UNIVERSITY OF CAPE COAST

UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN FACILITATING TEACHING AND LEARNING AT THE CAPE COAST POLYTECHNIC

AFUA ANIMA GYAMERA

2012

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BY

AFUA ANIMA GYAMERA

Thesis submitted to the Institute for Educational Planning and Administration of the Faculty of Education, University of Cape Coast, in partial fulfilment of the requirements for award of Master of Philosophy Degree in Administration in Higher Education

MARCH 2012

DECLARATION

Candidate's Declaration

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

Candidate's Name: Afua Anima Gyamera

Signature:…… Date:……

Supervisors' Declaration

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

Principal Supervisor's Name: Emmanuel Oheneba Agyenim-Boateng (Ph.D)

Signature:…….…... Date:……..……..

Co-Supervisor's Name: Dr. Rosemary Bosu

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ABSTRACT

The study investigated the utilization of information communication technology (ICT) in facilitating teaching and learning at the Cape Coast Polytechnic. The research design used for the study was descriptive survey. A total sample of 360 including 300 students and 60 teaching staff was selected for the study. Multi-stage sampling was used to select the students whiles the census method was used to select the teaching staff. The instrument used for gathering data was the questionnaire. The Cronbach's Alpha coefficient for reliability was .648 for teaching staff and .661 for students. The descriptive statistics such as percentages, mean and standard deviation were used where applicable to analyze data.

The main findings from the study were that ICT facilities with respect to computers, printers, software and internet access were located at the ICT centre, Head of Department's office, computer laboratory and library and none at the lecture rooms. In addition, staff had acquired a level of ICT proficiency outside the Polytechnic whereas the student had acquired their proficiency from the Polytechnic. The institutional support for ICT was low. ICT use was hampered by factors such as unreliable internet service, inadequate computers/computer peripherals and inadequate professional training.

The study recommends the need to organise regular training in ICT for staff and students, employ internet service providers to provide the Polytechnic with reliable and stable internet connections, and review and implement the framework for achieving the ICT policy plan, 2007-2010 and the 5-year Strategic Plan, 2007-2011.

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No study of this kind could be successfully conducted without help and encouragement from others. For this reason, I wish to express my profound gratitude to all whom in diverse ways contributed to the completion of the thesis.

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I also wish to thank Mr. Anthony Turkson, Planning Officer of the Cape Coast Polytechnic, Mr. Albert Ayia-Koi and Mr. Michael Kissi, both Lecturers at the Department of Tourism, Cape Coast Polytechnic for their support during data collection at the Cape Coast Polytechnic. My sincere appreciation goes to Mr. Michael Gyensare, Mr. David Larbi, Mr. Ebenezer Domey, Mr. Isaac Kwenin, Mr. Nasir Yaqub Entsie and Mr. Forster Danso Ntow who helped me with data analysis as well as reading through the final work.

Finally, my appreciation goes to all the staff of the Division of Academic Affairs (Admissions Office) for their support, especially Mr. Joseph Gordon Mensah. To all authors of the books and articles I used as sources of reference of my work, I say thank you.

DEDICATION

To my uncle, Dr. Isaac Kofi Ohene

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CHAPTER ONE

INTRODUCTION

Background to the Study

The society in which we live is constantly changing. As we move through the information age, technological advances are changing the way that many organizations operate. Education is not immune to these changes (Griffin, 2003). Schools cannot truly prepare teachers and students to function within society if the curriculum fails to cover the equipment and skills they will actually use in the real world. Schools cannot hope to improve either the academic achievement of their students or the overall value of their programmes without sufficiently integrating technology (Donahoo & Whitney, 2006). Teachers and students must be able to use technology if they are going to teach and learn successfully in an increasingly complex and information-driven society (Miller, 2007).

Concerns over educational relevance and quality coexist with the imperative of expanding educational opportunities to meet the changing demand of society with the emergence of the knowledge society in the 21st century. The emergence of the information age has brought to the fore the important role that information, communication and technology can play (The Republic of Ghana, 2003). An effective use of Information and Communication Technology (ICT) in schools can have an immediate positive impact on the schools' learning environments such as, creating more dynamic interaction between students and teachers, increasing collaboration and team work in problem-solving activities, stimulating creativity in both students and teachers, and helping students to control and monitor their own learning. Furthermore, successful use of ICT in schools can

help students to develop skills; both specific to ICT and more generally, that will be useful for them in their future academic and professional lives (Organisation for Economic Cooperation and Development [OECD], (2005). Such students will have the advantage of being familiar with different media common to the modern workplace, and should be able to use these ICT skills to access, compile, synthesize and exchange information effectively.

The world of information communication and technology (ICT) has changed very fast over the years, especially in the area of internet that is the vehicle for conveying messages across borders. The internet is the most accessed facility when it comes to ICT use in organisations. The internet evolved from a research conducted by the US Defence Department (Universal Almanac, 1996). Computers and the internet create new opportunities for teaching and learning. As Hew and Brush (2007) state, computers and internet technologies can help students improve their scores on standardized tests (Bain & Ross, 1999), improve their inventive thinking (CEO Forum on Education and Technology, 2001), and improve students' self-concept and motivation (Sivin-Kachala & Bialo, 2000). Valdez (2004) found that with an extensive literature review, technology can impact student achievement significantly.

Global changes also put pressure on all groups to constantly acquire and apply new skills. The International Labour Organization defines the requirements for education and training in the new global economy simply as "Basic Education for All", "Core Work Skills for All" and "Lifelong Learning for All" (Verma, 2010). When effectively integrated, technology can provide teachers and students with engaging opportunities to find and utilize current information and apply

academic skills for solving real-world problems. Traditional educational practices do not provide teachers and students with all the necessary skills for success in today's world (International Society for Teacher Education, 2005; Miller, 2007).

The way in which technology is used in a classroom is a critical measure of its success. As stated by the Office of Technology Assessment (1995) ''...it is becoming increasingly clear that technology, in and of itself, does not directly change teaching or learning. Rather, the critical element is how technology is incorporated into instruction" (p.57). Technology in itself cannot change the education. It could cause a change when integrated into the curriculum (Muir-Herzig, 2004).

ICT in education means all the contemporary digital tools, such as computers, accessories and internet that can be used in education helping to fulfil its goals (Costas, 1998). ICT refers to technologies that merge computers with high speed communication links carrying data, sound and video (Williams, Sawyerr & Hutchinson, 1999). This includes telephone, cellular technologies, computers, telefax, electronic – mail and the internet. ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form: for example, computers, digital television, email, scanners, digital cameras, overhead projectors and telejectors.

Technology in itself does not support learning. It can play out its full potential only when it is well integrated into learning environment (Otto & Albion, 2004; Voogt & Knezek, 2008). The availability of ICT is not, in itself, sufficient to enhance learning and teaching and in turn, increase attainment. The related literature indicates that while ICT can be motivating and engage pupils in

learning more effectively, sustained impact depends on the ability of the teacher to integrate or embed ICT into the learning experience of pupils in such a way that the potential of the technology is fully realized (Condie & Munro, 2007). The use of computers in education opens a new area of knowledge and offers a tool that has the potential to change some of the existing educational methods (McCannon & Crews, 2000).

Darkwa (2007) maintains that the state of ICT infrastructure in Africa cannot be overlooked. In this new knowledge-based society, access to information and knowledge has become essential resources for development. As a continent, the future and survival depends upon the willingness to harness the new information and communication technologies. A nation unable to join this new economic order, unable to harness the power of ICT is effectively locked out of the new global economy, and forced to remain a marginal player on the economic stage. The ICT revolution offers the continent a tremendous opportunity to leapfrog the earlier stages of development and to move swiftly and directly on to the world economic stage. The information revolution is being driven by the convergence of technological infrastructure such as computers, satellites, and fiber optic technologies. Adequate ICT infrastructure to support the expansion and high level connectivity is needed for the rapid emergence of ICT on the continent (Darkwa, 2007)

Unfortunately, ICT infrastructure in Africa is still in its infancy. Looking at global connectivity maps, it is immediately evident that Sub-Saharan Africa is the least connected part of the world (Darkwa, 2007). Without adequate ICT infrastructure to move information rapidly Africa will be further marginalised

(Darkwa, 2007). Speaking at the opening ceremony of the World Summit on the Information Society (WSIS) Africa Regional Preparatory Conference, held in Accra from 2nd to 4th February, 2005, Mr. E. Amoako decried the daunting constraints to the use of Information Communication and Technology. He reiterated the need to make the best effort to bridge the digital gap and for Africa to launch a massive scale or continent-wide Information and Communication infrastructure plan geared toward increasing access to ICT infrastructure, reducing bandwidth costs and facilitating access to the internet.

Nations worldwide have recognised the developmental opportunities and the challenges of the emerging information age characterised by ICTs. These technologies are driving national development efforts worldwide and a number of countries in both the developed and developing world are exploring ways of facilitating their development process through the development, deployment and the exploitations of ICTs within their economies and societies (The Republic of Ghana, 2003).

It is against this background that Ghana in her quest to bridge the gap as far as ICT is concerned developed a national policy on ICT and christened it "Ghana ICT for Accelerated Development (ICT4AD)" (The Republic of Ghana, 2003). "This policy provides the basis for facilitating the socio-economic development of Ghana in an emerging information, knowledge and technological age to be dominated by information and knowledge-based economies" (The Republic of Ghana, 2003, p. 6). "To facilitate the process of transforming Ghana into a predominantly information-rich and knowledge-based society, certain priority areas constituting the 14 pillars of the ICT4AD are targeted" (The

Republic of Ghana, 2003, p. 31). Out of this, the priority areas that have direct link to the educational sector are "promoting ICTs in education, that is the deployment and exploitation of ICTs in education" and "rapid ICT and enabling physical infrastructure development" (The Republic of Ghana, 2003, p. 31).

The second pillar which is "promoting ICTs in education" will further be elaborated. Ghana has a high illiteracy rate of close to 40% of the population above the age of 6 years who have never been to school with only about 3% of the population with tertiary level education (The Republic of Ghana, 2003).

The key role that ICTs can play in widening access to education to a wider section of the population; in literacy education and for facilitating educational delivery and training at all levels of education has been recognized. The government of Ghana has acknowledged the need for ICT training and education in schools, polytechnics and universities and to improve the educational system as a whole (The Republic of Ghana, 2003). As part of the mission to transform the educational system to provide the requisite educational and training services and environment capable of producing the right types of skills and human resources, the Government of Ghana is committed to a comprehensive programme within the educational system (The Republic of Ghana, 2003).

The objectives for promoting ICTs in education are to facilitate the deployment, utilization and exploitation of ICTs within the educational system; to improve on educational access and delivery, and to support teaching and learning. It is also to promote technical and vocational education and training to enhance middle level management (The Republic of Ghana, 2003). Some of the strategies of the policy are "To promote ICT awareness, computer literacy within the public

at large; develop and restructure the relevant ICT curricula for all levels of the educational system; to provide educational materials and tools at all levels of the educational system and to promote internet access to all educational institutions" (The Republic of Ghana, 2003, p. 38).

The development of ICT has set the stage for the integration of the ICT into every activity of education in Ghana. Such integration is envisaged to include the use of high speed computers, fax machines, printers and scanning machines to be used by the staff of educational institutions.

The Cape Coast Polytechnic has not been left out in the development and integration of ICT into its daily operations. The operations of the Polytechnic are teaching, research and management. It is believed that when ICT is incorporated into the operations of the Polytechnic at its optimal level, there would be great effectiveness and efficiency; the delays in responding to issues will be reduced to its barest minimum and tasks or duties would be discharged with speed to save time. Research and teaching which is part of the Polytechnics' core business will be greatly enhanced.

The Cape Coast Polytechnic in its quest to provide competency-based training to equip students and staff with the requisite skills much needed to service industry and commerce developed a 5-Year Strategic Plan from 2007-2011 (Cape Coast Polytechnic Strategic Plan, 2007-2011). "This 5-year Strategic Plan is intended to serve as the Polytechnics blue-print which would help put the institution on an even keel towards sustained growth and rapid transformation to meet the challenges of the times" (Cape Coast Polytechnic Strategic Plan 2007-2011, p. 1). One of the thrust of this Plan is to "enhance institutional capacities in

ICT for teaching, learning, research and management activities" (Cape Coast Polytechnic Strategic Plan, 2007-2011, p. 12). The thrust has among other plans, to provide consultancy services in ICT and to offer computer literacy as part of continuing professional education (Cape Coast Polytechnic Strategic Plan, 2007-2011). The framework for achieving this thrust is given in Table 1.

