.3%) agreed that they have the ability to use Ms PowerPoint in presenting lesson. Eighty (80) respondents representing 74.8% disagreed that they have knowledge and skills in the use of Ms Access but 23 (21.5%) agreed. As much as 74 (61.7%) respondents agreed that they will make use of the internet as teachers but 40 (33.3%) of the respondents disagreed that they will use the internet as teachers.

From the analysis shown in both Table 11 and Table 12, majority of the tutors believe that computers are valuable tools that will improve teaching and learning. This corroborates Curtis, Kopera, Norris and Soloway (2004) claim that educators have long understood the benefit associated with technology and consistently stated that when thoughtfully and effectively used, it can greatly assist students. It is also evident that both tutors and student-teachers perceive that they need more training in technology. This is consistent with Al-Oteawi (2002) who suggests that teachers need knowledge and skills that will enable them to

improve their teaching, such as integrating IT within the curriculum in order to enhance learning and allow students to learn from different sources.

Analysis from the results indicates that tutors and student-teachers believe that they will be better teachers with technology. Both tutors and student teachers also believe that the internet is a good tool for technology integration.

Research question five

What kind of professional development programmes regarding technology integration is going on in the Colleges of Education?

Item 5 of the questionnaire was meant to find out the extent of professional development in regard to technology integration in the Colleges of Education. Data collected on attendance of professional development programmes by tutors on the integration of technology are shown in Table 13.

Table 13: Participants' Attendance of Professional Development on the Integration of Technology

Response	Frequency	Percentage
Yes	60	40%
No	90	60%
Total	150	100

In Table 13, 90 (60%) respondents responded “No” to whether they had ever attended any professional development programme on the integration of technology while 60 (40%) responded “Yes”. This suggests that many of the tutors have not attended any professional development on the integration of technology.

Information was also gathered with regards to the number of times tutors attended professional development programmes on technology integration. The results is analysed in Table 14.

Table 14: Number of Times Respondents Attended Professional Development Programmes

Response	Frequency	Percentage
Once	15	25%
Twice	30	50%
Thrice	12	20%
Four times	3	5%
Total	60	100

Table 14 gives evidence that out of the number who have ever attended professional development programmes, 30 (50%) attended twice, 15 (25%) once, 12 (20%) thrice and 3 (5%)four times.

Data were again gathered about the organisers of professional development programmes for tutors in the College of Education and the results analysed in Table 15.

Table 15: Organisers of the Professional Development Programmes

Response	Frequency	Percentage
GES	3	5%
TED	42	70%
MOE	15	25%
The college	0	0
Own initiative	0	0
Total	60	100

In Table 15, 42 (70%) of the tutors responded that TED organized the professional development, 15 (25%) said MOE, 3 (5%) said GES, while the college and own initiative had no response. The response shows that most of the professional development programmes were organized by TED.

The researcher sought to find out the impact of the professional development programmes attended by tutors in the colleges. This is represented in Table 16.

Table 16: Participants' Responses on the Impact of the Professional Development Programmes

Response	Frequency	Percentage
Yes	24	40%
No	36	60%
Total	60	100

In Table 16, 36 (60%) respondents responded “No” while 24 (40%) responded “Yes”. This suggests that most of the tutors who attended the professional development programmes think it had no impact on them.

Information on whether the tutors are satisfied with the professional development programmes is shown in Table 17.

Table 17: Participants’ Response on Whether They Were Satisfied With the Programmes

Response	Frequency	Percentage
Yes	21	35%
No	39	65%
Total	60	100

Table 17 suggested that 39 (65%) responded “No” while 21 (35%) responded “Yes”. This gives evidence that majority of tutors who attended the professional development programmes were not satisfied with the programmes.

Information in regards to whether the tutors paid for attending the professional programmes is analysed in Table 18.

Table 18: Participants’ Response on Whether They Paid for Attending Any of the Programmes

Response	Frequency	Percentage
Yes	11	18.3%
No	49	81.7%
Total	60	100

In Table 18, 39 (65%) respondents responded “No” while 21 (35%) responded “Yes”. This shows that most tutors do not pay for attending professional development programmes.

Information was also gathered on whether the tutors were paid for attending the professional Programmes and this is shown in Table 19

Table 19: Participants’ Response on Whether They Were Paid for Attending the Programmes

Response	Frequency	Percentage
Yes	0	0%
No	60	100%
Total	60	100

In Table 19, 60 (100%) respondents responded “No”. This means that tutors are not paid for attending professional development programmes.