Table 1: Strategic Thrust 4 - Enhance Institutional Capacities in ICT for Teaching, Learning, Research and Management Activities

Activity	Time Frame	Financial Input (¢)	Responsibility	Expected Output	Sources of Funding
1.Develop an integrated MIS for the institution (including developing LAN, CAN and internet facilities)	2007-2011	700 million	System Management Unit and Planning Office	MIS integrated campus wide network acquired and installed	GETFUND TALIF GOG IGF
2. Acquire teaching and learning aids	2007-2011	3.5 billion	System Management Unit and Planning Office	Fully connected 200-seater capacity ICT centre	GETFUND TALIF GOG IGF
3. Establish training programmes for use of ICT facilities	2007-2011	300 million	System Management Unit	Staff and students proficient in ICT usage	GETFUND TALIF GOG IGF

Source: Cape Coast Polytechnic Strategic Plan (2007-2011, p. 17).

The need to be abreast of the information age has further spurred the Cape Coast Polytechnic on to draw up an ICT Policy Plan. Its main mission is "To transform the institution's academic programmes into ICT based research oriented, information/knowledge driven activities capable of producing the type of vocational/teaching profession with expertise and high quality information literacy required to compete in today's fast evolving information age" (Cape Coast Polytechnic ICT Policy Plan, 2007-2010, p. 1).

The scope of the ICT Policy Plan is three years from September 2007-September 2010. The strategies of the policy are as follows:

1. To introduce ICT as a programme and as a course alongside computer literacy in the curriculum.
2. To provide a sustainable training programme for personnel to acquire adequate knowledge in ICT.
3. To create the necessary webbed and networked environment to support intra and inter departmental exchange and dissemination of data/information and create communication effectiveness.
4. To fully automate all management operations and all other supporting services and create a Campus Local Area Network (C-LAN) to provide digital access to the library and its information resources and collaboration among departments and personnel.
5. To provide ethical framework to guide the use of ICT facilities.

One of the priority areas of the Policy which has a direct bearing on the area of this research is ICT for teaching and learning. By this, the Policy aims at the "Provision of ICT staff and infrastructure; development of an ICT curriculum

for the introduction of ICT as a course and as a programme; adoption of an ICT based teaching and learning methodologies; providing a periodic refresher programme to upgrade available ICT skills; setting up an ICT maintenance unit and offer of outreach programme to catchment areas" (Cape Coast Polytechnic ICT Policy Plan, 2007-2010, p. 2).

A lot has been said about the impact of the introduction of ICT in education. It is believed that ICT is a basis for a revolutionary reform in education. In general, it is widely expected that ICT will solve at least some of the problems that education faces. It should be noted that the academic and scientific dialogue concerning the effectiveness of ICT in education still remains an open issue. At one end, there are those who believe that ICT should be applied in every discipline expecting that its penetration will improve the performance of every educational process. At the other end, there are those who believe that penetration of ICT in education will not change things radically hence it should be dealt with caution, leaving no room for excitement (Costas, 1998).

However, the experience of introducing ICT in the educational institution such as the Polytechnic and other educational institutions suggests that the full realization of the potential educational benefits of ICTs is not automatic. The effective integration of ICTs into the educational system is a complex, multifaceted process that involves not just technology, indeed, given enough initial capital, getting the technology is the easiest part, but also curriculum and pedagogy, institutional readiness, teacher competencies, and long-term financing, among others (Costas, 1998).

Statement of the problem

The move towards a globalised world where knowledge and information abound has raised concerns by educational institutions to expand educational opportunities to meet the changing demands of society. Information Communication and Technology (ICT) improves educational outcomes and enhances quality of teaching and learning (Wagner, 2001).

A study conducted by Bosu and Bon (2009) at Koforidua, Sunyani, Bolgatanga and Wa Polytechnics which left out the six Polytechnics in Ghana including Cape Coast Polytechnic revealed that ICTs for teaching and learning at the Polytechnic level was mainly basic ICT literacy training in office application and that Polytechnics in Ghana were in need for more computer and networking equipment and peripherals.

At the end of the Netherlands Programme for the Institutional Strengthening Post-Sec Education and Training Capacity (NPT-Programme) project as from December, 2008, at least all ten Polytechnics owned an internet connection, and were able to send and receive emails. The download speed of the internet and number of computers that accessed the internet were variables that differed from one Polytechnic to another. This difference was due to the availability of internet service providers, the available budget for ICT, the number of available ICT professionals and their individual skills (Kouwenhoven, Oduro, & Nsiah-Gyabaah, 2009).

Following the introduction of the ICT4AD Policy and the educational reforms in Ghana in 2004, ICT has assumed importance and has been incorporated in educational institutions at different levels. With the development of a 3-year

ICT Policy Plan from September 2007 - September 2010 and a 5-year Strategic Plan from 2007-2011, the Cape Coast Polytechnic is seen to have embraced the ICT revolution because of its importance to teaching and learning. Though the advent of ICT has been embraced, the utilisation of ICT facilities in teaching and learning at the Cape Coast Polytechnic needs to be investigated.

In a study on 'Adoption of ICT at schools in core and peripherals setting of Namibia: Exploring innovation, technology policy and development issues', Matengu (2006) evaluated, critiqued and developed an understanding of factors involved in the adoption of ICT in schools in Namibia. Matengu (2006) noted that schools were provided with computers on the basis that they did not have them and therefore cautioned against the assumption that schools with ICT would necessarily use them. The study found that the availability of technology infrastructure at schools did not guarantee their usage by learners and teachers.

From the foregoing, it is evident that though educational institutions have embraced the ICT revolution, much study has not been done to investigate the utilization of ICT facilities in teaching and learning particularly at the Cape Coast Polytechnic. Research needs to be conducted because though the Cape Coast Polytechnic may be equipped with ICT facilities, the utilization of such facilities needs to be investigated. This has therefore given rise to the need to investigate the utilization of ICT facilities in enhancing teaching and learning at the Cape Coast Polytechnic.

Purpose of the Study

The main purpose of the study was to examine the utilisation of ICT facilities in facilitating teaching and learning at the Cape Coast Polytechnic. Specifically, the study aimed at:

1. Identifying ICT facilities and application programmes that were used in teaching and learning at the Cape Coast Polytechnic.
2. Ascertaining the location of ICT facilities and application programmes at the Cape Coast Polytechnic.
3. Examining the staff and students' proficiency in ICT in facilitating teaching and learning at the Cape Coast Polytechnic.
4. Examining the institutional support that the Polytechnic gives to its staff and students in facilitating teaching and learning at the Cape Coast Polytechnic.
5. Identifying the challenges faced by staff and students of the Cape Coast Polytechnic in their use of ICT facilities in the teaching and learning situations.

Research Questions

Based on the objectives of the study, the following research questions guided the study.

1. What types of ICT facilities and application programmes are used in teaching and learning at the Cape Coast Polytechnic?
2. Where are the ICT facilities and application programmes located in the Cape Coast Polytechnic?

3. What proficiency do the staff and students of Cape Coast Polytechnic have in ICT usage?
4. What institutional support does the Cape Coast Polytechnic give its staff and student regarding the use of ICT in facilitating teaching and learning?
5. What are the challenges faced by staff and students of the Cape Coast Polytechnic in the usage of ICT in facilitating teaching and learning?

Significance of the Study

The findings of the study would help the Management of the Cape Coast Polytechnic to know the extent of ICT utilisation by its staff and students in facilitating teaching and learning. In addition, it is anticipated that the results of the study would inform the Polytechnic's Management on the problems faced by staff and students in the utilisation of ICT facilities so that appropriate measures could be taken to resolve the problem.

The findings would also provide the basis for the planning of in-service training for staff and students of the Cape Coast Polytechnic to enhance the efficient use of available ICT facilities. Finally, the Cape Coast Polytechnic would find the results of the study useful because it would guide them in future decision-making on ICT projects and policies and aid in the accomplishment of the 3-year ICT Policy Plan from September 2007 - September 2010 and a 5-year Strategic Plan from 2007-2011.

Delimitation of the Study

The population for the study is delimited to the teaching staff and students of the Cape Coast Polytechnic where the study was conducted. The focus of the

study was on teaching and learning. Therefore the results of this study could not be generalised over all polytechnics in Ghana.

Limitations of the Study

The collection of the data was through the questionnaire. As a result, the responses that were obtained might not be the true reflection of the reality because as descriptive survey, it may have delved into private and emotional issues of the respondents.

Again, questionnaires were given out to respondents to complete on their own. The likelihood that they would confer from each other could affect the quality of the study. However, these limitations notwithstanding, resultant findings of the study would constitute a strong basis for generalization.

Organization of the Rest of the Study

The study has been organized into five chapters. Chapter One is the introductory phase of the study. It deals with the background of the study, the statement of the problem, the purpose of the study, research questions, and significance of the study. It also covers the delimitation, limitation, organization of the study and definition of terms.

Chapter Two covers the review of the related literature. It deals with issues such as development of polytechnic education in Ghana, objectives of the polytechnics, regulatory and governing bodies of polytechnics, history of Cape Coast Polytechnic, ICT policies in Ghana and theoretical perspectives of ICT in teaching and learning. Others include application software used in teaching and

learning, ICT facilities used in teaching and learning, proficiency of teachers and students in using ICT facilities, institutional support for ICT and educational policy design and implementation. It concludes with barriers of ICT utilization, research conducted by other researchers and the conceptual framework of the study.

Chapter Three focuses on the methodology of the study. It covers issues such as the research design, population, sample and sampling procedures used as well as research instrument and pilot testing of the instrument, data collection procedure and data analysis procedure have also been discussed in this chapter.

Chapter Four deals with the presentation of results and discussion of data collected from the field.

The concluding chapter, Chapter Five presents the summary, conclusions and recommendations of the study. It also covers suggestions for further studies.

The next chapter considers the review of related and relevant literature on the topic under discussion.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter reviews literature relevant to the study. The review is done under the following broad topics: Development of Polytechnic education in Ghana, objectives of the polytechnics, regulatory and governing bodies of polytechnics, history of Cape Coast Polytechnic, ICT policies in Ghana and theoretical perspectives of ICT in teaching and learning. Others include application software used in teaching and learning, ICT resources used in teaching and learning, proficiency of teachers and students in using ICT facilities, institutional support for ICT and educational policy design and implementation. It concludes with barriers of ICT utilization, research conducted by other researchers and the conceptual framework of the study.

Development of Polytechnic Education in Ghana

Polytechnics are tertiary educational institutions responsible for training in scientific and technical subjects. Since 1992, when Government o Ghana directed Polytechnics in Ghana to run tertiary programmes, significant gains have been made in the output of the Polytechnic graduates. The Polytechnics provide people with technical education that is relevant, up-to-date in technology, and forward looking in approach. As such, polytechnic graduates play a significant role in the development of the nation (Boakye-Agyeman, 2006).

The Polytechnics in Ghana were first established as technical institutes that offered craft courses. In 1960, following the industrial development policy and rapid technological progress in a broad range of areas, technical education became

a necessity for the country (Boakye-Agyeman, 2006). Since the technical institutions (Polytechnics) were offering second-cycle craft courses while the universities were offering higher tertiary courses, there was a gap in the human resource supply needs of the country (Nsiah-Gyabaah, 2005). In recognition of this, some of the technical institutes were established to train lower and middle-level skilled human resource to fill the gap. These technical institutes were established in Accra, Kumasi and Takoradi. In 1963, the technical institutes were re-designated as polytechnics to run non-tertiary programmes. The Tamale and Ho technical institutes were elevated to polytechnic status in 1984 and 1986 respectively. The Cape Coast Polytechnic which was planned as a polytechnic was opened in 1986 (The Polytechnic Law, 1992). In 1987, the Government of Ghana constituted a University Rationalisation Committee (URC) to develop proposals for reforming the management, academic structure and funding of tertiary education in Ghana. Following the submission of the URC's Report, the government issued a White Paper in 1991 on the Reforms to the Tertiary Education System (Ministry of Education, 1993).

The White Paper gave prominence to Polytechnic Education in 1993. Following the promulgation of the Polytechnic Law, 1992 (PNDCL 321), the Polytechnics were upgraded to tertiary status. In line with government's policy of making the polytechnics regionally based institutions, the Sunyani, Koforidua, Wa and Bolgatanga Polytechnics were also established. In 1994, all the Polytechnics in Ghana commenced the running of HND programmes. The White Paper specifically stated that the Polytechnics have a distinct and important role to play in middle-level manpower development and that programmes and courses were to

be offered at the middle-level of technical training leading to the award of higher national diplomas but not departing from syllabi dedicated to practical training. The provision of such programmes was meant to complete the cycle of technical education and provide a capacity for higher-level technician training and practical research (Ministry of Education, 1993).