In Table 20, I analysed the effects of professional development programmes on the teaching of tutors who attended the programmes.

Table 20: Participants’ Response on Whether the Programmes Had an Effect on Their Teaching

Response	Frequency	Percentage
Positive effect	24	40%
No effect	36	60%
Total	150	100

Table 20, 36 (60%) respondents said the programmes had no effect while 24 (40%) said the programmes had positive effect. The responses show that most of the tutors who attend professional development programmes believe it does not have any positive effect on their teaching.

This item seeks to find out the reasons why some tutors refuse to attend professional development programmes on technology integration. This is shown in Table 21.

Table 21: Tutors' Response for not Attending any Professional Development Programmes

Reason	Frequency	Percentage
I did not have the pre-requisites (e.g. qualifications, experience, and seniority).	9	10%
There was a lack of employer support	18	20%
Professional development conflicted with my work schedule	9	10%
There was no suitable professional development offered	54	60%
Total	90	100

In Table 21, 54 (60%) said there was no suitable professional development offered, 18 (20%) said there was lack of employer support, 9 (10%) think that professional development conflict with their schedule and 9 (10%) also think they did not have the pre-requisite qualification to attend the programmes. The results give evidence that most tutors do not attend professional development because they think there is no suitable professional development offered.

Analyses from the results reveal that there have been efforts to organize professional development programmes for tutors in the colleges by Teacher Education Division (TED), Ghana Education Service (GES) as well as Ministry of Education, (MOE). Professional development on the part of the college and the tutors own initiative is absent. As cited by Cheung and Cheng (1997) that teachers should be aware of the importance of developing themselves strategically in order to achieve their personal goals and school mission and be able to formulate their own professional development plan. This is not the case in the Colleges of Education as the results shows that tutors are not making any effort in developing their skills in regards to technology integration.

It is again evident from the results that most of the tutors do not benefit from the few professional development programmes that are organized by TED, GES and MOE.

Most of the tutors who did not attend professional development programmes said they did not attend because there was no suitable professional development offered regarding the integration of technology in the class. This is consistent with the view that in spite of the importance of professional development in teacher training, traditional methods of professional development of teachers and instructors have come under severe attacks as inadequate, inappropriate and out of tune with current research about how teachers learn and how expertise is developed (Fullan, 1995; Liberman, 1995; Guskey & Huberman, 1995).

The last item on the questionnaire sought to find out the general view of tutors on technology integration. The data gathered is shown in Table 22.

Table 22: General view of Tutors on Technology Integration

Response	Frequency	Percentage
Should be encouraged	69	46%
It will enhance teaching and learning	66	44%
Needs government support	12	8%
There is no need for technology integration	3	2%
Total	150	100

In Table 22, 69 (46%) of the tutors said it should be encouraged, 66 (44%) said it will enhance teaching and learning, 12 (8%) said it needs government support and 3 (2%) stated that there is no need for technology integration. The responses show that majority of the tutors wants technology integration to be part of the teaching and learning in the Colleges of Education.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Overview of the Study

The study examined the level of technology integration in Ghana's Colleges of Education programme. It also assessed tutors and student-teachers perception regarding technology integration. In addition, the study found out some of the factors affecting the integration of technology in the Ghanaian Colleges of Education. The study further described the kind of professional development regarding technology integration in the colleges as well as curriculum change made by policy makers in this regard. Tutors from all over the colleges as well as student-teachers from three colleges provided data required for the study. Data were gathered via questionnaire and document analysis.

Key Findings

1. It was evident from the data gathered that technology has not been effectively incorporated into Ghana's Colleges of Education curricular.
2. Access to computer hardware and software and related infrastructure as well as lack of knowledge and skills regarding how computers can be used as teaching tools were the major factors that hindered technology integration in Ghana's Colleges of Education.

3. In addition, tutors and student-teachers perceived technology as valuable tools that can enhance teaching and learning.
4. Both set of participant also reported low knowledge and skills in the use of technology in teaching and learning.

Conclusions

At the end of the research, the following are the conclusions drawn regarding integration of technology in the Colleges of Education.

First of all, the study concludes that there is low level of technology integration in the Colleges of Education. Findings from the research showed that most of the tutors did not engage the students in their teaching using technology. Most of the tutors from different subject backgrounds did not use technology to present lectures. In addition, most of the tutors did not use technology for classroom management as well as assessment and evaluation.