Objectives of the Polytechnics

The Polytechnic Law (PNDCL 321), assigned appropriate aims and objectives which the Polytechnics are to strive to achieve as follows:

1. Provide tertiary education through full time courses in the field of manufacturing, commerce, science, technology, applied social sciences, applied arts and such other areas as may be determined by the authority for the time being responsible for higher education.
2. Encourage study in technical subjects at tertiary level.
3. Provide opportunity for development, research and publication of research findings.

The Polytechnic Law (PNDCL 321) also gave legal backing to desirable changes in polytechnic administration, course structure, grading, certification and staffing. The Polytechnics in Ghana now have their own Governing Boards or Councils and the right to design their own curricula, plan their management and development activities (The Polytechnic Law, 1992).

Regulatory and Governing Bodies of Polytechnics

Ministry of Education (1993) further stipulates that in the performance of the Polytechnics functions, a number of key institutions coordinate the activities of the polytechnics to ensure quality of programmes and award diploma certificates to students. The institutions that impact on the governance and activities of the polytechnics include: the Ministry of Education (MoE); National Council for Tertiary Education (NCTE); National Accreditation Board (NAB); and National Board for Professional and Technician Examinations (NABPTEX).

The Ministry of Education (MoE) and National Council for Tertiary Education (NCTE)

The Ministry of Education has ministerial responsibility for all levels of education in Ghana. The National Council for Tertiary Education (NCTE) advises the Minister in charge of tertiary education on matters relating to the development of tertiary education. It has a leading role in guiding and co-ordinating the tertiary education sector, and in interpreting and implementing government policy on tertiary education (Ministry of Education, 1993).

National Accreditation Board (NAB)

Accreditation is necessary to ensure the quality of programmes and to foster public confidence in the programmes offered in tertiary institutions. The National Accreditation Board (NAB) is mandated under National Accreditation Board Law 1993 (PNDCL 317), to accredit programmes offered in each polytechnic. Programme accreditation is given to polytechnics that meet or satisfy

academic, staffing and physical facility requirements and other conditions of NAB (Ministry of Education, 1993).

National Board for Professional and Technician Examinations (NABPTEX)

The NABPTEX was established by the National Board for Professional and Technician Examinations Act 1994 (Act 492) to among other things, formulate and administer schemes of examinations, evaluation, assessment, certification and standards for skills and syllabus competencies for non-university tertiary institutions. NABPTEX has taken steps to coordinate the appointment of moderators for the various polytechnics (Ministry of Education, 1993).

History of Cape Coast Polytechnic

Cape Coast Polytechnic was established by the Government of Ghana in 1984 as a second cycle institution. In 1986, it operated under the administration of Ghana Education Service to offer intermediate courses leading to the award of non-tertiary certificates. In 1992, the Polytechnic was upgraded to tertiary level by PNDCL 321 to run programmes for the award of the Higher National Diplomas. The new Polytechnic Act of 2007, Act 745 has given the Polytechnic the mandate to run degree programmes (The Cape Coast Polytechnic, 2011).

Vision Statement

The vision of Cape Coast Polytechnic is to be a leading Polytechnic in Ghana that offers high quality career-oriented vocational and technical education for national development (The Cape Coast Polytechnic, 2011).

Mission Statement

As enshrined in the Polytechnic's motto "Nyimdzee na Nkyerekyere ma Nyansa" literally explained as "Knowledge and Education culminate in Wisdom," Cape Coast Polytechnic has as its mission to provide increasing access to tertiary education for all people who have a yearning to acquire a hands-on training for academic and professional excellence (The Cape Coast Polytechnic, 2011).

Professor Robert Kwame Nkum, the rector of the Cape Coast Polytechnic indicated at the Polytechnic's 6th Congregation on Saturday, 7th November, 2009 that the Polytechnic had three Schools and twelve academic departments with a student population of 3,463 pursuing various programmes in Engineering, Business and Applied Sciences and Arts. He further stipulated that the Polytechnic continues to enjoy infrastructural developments through Ghana Education Trust Fund (GETFUND), Teaching and Learning Innovative Fund (TALIF) and Netherlands Organisation for International Cooperation in Higher Education (NUFFIC) projects. The institution had acquired some ultra-modern machines and equipment for its Mechanical Engineering Department to improve teaching and practical training (Cape Coast Polytechnic, 2009).

In the address at the administration page of the Polytechnic's website www.cpoly.edu.gh, the Rector of the Polytechnic, Professor Robert Kwame Nkum (2008), indicated that:

> In the very foreseeable future, the Polytechnic would run degree programmes in Statistics/Mathematics and Computer Science, Hotel Catering and Institutional Management, Engineering, Secretaryship and Management Studies. Ultimately, we shall

introduce M.Tech degree programmes in relevant courses as we strive to achieve academic excellence. The portal services would help students to access academic information from their departments, online-library, lecture notes and examination results. Also online-registration and payment of fees would be effected. Prospective students can also process their admissions form on-line. We have a dream. Come, enjoy, share and contribute towards our beautiful dream.

ICT Policies in Ghana

The Government of Ghana has placed a strong emphasis on the role of ICT in contributing to the country's economy. The country's Medium-Term Development Plan captured in the Ghana Poverty Reduction Strategy Paper (GPRS I&II) and the Education Strategic Plan 2003-2015 all suggest the use of ICT as a means of reaching out to Ghanaians (The Republic of Ghana, 2003).

National ICT Policy

In 2004, Parliament passed into law Ghana's ICT for Accelerated Development (ICT4AD) Policy, which is currently at various stages of implementation (The Ghana ICT for Accelerated Development (ICT4AD) Policy, 2003). This policy represents the vision of Ghana in the information age and addresses 14 priority focus areas or pillars:

1. Accelerating human resource development

2. Promoting ICTs in education – the deployment and exploitation of ICTs in education
3. Facilitating government administration and service delivery
4. Facilitating the development of the private sector
5. Developing an export-oriented ICT products and services industry
6. Modernising agriculture and developing an agro-business industry
7. Developing a globally competitive value-added services sector – a regional business service and ICT hub
8. Deploying and spreading ICTs in the community
9. Promoting national health
10. Rapidly developing ICT and enabling physical infrastructure
11. Developing scientific, and industrial research capacity
12. Providing legal, regulatory, and institutional frameworks
13. Promoting foreign and local direct investment drive in ICTs
14. Facilitating national security and law and order

At the national level, a proposed National Information Technology Agency (currently under the name of Ghana ICT Directorate) has been formed and a bill is awaiting Parliamentary approval. A government interoperability framework has also been finalised and several Ministries, Departments, and Agencies are at various stages of implementation (The Government of Ghana, 2003).

ICT in Education Policy

The ICT in Education Policy for Ghana had a long gestation period. An attempt at policy development for the sector predates the national ICT policy. A

committee set up by the Ministry of Education, Youth and Sports to outline an ICT in Education Policy Framework and produce a document that could remain untouched for a long time (Mangesi, 2007). The objectives of the policy were to:

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

The Ghanaian tertiary education sector is the most advanced in the deployment and use of ICTs in the country. All the country's major universities have their own separate ICT policy, which includes an ICT levy for students. This enables students to have access to 24-hour computer laboratories with broadband connection. However, not all tertiary institutions in the country are equally endowed and there are instances where the computer facilities are run purely by the private sector as cyber cafés on campuses (Mangesi, 2007).

Theoretical Perspectives of ICT in Teaching and Learning

The literature dealing with technology and pedagogy attests to the powerful impact ICT can have on the teaching and learning process. In terms of generic learning, the research indicates that levels of collaboration and communication are enhanced by the use of computers as are knowledge building

and thinking skills (Sandholz, Ringstaff, & Dwyer, 1991; Howe, Tolmie, & McKenzie, 1996; McFarlane, 1997). In various subject areas, there is also evidence that new technologies afford a range of opportunities that can transform teaching and offer improved possibilities for learning (Vaughan, 1997; Barton 1997; Selinger, 2002).

A great deal of research and development has been conducted in order to bring Information and Communication Technology (ICT) to its current state of art. ICT was originally intended to serve as a means of improving efficiency in the educational process (Jones & Knezek, 1993). Furthermore, it has been shown that the use of ICT in education can help improve memory retention, increase motivation and generally deepen understanding (Dede, 1998). ICT can also be used to promote collaborative learning, including role playing, group problem solving activities and articulated projects (Forcheri & Molfino, 2000). Generally, ICT is promoting new approaches to working and learning, and new ways of interacting.

Technology involves the generation of knowledge and processes to develop systems that solve problems and extend human capabilities. In other words, technology can change or alter how people access, gather, analyze, present, transmit, and simulate information (See, 1994). The impact of technology is one of the most critical issues in education (Webber, 2003). The use of Information and Communication Technology (ICT) creates a powerful learning environment and it transforms the learning and teaching process in which students deal with knowledge in an active, self directed and constructive way (Volman & VanEck, 2001). ICT is not just regarded as a tool, which can be added to or used as a

replacement of existing teaching methods. A major survey study with more than 4,000 teachers found that increased access to computers in the teacher's own classroom, as compared to an ICT suite, was a strong determinant of computer use (Becker, 1999, 2001). ICT is seen as an important instrument to support new and specific ways of teaching and learning. It should be used to develop student's skills for cooperation, communication, problem solving and lifelong learning (Plomp, Brummelhis & Rapmund, 1996; Voogt, 2003).

Integrating technology into curricula with the intent of positively influencing teaching and learning has been in a state of evolution over the past 20 years (Dias & Atkinson, 2001; Dockstader, 1999). Driven primarily by hardware and software evolution, accessibility to computers in educational settings, and popular instructional technology trends, technology integration has covered the continuum from instruction on programming skills, self-directed drill and practice, interactive learning software, online training, testing, instructional delivery augmentation, and Internet-based accessibility to information, communication, and publication (Dias & Atkinson, 2001). According to Flanagan and Jacobsen (2003), technology integration is meant to be cross curricular rather than become a separate course or topic in itself.

Technology should be used as a tool to support the educational objectives such as skills for searching and assessing information, cooperation, communication and problem solving which are important for the preparation of students for the knowledge society (Drent & Meelissen, 2007). In fact, innovative use of ICT can facilitate student centered learning (Drent, 2005). Hence, every classroom teacher should use learning technologies to enhance their student

learning in every subject because it can engage the thinking, decision making, problem solving and reasoning behaviours of students (Grabe & Grabe, 2001). These are cognitive behaviours that students need to learn in an information age.

In their analysis of the contribution that new technologies can make to teaching and learning, Gregoire, Bracewell & Lafarriere (1996) provide the following with respect to student learning:

1. New technologies can stimulate the development of intellectual skills.
2. New technologies can contribute to the ways of learning knowledge, skills and attitudes, although this is dependent on previously acquired knowledge and the type of learning activity.
3. New technologies spur spontaneous interest more than traditional approaches.
4. Students using new technologies concentrate more than students in traditional settings.

The benefit to students of using new technologies is greatly dependent on the technological skill of the teacher and the teacher's attitude to the presence of the technology in teaching. This skill and attitude in turn are largely dependent on the training staff have received in this area. Although ICT may facilitate independent self-paced learning, the potential of ICT may not be optimized if there is no shift in the learning and teaching paradigm (Bangkok, 2004). In fact, teachers play an important role in the teaching and learning paradigm shift. They must understand the potential role of technology in education. Also, they should become effective agents in the use of various computer softwares to be able to make use of technology in the classroom.

Application Software Used in Teaching and Learning

The use of various computer softwares is really just making use of electronic tools to extend our capabilities. Being able to select and use the best software package for the task is a skill every educator needs. The ability to evaluate software is especially valuable when you are selecting software specifically designed to assist educators (Lever-Duffy, Mcdonald & Mizell, 2005). It is the educator's expertise in teaching and in learning that ensures that the application programmes acquired by a school address the specific, targeted competencies that have been articulated through the instructional design process. The application of the right software package at the right time can solve pressing challenges for both teachers and students. Being able to select, solve application problems and use the best software package is a skill every educator needs (Lever-Duffy et al., 2005).

What is Application Software?

Computer software is defined as a set of programmes and procedures that are intended to perform specific tasks on a computer system (Buzzle Web Portal, 2011). A software programme is a set of instructions that are aimed at changing the state of computer hardware (Buzzle Web Portal, 2011). At the lowest level, software is in a form of an assembly language, a set of instructions in a machine-understandable form. At the highest level, software is in a form of high-level languages, which are compiled or interpreted into machine language code (Buzzle Web Portal, 2011). Application software is able to manipulate text, numbers and graphics. It can be in the form of software focused on a certain single task like

word processing, spreadsheet or playing of audio and video files (Buzzle Web Portal, 2011).