Secondly, findings from the study have the following as the factors working against technology integration in the Colleges of Education. Limited knowledge in the use of computers prevents tutors from integrating technology. Also, unavailability of equipment makes the classroom not conducive for integration of technology. Further more, there is lack of administrative support for technology integration. However, findings from the study showed that lack of time is not a factor working against the technology integration in the Colleges of Education.

Thirdly, it can be concluded that there has not been any curriculum change by policy makers to integrate technology in the colleges of education. This can be

seen from the course outline of the Colleges of Education in Ghana especially the course outlines for the methods of teaching in the various subjects. There is no model as to how technology integration should be carried out in the Colleges of Education.

Fourthly, the following conclusions are made in regards to the perceptions of tutors and student-teachers to technology integration into teaching and learning. Both tutors and student-teachers perceive technology to be valuable and can improve teaching and learning. Again, both tutors and student-teachers need more training in the use of computers in teaching and learning. Also, both tutors and student-teachers believe that they will be better teachers with technology.

Finally, these conclusions are made on the kind of professional development programme regarding technology integration in the Colleges of Education. There have been few professional development programmes concerning technology integration in the Colleges of Education. Again, tutors did not take professional development programme on their own in the area of technology integration. Furthermore, most of the professional development programmes that are organized did not have positive impact on the tutors in view of technology integration in the Colleges of Education.

Recommendations

Recommendations for Policy and Practice

On the basis of the findings of this study, the following are the recommendations I would like to make, because they have implications for the integration of technology in the Colleges of Education.

1. There is the need for the curricular of the Colleges of Education to be redesigned to emphasize the integration of technology as part of the course in all methodology courses taught in the Colleges of Education.
2. The colleges should establish technology centres in the schools, which will serve as training centres for tutors as well as centres for the acquisition of technology tool for teaching and learning purposes.
3. A Technology-Based Learning Model (TLM) should be develop and established to guide technology integration methods in the Colleges of Education.
4. There should be a programme in place by policy makers like TED, MOE and GES to provide more training for tutors on technology integration in the classroom.
5. Teachers should be motivated to take courses on technology integration on their own initiative so as to be abreast with modern trends in teaching.

Suggestions for Future Research

The current research provides an understanding of the issues that affect the integration and the use of computer technology in the teaching and learning situation. The scope of this study is limited to the Colleges of Education in Ghana.

The following are suggestions for future researchers who will like to research on the integration of technology in the Colleges of Education in Ghana.

1. Future studies could look at how technology integration can be carried on specific subject areas. Again, future studies could investigate the educational software and the technology applications that should be used in the integration of technology in the Colleges of Education in Ghana.
2. Another focus for future research could be the use of suggested Technology-Based Learning Models (TLM) to see its effectiveness in technology integration in Ghanaian Colleges of Education.
3. Another area that future research could look at is the appropriate professional development programme that will enhance the integration of technology in the Colleges of Education.

I hope that the contributions made in the form of suggestions will help the Ghana's Colleges of Education stakeholders see the need for the integration of computer technology in the teaching and learning settings of the twenty-first century.

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APPENDICES

APPENDIX A

QUESTIONNAIRE

**Integrating Technology into Teaching and Learning in Colleges of Education
in Ghana**

Dear Tutor,

This questionnaire is designed to investigate the integration of technology into teaching and learning in Colleges of Education in Ghana.

All information that is collected in this study will be treated confidentially.

Yours faithfully,

Issah Bala Abdulai

Information about the Participant (Tutors)

1. Gender

Male	
Female	

2. Age

Under 30	
31-40	
41-50	
Over 50	

4. Teaching experience in the college
college?

5. What is/are your position in the

Less than 1 year	
1-5years	
6-10years	
Over 10years	

Form tutor	
Subject tutor	
Tutor serving as an administrator	
Head of department	

6. What subject do you teach?.....

Teachers' Perceptions towards the Integration of Technology

Circle or tick one for each item to indicate how you feel.

D = Disagree, U = Undecided, A = Agree,

	Statement	D	U	A
7	Computers are valuable tools that can be used to improve the quality of education.	1	2	3
8	Teachers should know how to use computers in their classrooms.	1	2	3
9	If there was a computer in my classroom, it would help me to be a better teacher.	1	2	3
10	I enjoy using new tools for instruction.	1	2	3
11	I believe that textbooks will be replaced by technology tools in the near future	1	2	3
12	I believe that the role of the teacher will be dramatically changed because of technology	1	2	3
13	I believe that I am a better teacher with technology.	1	2	3
14	I need more training with technology.	1	2	3

15	I need access to the Internet.	1	2	3
16	I need more software that is curricular-based.	1	2	3
17	I need more technical support to keep the computers working.	1	2	3
18	Student time on the Internet is time well spent.	1	2	3

Level of Technology Integration

How will you rate your experience with computers?