The types of application software this study sought to research are word processors, electronic spreadsheets, database management systems, and presentation software. These types of software can be purchased in individual packages or in application suites and are designed to run on either a PC or Macintosh platforms. Often, a school system will equip the administrative component of its operation with application software, which teachers can adapt to address educational tasks. The school will often purchase a site license, that is, a license that allows the use of a software package on all machines at locations associated with one organization (Lever-Duffy et al., 2005). These four major types of application software are discussed under this section.

Word Processing Software

Word-processing software is the most commonly used computer application. Computers loaded with word-processing software have all but replaced typewriters for text oriented tasks, although the typewriter still has a niche in the completion of noncomputerized forms. Today's word processors, however, are capable of doing far more than even the most advanced electronic typewriter. In addition to creating, editing, and printing documents, these software packages are capable of doing desktop publishing and creating and editing graphics. Combined with a relatively inexpensive colour ink-jet printer, word-processing software packages are also powerful tools for creating full-colour transparencies, classroom signs and posters, customized certificates and awards.

Of course, they are also essential tools for creating tests, student worksheets, and memos (Lever-Duffy et al., 2005).

Word-processing programmes maintain large amounts of data in an electronic format until it is ready to print out. This allows educators to store and easily update or modify the many documents they use in the daily teaching and learning tasks. Word processing offers educators a way to easily access electronic documents and then to modify and update them with little effort. Furthermore, word processors typically include a built-in capacity to check grammar and spelling and an interactive thesaurus, which make this software application a valuable tool for every educator. Most word-processing packages share several significant and useful features. These can be broadly grouped in terms of the word-processing functions they enhance. These functions include document preparation and editing, desktop publishing, and archiving and printing (Lever-Duffy et al., 2005).

Electronic Spreadsheets Software

Electronic spreadsheet software is to numeric data as word-processing software is to text. With an electronic spreadsheet software package, you can organize, input, edit and chart data, and produce accurate professional reports for any teaching and learning task that deals extensively with numbers. Spreadsheet software not only allows you to organize numeric information, but also has built-in mathematical and statistical formulas that can be applied to the data with just a few clicks of the mouse button. Whether adding long columns of data or computing a complex weighted-averaging formula, electronic spreadsheets

complete your mathematical tasks at lightning speed and with total accuracy. With a spreadsheet, budgets can be easily developed and modified, grades can be tracked and averaged, and class statistical information can be extracted. Furthermore, most spreadsheets include built-in graphing capabilities that can turn numeric data into colourful, three-dimensional pie, bar, or line charts that will visually illustrate numeric relationships (Lever-Duffy et al., 2005).

One of the key advantages of electronic spreadsheets over their manual counterparts is in their accuracy. Given accurate data, a spreadsheet will always produce accurate results. A second advantage is the fact that spreadsheets can be modified easily. This time-saving feature makes electronic spreadsheets easier to use, less time-consuming, and far more accurate than doing the calculations manually (Lever-Duffy et al., 2005).

Several software vendors produce electronic spreadsheet programmes. Some of these, such as Microsoft Excel or Lotus, are powerful, business-oriented software packages that have numerous features. Others are for home or general consumer use, such as the spreadsheet component of AppleWorks, ClarisWorks, or Microsoft Works. Regardless of the capabilities of any given spreadsheet package, they all have a full range of common features. The Companion Compact Disk (CD) demonstrates and provides practice with Excel, one of the most common of all electronic spreadsheets (Lever-Duffy et al., 2005).

Every educator's job includes the cumbersome tasks of organizing, maintaining, and retrieving many types of data. Educators must be able to easily and quickly access and extract the information they need. The productivity

software that accomplishes this type of task electronically is called database management software.

Database Management Software

Database management software offers educators an easy-to-use system for creating customized records to contain data, retrieving targeted records, updating and editing the information in those records, and then organizing clear and accurate reports from the data. Furthermore, database software allows you to sort all your data automatically at the touch of a key or to query the database for a match to any single word or phrase. Considering the amount of information an educator must deal with, database management software offers many advantages over manual filing systems (Lever-Duffy et al., 2005).

An electronic card catalogue in a media centre library is one example of the advantage of database management systems over manual systems. Consider for a moment the complexity of cataloguing or locating a book using a manual system. In manual cataloguing, a book must be cross-referenced on at least three different index cards under title, author, and subject. All of these must be typed out and manually sorted and filed. To find the book, the card catalogue user must look through drawers full of cards until just the right card is located. For both the media specialist and the library patron, the process can be laborious. With an electronic card catalogue that is a dedicated database management system of the library collections, the process is much simplified. All database management software contains key features to make the organization and manipulation of data easy (Lever-Duffy et al., 2005).

Presentation Software

From a software perspective, presentations are a prearranged group of electronic slides that present one idea or theme after another (Lever-Duffy et al., 2005). The Buzzle Web Portal (2011) posits that the software that is used to display information in the form of a slide show is known as presentation software. This type of software includes three functions, namely, editing that allows insertion and formatting of text, methods to include graphics in the text and a functionality of executing the slide shows. Microsoft PowerPoint is the best example of presentation software (Buzzle Web Portal, 2011).

Whether for teacher-led presentations or student-led class reports, presentation software can help to organize and enhance the delivery of content. Presentation software includes programmes that are designed to create digital support materials for oral presentations. Completed presentations sequence and display these slides on a computer monitor, large-screen video monitor, or projection screen (Lever-Duffy et al., 2005). Presentations typically proceed through all slides in a linear sequence but the software has the capabilities needed for nonlinear, hyperlink-driven sequencing. These programmes, originally designed for use in business as a sales and presentation tool, have been adapted by educators to assist the communication process by providing electronic visual displays that enhance verbal delivery (Lever-Duffy et al., 2005).

Resources for the acquisition of educational technology are typically very limited, and careful purchases will make those limited resources go much further. Once the software has been acquired, you might even need to install it on the

hardware you have available to you. In order for teachers and students to get the most out of the software, one will need to become familiar with how it works because software evaluation, acquisition, installation, and training are indeed extensive tasks. The up-front investment of time and energy in this process, however, will make the difference between the acquisition of valuable educational tools and the purchase of software that looked good on first inspection but ended up gathering dust in a storage closet (Lever-Duffy et al., 2005). However, there are other ICT applications that are also used to facilitate teaching and learning and these include the use of the e-mail and internet. The importance of these in teaching and learning are discussed in the next session.

Electronic Mail (E-Mail)

Morton (1995) describes email as a one-to-one technique suitable for "learning contracts, apprenticeships, internships and correspondence studies". Most often it is used for communication between student and lecturer or student and tutor with certain advantages and disadvantages.

The Centre for the Advancement of Teaching and Learning (2003) outlines the general advantages and disadvantages in using e-mail to communicate with students as follows:

Advantages of using e-mail to communicate with students

1. Staff and students can communicate outside of office hours, at anytime convenient to them.
2. Faster than an ordinary mail; messages travel almost instantaneously.

3. Staff and/or students can be in the safety and comfort of their own homes for after class or office hours.
4. Working students, part-time students and students with family responsibilities will be able to attend classes without much inconvenience.
5. Cheaper and less intrusive than a telephone call, particularly for a large amount of information.

Disadvantages of using e-mail to communicate with students

1. Not all students have easy access to computers and have e-mail accounts and computer laboratories might not be open after office hours.
2. Students may need training to communicate effectively via e-mail before using e-mail in learning.
3. Hardware/software incompatibility may result in garbled messages.
4. The recipient may be unaware of an urgent message's arrival and quick answers may not be forthcoming.
5. Recipient unable to interpret nuances which are easy to communicate when face-to-face.

The Centre for the Advancement of Teaching and Learning (2003) further expounds the uses of e-mail for submission of assignments.

Advantages of using e-mail for submission of assignments

1. Students do not have to go to the Department to submit their assignment.
2. Assignment is submitted directly to the teacher and less likely to get 'lost' in the system.

3. Receipt of assignment can be acknowledged quickly.
4. For some students using e-mail and attaching an assignment will be an IT learning experience.
5. Teacher can type comments and mark directly onto document and return by e-mail without delay.

Disadvantages of using e-mail for submission of assignments

1. Attached assignments may contain viruses.
2. Transmission problems may cause extra work for the lecturer if students have to be contacted and asked to resend assignments.
3. Teacher may need to print assignments, which may be time consuming and may increase stationery cost for the Department.
4. Not all students may have e-mail address.

Internet

Schreiner (2008) asserts that the internet is a valuable tool that is tremendously useful to teachers. Through the use of the internet, teachers can allow their students access to new information, points of view and experiences that they would otherwise not have been able to encounter. There are several internet tools that prove particularly useful to teachers for planning and teaching. These tools make it easier for educators to teach and enhance student learning by allowing ready access to information that would have been hard to acquire prior to the internet.

Schreiner (2008) expounds the internet tools that are useful for teaching and learning as follows:

Webquests: Webquests promote independent learning and help students develop problem-solving skills. Teachers can create webquests to incorporate into their lessons by making a list of terms germane to the area of study. Webquests are an excellent tool for beginning a unit. Prior to the start of the unit, the teacher can give the students a list of terms that will be covered in the unit and allow them time to find definitions for the terms listed. After completing the webquests, students will have a base knowledge of the term so that it is not totally foreign to them when they encounter it during the unit.

Lesson planning: Thanks to the internet, teachers have instant access to tested lesson plans that have worked for others in the past. This saves them time and increases their effectiveness, as they do not have to engage in the typical trial-and-error method of lesson development. Many sites even allow teachers the convenience of selecting an age range or subject area to limit the results and ensure that the teacher is given the exact information. The plethora of lessons available on the internet allows teachers to select standards-based lessons that have been shown to work.

Streaming videos: Thanks to the internet, the era of VHS is over. Even the DVD, which once seemed so cutting-edge, is now passé. Today, teachers need nothing but internet access and an LCD projector. The internet is full of useful sites that feature videos designed for use in the classroom.

Test preparation: In this age of high-stakes testing, an increased emphasis is being put on students passing the state tests. There are a number of websites aimed

at helping students improve their scores on standardized test that offer subscription services to schools. These sites provide teachers with the ability to have each student work on a different skill simultaneously. The sites are student-centered, so the focus is on what the student needs in order to be successful. They aim to help increase student learning by providing tailor-made lessons at the student's individual level.

Given the recognized importance of the various ICT applications in education, it becomes necessary for every educator to develop sufficient literacy, which is the ability to effectively locate and use appropriate ICT applications. To do so, educators must find out how to make maximum use of the ICT facilities in their educational institutions.

ICT Resources Used in Teaching and Learning

Computer Laboratory

According to Wikipedia (2011), a computer laboratory also known as a computer suite or computer cluster is typically a room which contains many networked computers for public use. Computer laboratories can be found in libraries, schools, government buildings, science laboratories, community centers, schools with IT departments that require such a place for their employees to do their jobs, and research centers. They are distinct from internet cafes in that the usage of the computer laboratories is typically free for those with access. Printers, scanners and other peripherals may augment the laboratory setup.

Blink (2011) maintains that traditionally, computer laboratories have been configured to support teaching and learning by providing rows of computers in a

lecture-style classroom set-up. Laboratory computers and software allowed students to complete course assignments or learn new programmes. The uses of technology for teaching have evolved, however, and so must the design and configuration of computer laboratories; they must transform into flexible, technology-enhanced spaces for maximum effectiveness.

In a study conducted by Blink (2011) about how students and faculty use laboratory spaces, the study revealed that a laboratory's campus location matters; proximity has an impact on how a space is used. For example, a computer laboratory that is near a quiet study space such as the library may reflect the characteristics of that space and might also serve as a quiet study space. A laboratory space near an area where students congregate, on the other hand, may become a collaborative space despite its configuration. All of the computer laboratories had a traditional classroom configuration, yet the uses of the different locations varied tremendously.

ICT Centre

Jalulah (2011) reported in the June 16th edition of 'The Chronicle' that the Management of the Bolgatanga Polytechnic out-doored a modern ICT Centre, located within the school's main campus at Sumbrungu in the Bolgatanga Municipality. The ICT Centre, according to the Management, would also help accomplish its vision of becoming a centre of academic and professional excellence, employing state-of-the-art technology for teaching, learning, research and community service. The acting Rector of the Polytechnic, Mr. John Bosco Azigwe, disclosed that the Centre had been set up with 100 new

sets of computers, with contributions from students and the Management of the Polytechnic. The Centre is divided into two and each stocked with 50 computers for students' use, and 10 laptop computers for lecturers.

School Library

The Department of Education (2011) outlined the role of the school library. The role of the school library and information programmes and services is to:

1. facilitate the planning and implementation of learning programmes that will equip students with the skills necessary to succeed in a constantly changing social and economic environment. Through resource-based programmes, students acquire skills to collect, critically analyse, organize information and communicate their understanding.
2. provide and promote quality fiction to develop and sustain in students the habit and enjoyment of reading for pleasure and to enrich students' intellectual, aesthetic, cultural and emotional growth.
3. cater for differences in learning and teaching styles through the provision of and equality of access to a wide range of material, fiction and non-fiction, print, audio, video and digital.
4. provide teachers with access to relevant curriculum information and professional development materials within and outside the school and opportunities to co-operating plan, implement and evaluate learning programmes which integrate information resources and technologies.

Computers

Vahlensieck, (2011) outlines the following ways teachers can incorporate computers into their classroom.

Presentation media: The simplest and most inexpensive way to include the computer during a lesson is to gather students around the teacher's computer screen. Obviously, this approach is limited to the number of students that can see the screen.

Video projector: With the help of a video projector (similar to a slide projector) a teacher can project his or her screen to the front of the classroom. Unless the projector has a high intensity light, the teacher must dim the lights in order that all the students can see the screen. Projectors, particularly those with a high intensity lights, are very expensive. In addition, the teacher cannot monitor the students' computer or direct the students' attention to the presentation, which is possible with the following systems.

Hardware video network: The hardware video network transmits the teacher's screen over a cable to all the computer screens in the classroom; the teacher does not need to dim the lights for students to see the screen. However, this hardware solution is not easily moved between classrooms and its implementation costs can be high.

ICT facilities are the vehicles through which teachers and students maximise teaching and learning, however, the use of these facilities largely depends on the capacity of teachers and students to use them.

Proficiency of Teachers and Students in Using ICT Facilities

The National Association of Advisers for Computers in Education (NAACE) and British Educational Communications and Technology Agency (BECTA) (2001), jointly produced a document on the key characteristics of good quality teaching and learning with ICT. They indicated in their joint publication that in January 2001, Michael Wills, MP, then Minister for Learning Technologies, concluded his speech by inviting the education community to debate "what constitutes effective and good practice in ICT, both for the teacher and the learner". He suggested five features of ICT in learning which includes autonomy, capability, creativity, quality and scope.

Five Features of Effective Training in ICT for Students

Autonomy

Students develop autonomy through their use of ICT. They take control of their learning. They engage with the technology and work independently or with others, at the most effective pace and at the most appropriate level. They articulate reasons for their use of ICT.

Characteristics of autonomy

1. Students make decisions or show initiative about which application or hardware is best suited to a task.
2. Students develop their own ways of thinking about the task and develop their own strategies for overcoming problems.
3. Students are inspired to learn with ICT, prepared to take risks and learn from their mistakes.

4. They recognise and value how knowledge gained outside the classroom contributes to their schoolwork.

Capability

Students develop the knowledge and skills that enable them to use new technologies efficiently and effectively.

Characteristics of capability

1. Students are developing good ICT skills that they deploy appropriately to the task in hand with increasing confidence and competence.
2. Students transfer and apply their skills using ICT effectively to support learning in other subjects.
3. Students experiment purposefully, problem solving through extrapolating from previous experience.
4. Students develop the ability to make critical judgements about the contribution of ICT to their work and understand the value of using ICT.

Creativity

Students' creativity is inspired by their use of ICT. They will find opportunities to be creative using ICT in a wide range of subjects and contexts throughout their school life.

Characteristics of creativity

1. Students release their creative ability through a range of ICT tools.
2. Students use ICT to explore styles of communication and expression.
3. Students explore the possibilities of multimedia tools, enabling them to create in the styles readily available to them.

Quality

Students use ICT to develop their ideas and improve the quality of their work. They use ICT to enrich their learning, making use of the wide range of source material available to them. Where appropriate, they also use ICT to improve the presentation of their work.

Characteristics of quality

1. Students use ICT to present and communicate their ideas to a high standard, redrafting as necessary to produce better quality outcomes.
2. Students have clear ideas of how they use ICT to improve the quality of their work.
3. Students readily engage in thinking about the task in hand. They justify their use of ICT in terms of the quality of the outcomes.

Scope

Students use ICT to make practicable learning activities that would otherwise be too onerous, difficult, time-consuming or impossible to achieve. Students use ICT to add intrinsic value to a process.

Characteristics of scope

1. Students employ ICT to gain access to experiences, information or resources in ways that are not possible with other media. This extends opportunities and brings a new dimension to teaching and learning.
2. Students' learning is enhanced by reaching beyond the classroom, via e-mail, internet use etc, expanding their knowledge and understanding.
3. Students use ICT to explore and question, hypothesise and predict. They find different ways to do things.

The ICT training programmes value the use of ICT in many learning contexts and students are provided with the opportunity to develop high standards in and with ICT. Studies have shown that students often learn more in less time. That is, their productivity increases when they use computer support appropriately (Schacter, 1999). The ICT training develops students who are: autonomous in their use of ICT; capable with ICT; creative in their use of ICT; using ICT to produce work of quality; adding value to their learning through the scope of ICT in use.

Training for ICT is not only taken up by students. It is promoted and taken up by all of the senior management team, teachers and support staff who are to take full advantage of professional development opportunities. Such professional development programmes should be continuous to ensure effectiveness of the programme (Schacter, 1999).

Five Features of Effective Training in ICT for Teachers

Division of Higher Education (2002) asserts that teachers are fully integrating ICT in all aspects of their professional life to improve their own learning and the learning of their students. Division of Higher Education (2002) further posits that there are general competencies and abilities common to all approaches to integrating ICT in learning and the management of learning. The focus of professional development will be on developing the confidence and competence of teachers, building upon their previous education and professional development in applying ICT to teaching. Professional development in this stage will encourage teachers to collaborate in developing their subject curriculum and identifying innovative teaching methodologies.

Division of Higher Education (2002) outlines how ICT is being used to integrate subject knowledge and skills from across the curriculum to achieve individual learning objectives through the following teacher competencies.

1. Understanding why, when, where and how ICT tools will contribute to learning objectives; and choosing from among a wide range of ICT tools those that are most appropriate to stimulate students' learning. This includes;
    i. choosing ICT tools and teaching methods that integrate ICT into the whole curriculum
    ii. choosing and recommending ICT tools and teaching methods appropriate to individual students' learning objectives
    iii. planning a whole learning programme that allows a range of ICT tools and teaching methods to be used
    iv. choosing tools and teaching methods that allow the teacher and student to manage their own learning.
2. Managing whole school and classroom-based environments and teamwork to achieve learning objectives. This includes;
    i. managing learning environments that contribute to the use of different ICT tools and teaching methods
    ii. understanding differences between students according to their competencies in using ICT, and having available strategies to manage differences as students progress
    iii. managing difficulties that can arise when using ICT to minimize impact on planned lesson objectives

iv. infusing ICT-based and non-ICT-based media, such as books and video into learning programmes

3. Infusing multimedia presentations into whole class, group or individual teaching, and learning to increase access to learning programmes. This includes;
    i. ensuring that the most appropriate media are built into learning programmes, that learning is accessible to all students
    ii. varying the kind of presentation, documents or other media according to the main goals and the chosen teaching method
    iii. analyzing a presentation for legibility, structure, coherence with teaching objectives, and suitability for students
4. Analyzing multimedia learning environments. This includes;
    i. utilizing web-based learning spaces and environments
    ii. including Compact Disc Read-Only Memory (CD-ROMs), web sites, video and audio, courseware
    iii. analyzing the specific contribution of ICT tools to individual student learning
5. Supporting students to analyze and synthesize information from the internet and school-based learning environments. This includes;
    i. supporting individual students and groups of students to perform complex web searches
    ii. supporting students in managing, criticizing, synthesizing, and presenting learning processes and products using ICT tools.

Using ICT more proficiently, regularly taking part in professional development, and participating in teaching experiments collaborate in the improvement of teaching and learning and management of learning processes. Integrating ICT across the curriculum to enhance learning and the management of learning leads teachers to an understanding of how to transform their teaching practice as well as the learning of their students. Having developed the proficiency of teachers and students institutions must support the realization of the full potential placed in the teachers and students, by the provision of ICT facilities.

Institutional Support for ICT

Schools and educational systems must provide the infrastructure and support for students and teachers and the maintenance of learning environments in which ICT is used. At the same time ICT tools will assist schools and educational systems in carrying this out (Computer Information Systems, 2010).

The Computer Information Systems (2010) outlines the following provisions made by their institution at the computer laboratories. The ICT department aims at supporting the community to pursue their causes by availing resources which include computer laboratories, network resources and wireless network access.

1. Computer Laboratory

   The CIS Computing Laboratories are available to all members of the Africa Nazarene University Community. There are five computer laboratories and priority for laboratory use is given to booked courses and assignments requiring use of specialized laboratory software, but the

machines are otherwise available for such general uses as word processing, data analysis, and e-mail. The laboratories are open from 8:00a.m to 12:00p.m daily with support staff available in case a problem arises. All of the laboratories require the use of user identification and personal passwords.

2. Network Resources

   With an endeavour to support the students to effectively perform, the department tries to maximize the meagre resources through the laid down network resources. Within our network all students are granted student accounts that enable them to save their projects, research documents and other important study materials. These accounts are only accessible to students with proper authentication. In order to support students to do their research effectively the department has made internet access possible to all the users within the network. In addition to that, the department is also supporting the teaching staff by availing space in our servers for the teaching staff to post in teaching materials that are accessible to students.

3. Wireless Network Access

   The department has set aside provision for users with laptops to be able to access the university's network. All users are required to ensure that their machines are properly configured in order to access the network. As the school grows the department is planning to expand the wireless network infrastructure to accommodate the growth, by installing various access points within the school.

The support given by institutions to facilitate ICT use cannot be complete without the involvement of professionals to give directives.

The Department of Education, (2011) outlines the roles and responsibilities of the school's information services team. The staff of the school information services must collaborate with teachers and school management to:

1. provide students with learning contexts, processes and skills as well as opportunities for wide reading, personal growth and fulfillment
2. provide teachers with the training they need to develop information literate students
3. provide the services and technologies needed to gain maximum access to information
4. provide functional facilities and congenial environment to support the school's wide range of information needs

Educational Policy Design and Implementation

The basic assumption, among many scholars in policy research, is that the policy design is fundamentally a process of collaboration and negotiation (Deelstra, Nooteboom, Kohlmann, Berg, & Innanen, 2003). Cooperating while having diversity and different viewpoints make the potential for conflict, tensions, and contradictions which may result in a lack of consent between parties (Easterbrook, Beck, Goodlet, Plowman, Sharples & Wood, 1993). Educational policy makers, who do not carefully contemplate these factors, may cause actors (stakeholders) to experience difficulties in reaching the objectives of their policies.

It has been noted by Jones and Kozma (2003) that ICT policies can serve several important functions. Firstly, ICT policies provide a rationale, a set of goals, and a vision of how education systems work if ICT is introduced into teaching and learning, and they can benefit students, teachers, parents and the general population of a given country. Secondly, ICT policies are expected to provide guidance, and failure to do so means that individual school and classroom innovations would be unlikely to be sustained. Additionally, individual efforts are less likely to be felt across the country unless there is a shared vision clearly laid out in the policy.

The International Maritime Organisation (IMO), a technical agency of the United Nation sets standards and harmonizes all the international maritime activities, including training and qualification of mariners who navigate ships. In 1978, the IMO introduced its first educational standards in the form of an international convention—the Standards of Training, Certification and Watch Keeping for Seafarers (STCW78). It was considered a breakthrough, as there were virtually no international standards in maritime training and certification thereat. After almost two decades of its implementations worldwide, the convention was not promoting the changes it was initially designed to make; meaning it has not reached its objectives (Lewarn 1999; McCarter 1999; Moreby 1999; Zec, Komadina & Pritchard, 2000).

Some of the rationales claimed for its failure include;

1. the terms and provisions in the convention were vague and opened to diverse interpretation

2. the education method introduced by the policy was not suitable for marine vocation
3. the policy itself was not clear about the responsibilities of different parties
4. the compliance to the convention was left to the satisfaction of maritime administrator of each country

Similarly, Whittaker (1999) asserts that failures of IT projects are attributed to many factors. The following factors were found to be responsible for IT projects failure

1. Poor planning.
2. Lack of top management support.
3. Failure to address risks areas.
4. Inadequate skill and expertise of IT project manager.

Institutions in their quest to catch up with the knowledge society, make provision for their staff and students to keep up the pace of the information society. Nonetheless, the optimal realization of these goals is sometimes hindered by certain factors. These factors if not carefully looked at disrupt all the laid down plans of the institution.

Barriers of ICT Utilization

The findings of British Educational Communications and Technology Agency (BECTA),(2004), into the barriers to the uptake of ICT by teachers are presented here, divided into sub-sections for each of the barriers or groups of barriers we identified.