19	I have never used a computer and I don't plan to anytime soon	
20	I have never used a computer but I would like to learn.	
21	I use applications like word processing, spreadsheets, etc	
22	I use computers for instruction in the classroom.	

23. Where did you receive your training? (Rank order all that apply).

Self-taught	
College or university	
Other (specify)	

24. Do you have access to internet at school?

Yes	
No	

25. Do you have access to internet at home?

Yes	
No	

How often do you use computer-based technology in the following areas?

Tick the option that best describe how frequent you use computer –based technology

Please, rate your frequency of use as follows: Always (A = 3), Sometimes (S = 2), Never (N = 1)

	Statement	A 3	S 2	N 1
26	communication (internet/email, chatting etc.	1	2	3
27	document preparation(word-processing)	1	2	3
28	student assessment/evaluation purposes (spreadsheet/database) Excel/Access	1	2	3
29	Teaching and learning activities for your students (PowerPoint presentation)	1	2	3
30	For instruction and course management	1	2	3
31	Research(internet)	1	2	3
32	Subject-based instructional software	1	2	3
33	Classroom management(database)	1	2	3

Teachers' Professional Development

Please only consider professional development you have taken **after** you started teaching in the college of education.

34. Have you ever attended any professional development on the integration of technology?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

35. If yes how many times?.....

36. Was the professional development programme on your subject area?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

37. Who organized the professional development programme?

GES	<input type="checkbox"/>
TED	<input type="checkbox"/>
MOE	<input type="checkbox"/>
The college	<input type="checkbox"/>
Own initiative	<input type="checkbox"/>

38. Did the professional development programme have positive effect on your teaching?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

39. Where you satisfied with the programmes?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

40. Did you pay for attending any of the professional development programme?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

41. Did you get any allowance for attending the professional development programme?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

If you have not participated in any professional development which of the following best explain what prevented you from doing so

42	I did not have the pre-requisites (e.g. qualifications, experience, and seniority).	<input type="checkbox"/>
43	There was a lack of employer support	<input type="checkbox"/>
44	Professional development conflicted with my work schedule	<input type="checkbox"/>
45	There was no suitable professional development offered	<input type="checkbox"/>

46. Other (please specify).....

Factors Working against Technology Integration

Please, circle or tick the option that best reflects how you feel about each of the statements.

Rating Scale: Agree (A = 3), Neutral (N = 2), Disagree (D = 1),

	Statement	D	N	A
47	My limited knowledge in the use of computers prevent me from integrating technology	1	2	3
48	I have no training in technology integration	1	2	3
49	I don't have the necessary equipments like projector and computer in the classroom	1	2	3
50	My classroom is not conducive for integrating technology	1	2	3
51	I don't have enough time to integrate technology in the classroom	1	2	3
52	I have administrative support for integration of technology	1	2	3
53	I have access to the internet	1	2	3
54	There are good instructional software for the subject I teach	1	2	3
55	I can design my own instructional software	1	2	3
56	I integrate technology because of the course I teach	1	2	3

57. Any other (please specify).....

58. Please give your general view about the integration of technology into the teaching and learning of colleges of education.

Thank you very much for your cooperation.

APPENDIX B

Students' Perception towards the Integration of Technology

Information about Participants (students)

Gender

Male Female

Age Number of years in school

Area of specialization.....

Name of college attended.....

Click or tick one for each item to indicate how you feel

Rating scale: Agree (A=3, Neutral (N=2, Disagree (D=1)

	Statement	D	U	A
1	I have learnt how to use technology from my teachers in the college I attended	1	2	3
2	I enjoyed lessons taught with the use of technology.	1	2	3
3	I will use technology in my teaching as an in service teacher.	1	2	3
4	I have specific skills about how to use technology effectively to teach content in my subject of specialization	1	2	3
5	The use of technology in my classroom would help me to be a better teacher	1	2	3
6	I have purchase a computer so that I can use it for the purpose of integrating technology in my teaching	1	2	3

7	I will need more training on how to integrate technology in my teaching	1	2	3
8	I can use power point in presenting a lesson to my student	1	2	3
9	I have knowledge and skills in the use of database software e.g. Ms Access	1	2	3
10	I would make enough use of the internet as a teacher	1	2	3

Thank you for your cooperation