1. Lack of teacher confidence and teachers' computer anxiety

Many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of students who perhaps know more than they do. Larner and Timberlake (1995) found that teachers were worried about showing their students that they did not know how to use the equipment. In addition, students' attitudes and expectations of their teachers' competence in ICT are likely to contribute to this teacher anxiety. Guha (2000) states that students, who on the whole experience daily interaction with a wide range of technology, are increasingly placing demands on teachers, expecting them to be knowledgeable in the area of computer usage. The lack of teacher competence, or teachers' perceptions of their competence and the quality of the training they receive, is also related to the degree of confidence they have about using ICT (Pina and Harris, 1993; Lee, 1997).

2. Lack of training

The issue of training teachers in how to use ICT to effectively manage student's learning, rather than simply training them in the skills of using ICT equipment, is an important one. Kirkwood, Van Der Kuyl, Parton, & Grant (2000) highlighted the fact that expecting teachers to train in their own time caused a slow uptake in the training. In Preston, Cox & Cox (2000) teachers felt that they had not had adequate training, particularly in their ability to solve technical problems and in understanding the basic workings of the technology. As a solution to this problem, Snoeyink and Ertmer (2001) suggest that the first stage of

training should focus on the basic operations of technology and software applications, and once teachers have acquired the basic skills, only then should they move on to pedagogical training. In addition, after receiving pedagogical training in ICT, the students were still not able to make full use of that training as what they had been taught did not transfer easily to what was available in the classroom during teaching practice.

3. Lack of access to resources

Mumtaz (2000) points out that evidence of very good practice in the use of ICT is invariably found in those schools that also have high quality ICT resources, and that a lack of computers and software can seriously limit what teachers can do in the classroom with regard to the implementation of ICT. The importance of schools being well resourced in ICT equipment is also highlighted by a recent Becta publication, "Primary Schools – ICT and Standards" (Becta, 2003). This study, which explored the relationship between schools' use of ICT and students' achievements in national tests, presented strong evidence to show that those schools which were well resourced in ICT tended to have better achievements than schools with unsatisfactory levels of ICT. The lack of good ICT resources in a school, then, will not only prevent teachers from making good use of ICT in their teaching, but it is also likely to have a detrimental effect on students' achievement. The issue of teachers' access to ICT resources is a complex area, and in order to understand this more, it is helpful to break it down into several 'sub-barriers'.

Lack of Hardware: In a worldwide study of the obstacles to the integration of ICT in education, Pelgrum (2001) found that the most frequently mentioned problem when teachers were asked about obstacles to their use of ICT was the insufficient number of computers available to them. Guha (2000) found similar results, with many teachers surveyed indicating that the number of computers in their classrooms was insufficient, and that if teachers were to continue to implement ICT into their work then they required the appropriate hardware and software to familiarise themselves with first, then guide their students accordingly. This may well be a problem caused by poor organisation of resources, rather than a physical lack of computers present at the schools. This leads us to consider a second barrier to ICT concerned with resources:

Poor Location of Resources: Fabry and Higgs (1997) noted that the numbers of computers alone do not necessarily ensure adequate access, and that it is important to locate the proper amount and right types of technology where teachers and students can effectively use them. Suggesting that in some cases it is the organisation of resources, rather than the physical lack of them which is creating a barrier to the use of ICT by teachers.

Poor Quality Hardware: In a report by the British Educational Suppliers Association (BESA, 2002), the average UK school in 2000 reported that a third of its desktop computer stock was ineffective for teaching the curriculum. The report suggests that the effectiveness of computers is closely related to their age. There is evidence (Preston et al., 2000) to

suggest that teachers are less enthusiastic about using ICT where the equipment available is old and unreliable. Preston et al. (2000) found this to be a particular problem for teachers, who complained about out of date resources, and the fact that hardware became obsolete very quickly. Fabry and Higgs (1997) point out that if teachers and their students are to have adequate access to ICT facilities which are to enhance learning, then not only do those facilities need to be located in a position where all can access them, but they also need to be of a high enough specification to make their use worthwhile. This involves ensuring that they are internet connected, for example, to allow access to rich resources beyond the school, and also inter-connected, or networked, to allow teachers and students to communicate and collaborate.

Inappropriate software: A number of respondents to the Becta (2003) survey suggested that although there might be an array of software now available for use in the classroom, much of this software is not appropriate or would not actually enhance a lesson in any way. This idea is supported by Guha (2000) who found that poorly designed software, and a lack of time for teachers to design their own software, often cause teachers to "give up" and choose not to make use of ICT. Inappropriate software is also identified as a barrier in the research undertaken by the Centre for Guidance Studies (Bosley and Moon, 2003).

4. Lack of time

A problem that exists for teachers in many aspects of their work is that of the lack of time available for them to complete given tasks, and teaching

ICT is certainly an area that is affected by this. Fabry and Higgs (1997) point out that learning new skills in any profession requires time. Yet they do need that time to experiment with the technology, share their experiences with colleagues, and attend technology related in-service training programmes. According to Manternach-Wigans (1999) teachers are very concerned about the lack of time for technology; they feel that they need more time to learn computer basics, plan how to integrate technology into their lessons and actually use the technology in the classroom.

5. Technical problems

Another barrier originates from actual breakdowns of equipment, and the subsequent disruption that these can cause. If there is lack of technical support available in a school, then it is likely that preventative technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns (BECTA, 2004). Cuban (1999) supports this by pointing out that in the schools that cannot afford technicians, there are often, "software glitches and servers that crash, torpedoing lessons again and again." Once the breakdowns do occur, a lack of technical support may mean that the equipment remains out of use for a longer period of time.

6. Lack of electricity

News Africa's report on January 5, 2011 indicates that lack of electricity is a significant barrier to ICT take-up in developing countries. This is less of a problem for some ICTs that use batteries such as radio or mobile handsets, which can be recharged. Lack of power also raises costs since infrastructure such as wireless base stations must be powered by more

expensive diesel generators. Vota, (2011) continues to argue that electrical power is an issue across Africa or more accurately, the lack of reliable, affordable electricity is one of the greatest barriers to the adoption of information and communication technologies.

Understanding the extent to which these barriers affect individuals and institutions may help in deciding how they are to be tackled. It is important, however, to remember that there are complex relationships between the barriers. It is not possible to only think of them as existing in entirely separate groups. It is worth noting here that where policy makers continue to introduce strategies for ICT with the intention of increasing its use in school, such strategies need to be given support and guidance to help them bring about these changes.

Research Conducted by Other Researchers

A PhD study by Boateng (2007) focused on the use of computers in Ghanaian schools and how computers and computer related technologies were used in a rural-based school. It addressed issues of use and non-use of computers and related technology. Boateng (2007) found out that although computers were available at the school, teachers were not using them. Instead, computer lessons were taught as stand-alone subjects without any relevance to the school curriculum. This is attributed to inadequate training of teachers in the effective use and integration of computer technology in the school curriculum.

Similarly in a PhD study on 'Adoption of ICT at schools in core and peripherals setting of Namibia: Exploring innovation, technology policy and development issues', Matengu (2006) evaluated, critiqued and developed an

understanding of factors involved in the adoption of ICT in schools in Namibia. Matengu (2006) noted that schools were provided with computers on the basis that they did not have them and therefore cautioned against the assumption that schools with ICT would necessarily use them. The study also found that the availability of technology infrastructure at schools did not guarantee their usage for learners and teachers.

In another study by Howie and Blignant (2009), reporting on the Second Information Technology in Education (SITES), 2006 South African results, found that the ICT policy in education was in place and on the list of priorities. However, there were a number of ICT-related obstacles to realise pedagogical goals such as the location of ICT, staffing and the channels for teachers to acquire skills and knowledge. The analysis of data revealed that some essential conditions were not yet in place in most of the schools. Where the hardware and software was in place, significant attention was needed regarding the location of ICT, provision of staffing and the acquisition of skills and knowledge.

A number of variables that affect ICT utilization have been presented in the literature review and these variables are useful to this study. These variables provided information to the utilization of ICT in teaching and learning. This information discussed has provided insight into the formulation of the conceptual framework of this study.

Conceptual Framework

This section presents the conceptual framework of this study. The Four-in-Balance model (2009) was developed to structure key factors that influence ICT

use at school level. The Four-in-Balance model is a research based approach used to introduce ICT in education (Kennisnet, 2009) first presented in 2001 by the ICT at School Foundation and updated in 2004 as Four-in-Balance Plus. The model suggests successful implementation of ICT at school and teacher/classroom level which requires a balanced approach towards deploying the four basic elements: ICT infrastructure, expertise/proficiency, digital learning materials and location of resources (Kennisnet, 2009).

The conceptual framework for this study is presented in figure 1.

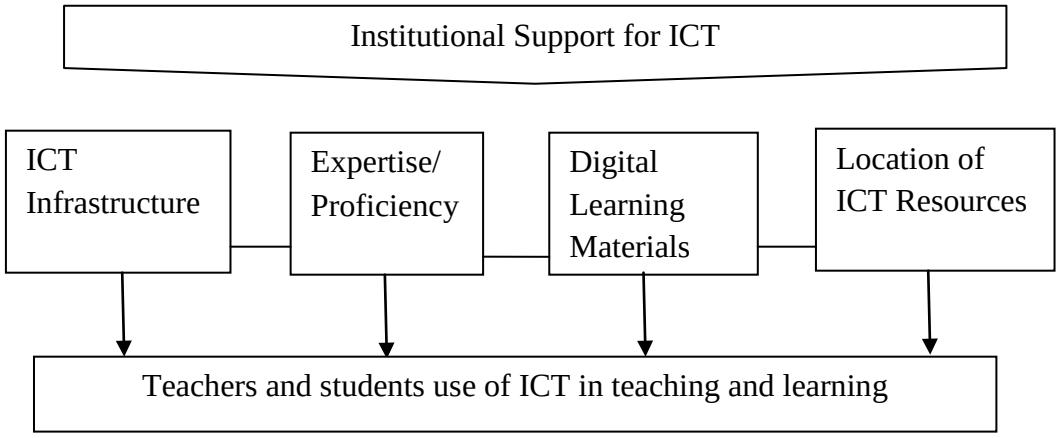

Figure 1: Variables that influence the utilization of ICT in teaching and learning; An adapted basic element of the Four-in-Balance model (Kennisnet, 2009) with slight modifications

ICT infrastructure refers to the availability and quality of computers, networks and internet connections. In addition, electronic learning environment and the management and maintenance of the school's ICT facilities are also considered as ICT infrastructure.

Expertise/proficiency implies that teachers and learners need to have sufficient knowledge and skills in order to utilize ICT to achieve educational objectives.

Digital learning materials refer to all digital learning educational content whether formal or informal.

Location of resources refers to the importance of locating the proper amount and right types of technology where teachers and students can effectively use them. It is the location of resources which enhances their use.

Institutional support refers to the schools' view of what constitute a good teaching and learning approach and how the school aims to achieve its objectives, considering the role of the teachers and learners and the teaching and learning materials being used to teach. The vision of the school management determines the policy of the school and the design and organisation of its teaching.

Teachers and students use of ICT implies the effective use of ICT in schools have an immediate positive impact on teaching and learning activities.

The Four-in-Balance model (2009) has been adopted in this study to provide the conceptual basis for the description of how ICT is being utilized in teaching and learning. The concepts in the model have been found suitable to serve as a guide for generating items of variables to be considered in the generation of instrument for data collection. In addition, this model summarized the variables that influence the utilization of ICT in teaching and learning. Based on these reasons, the Four-in-Balance model (2009) was adopted for this study.

Summary of Literature Review

With the introduction of ICT, the teaching and learning process will change and new skills for the teacher and the learner should be developed. Thus, methodology and content of teaching will change so that the learners will benefit

most from the new technology. Learners will not be evaluated only according to their knowledge but mainly with respect to their ability to achieve goals with all the technological means available to them. More specifically the teacher has to organize and arrange all the technological means available in the classroom, to spend time for planning well and scheduling performance and for choosing carefully the educational material for which the options are dramatically increasing. More structures have to be developed and new ways of interaction or dialogue have to be devised. Technology evolves in an accelerating and non-linear way. Hence, not only has it developed very fast, but also discoveries in science and technology from time to time impact our lives. ICT is becoming cheaper, smaller in size, friendlier and more effective.

A bright future lies ahead where information and communication technology is concerned in educational systems. This has significant implications for ICT at all levels of the educational system. All institutions are now cognizant of the fact that ICT is no longer a wish item in the curriculum at all levels. ICT is a must and from all indications, all embrace this view.

The next chapter discusses the methodology used for the study. Issues such as the research design, the population for the study, sample and sampling procedure and research instruments used for data collection will be discussed. In addition, the chapter considers data collection procedure and data analysis used for the study.

CHAPTER THREE

METHODOLOGY

This chapter describes the methods used in the study. This chapter specifically discusses the research design, the population, sample, sampling procedure, research instrument, pilot testing of the instrument, data collection procedure and data analysis.

Research Design

Given the nature of the research problem which involves fact-finding, the study adapted the descriptive survey design. The study mainly employed the descriptive survey approach to answer questions concerning the utilization of ICT in facilitating teaching and learning at the Cape Coast Polytechnic. This information was considered very important because one of the key strategies of the Cape Coast Polytechnic Strategic Thrusts is "to enhance institutional capacities in ICT for teaching, learning, research and management activities" (Cape Coast Polytechnic Strategic Plan, 2007-2011, p. 12). According to Keller and Warrack (2000) surveys depend on direct contact with persons or a sample of those whose characteristics, behaviour or attitudes are relevant for a specific investigation. Fraenkel and Wallen (2000) seem to be saying the same thing when they said that descriptive survey is mostly directed towards determining the nature of a situation as it exists at a time of the study and also interprets, synthesizes and integrates data as well as points to implications and interrelationships.

Descriptive survey was chosen because it has the advantages of producing good responses from a large range of people. At the same time, it provides a

meaningful picture of events and seeks to explain people's opinions and behaviours on the basis of data gathered at a point in time. Furthermore, it can be used with greater confidence with regard to a particular question of special interest or value to the researcher. Also, in-depth follow-up questions can be asked and items that are not clear can be explained using descriptive design (Fraenkel & Wallen, 2002; Gay, 1992).

Notwithstanding its advantages, the criticism of the descriptive survey is that it may produce untrustworthy result because they deal with private matter that people may not be completely truthful about. Similarly, descriptive surveys do not reveal a forecast of things to happen but they provide the basis from which decisions can be made using other methods of research (Fraenkel & Wallen, 2002).

This study sought to investigate how the Cape Coast Polytechnic was making use of ICT in its teaching and learning activities hence the descriptive survey design was considered appropriate as it has the capacity of assisting to investigate, describe, interprete and analyse the situation as it is and to highlight the implications of using ICT in the Cape Coast Polytechnic's core activities.

Population

The population for the study was the teaching staff and students of the Cape Coast Polytechnic during the 2009/2010 academic year. The teaching staff comprised the principal lecturers, senior lecturers, lecturers, assistant lecturers as well as principal instructors, senior instructors, instructors and assistant instructors. Table 2 shows the distribution of the teaching staff.

Table 2: Distribution of Teaching Staff Population by Schools

School	Number	Percentage (%)
School of Applied Arts and Sciences	25	34.7
School of Business and Management Studies	20	27.8
School of Engineering	27	37.5
Total	**72**	**100**

Source: Planning Unit, Cape Coast Polytechnic, 2009/2010

The student population existed within three main schools of the Polytechnic. These were the School of Engineering, School of Applied Arts and Sciences and School of Business and Management Studies. Table 3 shows the distribution of student population by schools.

Table 3: Distribution of Student Population by Schools

School	Year 1	Year 2	Year 3	Total
School of Applied Arts and Sciences	129	112	215	456
School of Business and Management Studies	824	726	830	2,380
School of Engineering	282	147	198	627
Total	**1,235**	**985**	**1,243**	**3,463**

Source: Planning Unit, Cape Coast Polytechnic, 2009/2010

Sample

The sample for the study comprised a total of 372 respondents. Of this number, 72 were the teaching staff and the remaining 300 were students. A census of the entire teaching staff population was conducted. The sample for the students were selected from year two and year three in the various schools because such students had been in the system for over a year and were in a better position to give information that reflected the situation in the Polytechnic. The choice of the students sample size was based on Krejcie and Morgan's (1970) determining sample size for research activities. Table 4 shows the distribution of student sample by schools.

Table 4: Distribution of Student Sample by Schools

School	Number	Percentage (%)
School of Applied Arts and Sciences	60	20
School of Business and Management Studies	160	53
School of Engineering	80	27
Total	**300**	**100**

Source: Planning Unit, Cape Coast Polytechnic, 2009/2010

Sampling Procedure

In this study, a combination of sampling methods was used for the selection of the sample. For the teaching staff, the census approach was used. The multi-stage sampling was used in the selection of the student's sample.

In the first stage, stratified sampling technique was used to partition the students population into the programmes they offered. Secondly, after obtaining these strata, the quota scheme was used to apportion various quotas to the programmes in the stratum (years) for the sample to be representative and also ensure valid generalizations of the study's results to the population.

In the third stage, the simple random sampling, that is, the lottery type was employed to select sample from the programme of study. Dillon, Madden and Firtle (1993) justify the unbiased nature of simple random sampling when they wrote that it guarantees that every sample of a given size as well as every individual in the target population has equal chance of being selected. In selecting the sample size of students from the programmes of study, their names were written on pieces of papers and put in a container. The container was shaken and shuffled and the respondents picked after each shuffle. The process continued until the required sample size was selected.

Instrument

The main instrument used for data collection was the questionnaire (See Appendices B and C). The questionnaire was chosen because it provides a much quicker means of gathering information from a fairly large population. Again it is economical, easy to construct and questions are consistent and uniform. It is,

however, limited to literate population and does not provide an opportunity to collect additional information (Fraenkel & Wallen, 2002). Leeding (1993) posits that questionnaire is one of the best impersonal observation techniques for eliciting data. Sarantakos (1998) identified questionnaire as being helpful in that they standardize data collection and ensure high confidentiality of respondents.

The development of the questionnaire was influenced by the review of relevant and related literature. Two sets of questionnaire were constructed; one for the teaching staff and the other for students. The questionnaire consisted of mostly closed-ended items and a few open-ended items since all the respondents were lettered. The instrument had five sections (See Appendices B and C). The first section requested information on respondents' demographic characteristics. That of the teaching staff included gender, age, educational qualification, academic rank, years of work and present status in the Polytechnic. That of the students included gender, age, programme of study and educational level.

The second section dealt with the accessibility and location of ICT facilities in the Polytechnic. Respondents were asked to indicate how accessible computers were to them and also indicate the ICT tools or application software that they used in their work. In both items, respondents were given a range of options to which they were to tick as many as were applicable. Respondents were further asked to indicate where ICT facilities and application software were located in the various places in the system. The purpose of this section was to find out whether the right kind of resources were provided and that they were at the expected places and access to the facilities were easy when there was the need.

The third section was in three parts. First, whether respondents had received training on the use of ICT facilities in or outside the Cape Coast Polytechnic; second, how adequate the training was and the third part solicited information on respondents' proficiency to use ICT facilities in teaching and learning activities. The fourth section, which was designed in the form of a four-point likert-type scale ranging from strongly agree, agree, disagree and strongly disagree was used to solicit information on the institutional support for ICT facilities put in place by the Cape Coast Polytechnic.

Finally, the fifth section, which was also designed in the form of a four-point likert-type scale ranging from strongly agree, agree, disagree and strongly disagree was used to solicit information on the challenges respondents faced in the use of ICT facilities. The last item was an open ended question that elicited suggestions in the improvement of ICT use in the Polytechnic.

Pilot-Testing of the Instrument

The main objective of the pilot-testing was to determine whether the items in the questionnaire possessed the desired qualities of measurement and understandability by those who responded to them. The pilot-testing was done to find out the possible ambiguities that would affect the answering of the items by the respondents who were involved in the study. According to Woken (2011), pilot-testing permits a thorough check of the planned statistical and analytical procedures, giving the researcher a chance to evaluate their usefulness for the data. The researcher may then be able to make needed alterations in the data collecting methods, and therefore, analyze data in the main study more efficiently.

The pilot-testing was done in the Takoradi Polytechnic. Two sets of questionnaires were given to 20 teaching staff and 20 students. These categories of people were used because they possessed similar characteristics with the population of the study. The feedback from the pilot test helped in rewording some of the items which were found to be ambiguous. It also helped in streamlining and reducing the number of items on the two sets of questionnaires. Questions which were found to be too loaded were reframed to facilitate easy response. In section A, *please tick in the appropriate box* was not initially indicated, *faculty* was changed to *school* to reflect the polytechnic system and the interval of the age range of respondents was corrected.

The return rate was 100% for both teaching staff and students. The reliability coefficients for the instrument as measured by Cronbach's Alpha during the pilot testing were .648 for the teaching staff and .661 for the students. Wikipedia (2011), states that internal consistency ranges between zero and one. A commonly accepted rule of thumb is that an alpha (α) of 0.6-0.7 indicates acceptable reliability, and 0.8 or higher indicates good reliability. The content of the instrument was validated by peers and supervisors. The result of the reliability coefficient is presented in Table 5.

Table 5: Result of Reliability Coefficient

Section	Cronbach Alpha	
	Staff	Student
B	.580	.771
C	.792	.804
D	.782	.906
E	.743	.620
Total	**.648**	**.661**

Source: Survey Data, 2011

Data Collection Procedure

The data used in the study were collected through the use of questionnaires that were administered to the staff and students of the Cape Coast Polytechnic.

In order to collect data from the campuses, permission was first sought from the Registrar using a letter of introduction from the Institute for Educational Planning and Administration (I.E.P.A) (See Appendix A) to introduce the researcher to the Rector of the Cape Coast Polytechnic. This was done to enable the researcher gain access to the respondents and be authorised for the collection of data.

To ensure effective data collection exercise, the respondents were informed that the exercise was strictly for academic purposes and therefore any information provided would be treated strictly confidential and used only for the reason stated. They were therefore encouraged to return the completed

questionnaires to the researcher immediately in order to reduce the incidence of maturation. The return rate of the questionnaire for a sample of 72 teaching staff was 60 representing 83.3% of the sample size where as for a sample of 300 students, the return rate was 300 representing 100% of the sample size. Hence the total sample size for the study was 360.

Data Analysis

The data that were collected on the views of the teaching staff and students of Cape Coast Polytechnic on utilization of ICT in facilitating teaching and learning were coded, edited, analysed and organised using Statistical Product for Services and Solutions (SPSS) version 15.0 software. The SPSS software helped in presenting the data in frequencies, percentages and tables. This gave a clearer picture of the responses from the respondents. The software was used because it is the most used package for analysing data (Gravetter & Wallnau, 2004). In addition, the advantages of the software include (a) it is user friendly, (b) it can easily be used to analyse multi-response questions, cross section and time series analysis and cross tabulation; (that is relate two sets of variables) and (c) it can also be used alongside Microsoft Excel and Word.

For the purpose of this study, the design for the study was descriptive so descriptive statistical tools were used to analyse data. The descriptive statistical tools used were tables, frequency counts, percentages, mean and standard deviation. The analysis of the research questions was done one after the other. In analysing research questions one and two descriptive statistical tools such as tables, frequency count and percentages were used to present results in tables of

summary statistics. Research questions three, four and five were analysed using mean and standard deviation. In scoring the items, appropriate weights were assigned to the degree of responses. These responses were assigned the following weights as 4-Strongly Agree, 3-Agree, 2- Disagree and 1- Strongly Disagree.

Summary

This chapter described the methodology that was used for the study. Issues such as the research design, population, sample and sampling procedure were discussed. The chapter also dealt with the research instrument, pilot testing of the instrument, data collection procedure and data analysis used in the study. The next chapter discusses how the data collected were analysed based on the research questions that guided the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

The study sought to find out the utilization of Information Communication and Technology (ICT) in facilitating teaching and learning at the Cape Coast Polytechnic. This chapter is organised under two main sections.

The first section presents background characteristics of respondents. The second section covers the results for the research questions of the study. The statistical procedure that was used includes tables, frequencies and distribution, percentages, mean and standard deviations whenever applicable.

Background Characteristics of Respondents

The study involved the sample of 360 respondents comprising 60 teaching staff and 300 students from the Cape Coast Polytechnic. Data of frequencies and percentages for the biographic information for the teaching staff and students of the Polytechnic are presented in tables. Table 6 shows the sex distribution of teaching staff and students who participated in the study.

Table 6: Sex Distribution of Respondents

Sex	Categories of Respondents			
	Teaching Staff		Students	
	No.	%	No.	%
Male	50	83.3	174	58.0
Female	10	16.7	126	42.0
Total	**60**	**100.0**	**300**	**100.0**

Source: Survey Data, 2011.

The results from Table 6 indicate that 50 (83.3%) of the teaching staff were males and 174 (58.0%) of the students were also males. This indicates that majority of the teaching staff were males emphasizing the male dominating nature of the teaching staff whereas the sex composition of the students was fairly balanced.

Concerning the age distribution of the respondents, the results from Table 7 indicate that 49 (81.6%) of the teaching staff who were involved in the study were aged between 30 and 49 years with none above the age 60 years. In the case of students, 241 (80.3%) were aged between 20 and 29 years with 44 (14.7%) aged between 30 and 39 years. This indicates that majority of the teaching staff were between 30 and 49 years whereas that of the students were between 20 and 29 years. This advantage will be of benefit to the Polytechnic if Management is able to develop training programmes that will endow this age group with the requisite skills and knowledge needed to adopt ICT in teaching and learning and

also catch up with global ICT trends and practices. Table 7 presents the age distribution of respondents.

Table 7: Age Distribution of Respondents

	Categories of Respondents			
Age	Teaching Staff		Students	
	No.	%	No.	%
20 – 29	9	15.0	241	80.3
30 – 39	29	48.3	44	14.7
40 – 49	20	33.3	9	3.0
50 – 59	2	3.3	4	1.3
60+	-	-	2	.7
Total	**60**	**100.0**	**300**	**100.0**

Source: Survey Data, 2011.

The Cape Coast Polytechnic had three schools and eleven academic departments. The schools and academic departments had their distinct role of teaching and research and this was done with various modes and methods of teaching that were chosen to suit the needs particular to areas of specialization. In this case, efforts were made to ensure that all schools were involved in the study. Table 8 shows the distribution of respondents by schools.

Table 8: Distribution of Respondents by Schools

School	Categories of Respondents			
	Teaching Staff		Students	
	No.	%	No.	%
Applied Sci & Arts	16	26.7	60	20.0
Business & Mgt Std	24	40.0	160	53.3
Engineering	20	33.3	80	26.7
Total	**60**	**100.0**	**300**	**100.0**

Source: Survey Data, 2011.

As reported in Table 9, 176 (58.7%) of the respondents were second year students, with 124 (41.3%) being third year students. This shows the proportional representation of respondents as they existed in the population.

Table 9: Educational Level of Students

Level	No.	%
200	176	58.7
300	124	41.3
Total	**300**	**100.0**

Source: Survey Data, 2011.

As reported in Table 10, 29 (48.3%) of the respondents were masters degree holders, 17 (28.4%) were bachelor degree holders while the rest of the respondents had qualification below the bachelor degree level. This shows that majority 46 (76.7%) of the respondents had academic qualifications ranging from bachelors degree to masters level and this put them in a better position to

understand the issues being investigated under this study. This is an indication that the Polytechnic recognized that ICT tasks at the Polytechnic are carried out by staff whose educational background should complement their role and expertise in teaching and learning activities. In this regard, the acquisition/deployment of staff was done considering the several areas and levels of expertise. Hence, given some form of training in ICT, with the academic qualification of these staff they would impart the knowledge and skills in teaching and learning.

Table 10: Academic Qualifications of Teaching Staff

Qualification	No.	%
PhD	2	3.3
Masters Degree	29	48.3
Bachelors Degree	17	28.4
Higher National Diploma	12	20.0
Total	**60**	**100.0**

Source: Survey Data, 2011.

Table 11 shows the various ranks of the teaching staff who took part in the study. From Table11, 24 (40.0%) of the total teaching staff were lecturers with 18 (30.0) of them being senior instructors. This clearly shows that most of the respondents covered in the study were lecturers and senior instructors. The indication here is that the lecturers and senior instructors had a onerous task in teaching activities in the Polytechnic. They have had to greatly impact students' learning and equip students with the necessary ICT skills that would enable them play meaningful roles in Ghana's economic development. Hence they had the

requisite experiences with regard to utilizing ICT in teaching that would enable them respond to the various issues being addressed in this study.

Table 11: Academic Rank of Teaching Staff

Rank	No.	%
Principal lecturer	-	-
Senior lecturer	2	3.3
Lecturer	24	40.0
Assistant lecturer	2	3.3
Principal Instructor	-	-
Senior Instructor	18	30.0
Instructor	5	8.3
Assistant Instructor	9	15.0
Total	**60**	**100.0**

Source: Survey Data, 2011.

Results from Table 12 indicate that 27 (45.0%) of the respondents had been working in the Polytechnic between 6 and 10 years, 14 (23.3%) had worked between 11 and 15 years, 3 (5.0%) had worked between 16 and 20 years whereas the rest had worked with the Polytechnic less than six years. This is an indication that the Polytechnic Management had put in place effective retention strategies that enable it to retain its core staff. Hence, respondents had the requisite experiences to enable them to respond to the various issues being addressed in this

study. Table 12 presents the number of years spent by teaching staff in the Polytechnic.

Table 12: Number of Years Spent by Teaching Staff in the Polytechnic

Number of Years	No.	%
1 – 5	16	26.7
6 – 10	27	45.0
11 – 15	14	23.3
16 – 20	3	5.0
Total	**60**	**100.0**

Source: Survey Data, 2011.

As reported in Table 13, 58 (96.7%) of the respondents were full time workers, 2 (3.3%) were part time workers whereas no worker on contract partook in the study. This implies that the participants had in-depth knowledge about the present position, hence, they were in a position to provide insights into the nuances pertaining to certain issues that they were grappled with.

Table 13: Present Status of Teaching Staff in the Polytechnic

Present Status	No.	%
Full Time	58	96.7
Part Time	2	3.3
On Contract	-	-
Total	**60**	**100**

Source: Survey Data, 2011.

The rest of the analyses of the study were done based on the research questions raised by the researcher to guide the study. The responses of both the teaching staff and students were discussed under the research questions that guided the study.

Findings of the Study

This section addresses the key research questions that were formulated to guide the study. The discussions were based on the responses from the teaching staff and students.

Types of Application Programmes Used In Teaching and Learning at the Cape Coast Polytechnic

One of the main objectives of the study sought to find out the application programmes or software at the disposal of respondents in their various departments and whether they used them in their teaching and learning activities. In order to know the application programmes used, respondents were asked how accessible computers were to them since computers were the main vehicle for conveying these application programmes. Table 14 presents responses of respondents.

The result from Table 14 shows that both staff and students had personal computers in addition to using computers at their offices, café or their friends' computers. This indicates that both staff and students had access to computers. This confirms McCannon and Crews' (2000) view that the use of computers in education opens a new area of knowledge and offers a tool that has the potential to

change some of the existing educational methods. It also confirms what Sandholz, Ringstaff and Dwyer, (1991); Howe, Tolmie and McKenzie, (1996) and McFarlane, (1997) posit that levels of collaboration, communication, knowledge building and thinking skills are enhanced by the use of computers.

Table 14: Respondent's Accessibility to Computers

Items	Response									
	Teaching Staff					Students				
	Yes		No			Yes		No		
	No.	%	No.	%	Total	No.	%	No.	%	Total
I have a personal computer	53	88.3	7	11.7	60	158	52.7	142	47.3	300
I use a computer at the café	10	16.7	50	83.3	60	113	37.7	187	62.3	300
I use a computer at the office	33	55.0	27	45.0	60	*	*	*	*	300
I use a friend's computer	*	*	*	*	60	117	39.0	183	61.0	300
I have no access to computers	-	-	60	100.0	60	27	9.0	273	91.0	300

Source: Survey Data, 2011 Scale: 1= Yes, 2= No

* Respondents were not asked that particular question

The next item concerned the types of application programmes that staff and students used in their teaching and learning activities. The respondents were asked to indicate by ticking as many as applicable, the application programmes or software that they used in their teaching and learning activities. Table 15 presents the application programmes used by the respondents at the Cape Coast Polytechnic.

The data gathered from the study indicates that the application software mostly used by both staff 57 (95.6) and students 220 (73.3) in their teaching and learning activities was word processing. This finding is consistent with what Lever-Duffy, Mcdonald and Mizell (2005) assert that word-processing software is the most commonly used application software. This was followed by staff 51 (85.0) and student's 207 (69.0) internet access and the use of e-mail having 47 (78.3) from staff and 156 (52.0) from students. The presentation software, spreadsheets and database management systems were the least used ones. These findings are in support of Lever-Duffy et al. (2005), that for teachers and students to get the most out of software, they need to become familiar with how it works because software evaluation, acquisition, installation, and training are indeed extensive tasks. The up-front investment of time and energy in this process, however, will make the difference between the acquisition of valuable educational tools and the purchase of software that looked good on first inspection but ended up gathering dust in a storage closet.

Table 15: Application Programmes used by Respondents

Items	Response									
Application Programmes	Teaching Staff					Students				
	Yes		No			Yes		No		
	No.	%	No.	%	Total	No.	%	No.	%	Total
Word Processing	57	95.6	3	5.0	60	220	73.3	80	26.7	300
Spreadsheet	19	31.7	41	68.3	60	66	22.0	234	78.0	300
Database Management System	2	3.3	58	96.7	60	14	4.7	286	95.3	300
Presentation Software	12	20.0	48	80.0	60	54	18.0	246	82.0	300
E-mail	47	78.3	13	21.7	60	156	52.0	144	48.0	300
Internet Access	51	85.0	9	15.0	60	207	69.0	93	31.0	300

Source: Survey Data, 2011

Scale: 1= Yes, 2= No

The Location of ICT Facilities and Application Programmes in the Cape Coast Polytechnic

The second research question sought to find out where the ICT facilities for the staff and students of the Polytechnic were located in the system which enabled them to utilize them. Table 16 shows the locations of the ICT facilities and application programmes in the Cape Coast Polytechnic.

Table 16 shows the responses from staff and students when asked to indicate where their ICT facilities were located. The facilities were computers, printers, software and internet access. The result from the study indicates that these facilities were located at the ICT Centre, Head of Department's office, computer laboratory and library. This finding is in conformity to what Fabry and Higgs (1997) pointed out that if teachers and their students are to have adequate access to ICT facilities which are to enhance learning, then not only do those facilities need to be located in a position where all can access them, but they also need to be of a high enough specification to make their use worthwhile. It also confirms what The Department of Education (2011) states that the school management must provide the services and technologies needed to gain maximum access to information and provide functional facilities to support the school's wide range of information needs.

Table 16: Location of ICT Facilities and Application Programmes

Resources	Relative Frequency (%)									
	Lecture Rooms		Computer Laboratory		Library		Head of Dept. Office		ICT Centre	
	TS	STUD	TS	STUD	TS	STUD	TS	STUD	TS	STUD
Computer	-	-	93.3	77.0	50.0	37.0	88.3	63.7	86.7	71.0
Internet Access	-	-	15.0	9.7	45.0	36.3	26.7	41.0	51.7	65.0
Printer	-	-	43.3	53.7	56.7	58.7	50.0	43.7	73.3	52.3
Application Software	-	-	11.7	57.0	58.7	58.0	51.7	54.7	90.0	55.7

TS= Teaching Staff STUD= Students

Source: Survey Data, 2011

However, the findings indicated that none of the ICT facilities were located at the lecture rooms. This finding supports what Mumtaz (2000) points out that lack of computers and software in the classrooms can seriously limit what teachers can do in the classroom with regard to the implementation of ICT.

Although respondents indicated that there were computers at the various locations, an observation made from the Computer Laboratory, Library and ICT Centre revealed that most of the computers were not being used because the service providers had not yet done the installations for the computers to be used. Moreover, a few computers on which some initial installations had been done were being used under great pressure due to the increasing number of staff and students.

The trend was the same for the location of printers and application softwares. Majority of the respondents indicated that there were printers and application softwares at the ICT Centre whereas the printers and application software could also be located at the library, Head of Department's office and computer laboratory. However, there were no printers and softwares at the lecture room. An observation made from the various locations of the printers indicated that though there were a number of printers in the system, they were not adequate for the work to be done in the Polytechnic. On the application softwares, though respondents indicated that they were on their computers, they were not putting them to use.

An observation at the various locations of having internet access revealed that internet access was not reliable. Not all computers had been connected to the internet. Moreover, the few computers that had been

connected were very slow, unstable and were most of the time not functional. This situation existed because of problems of networking and unreliable internet service providers.

Staff and Student's Proficiency in ICT Usage at Cape Coast Polytechnic

The third research question of the study was intended to find out whether the staff and students had the capacity to use the ICT facilities at their disposal and whether the second strategic thrust of the Polytechnic's ICT Policy Plan (September 2007 – September 2010) "To provide a sustainable training programme for personnel to acquire adequate knowledge in ICT" had been fulfilled.

The questions that sought to answer research question three were in three parts; Parts A, B and C were all closed-ended items. Part A sought to find out from the staff and students whether or not they had received any training in the use of ICT facilities by the Cape Coast Polytechnic.

Table 17: Responses of Respondents on Whether or not they had Received any Training in the use of ICT Facilities by the Cape Coast Polytechnic

Responses	Teaching Staff		Students	
	No.	%	No.	%
Yes	-	-	300	100.0
No	60	100.0	-	-
Total	**60**		**300**	

Source: Survey Data, 2011

Table 17 reports that when respondents were asked whether or not they had received any training in the use of ICT facilities by the Cape Coast Polytechnic, 300 (100%) students responded in the positive while 60 (100%) staff responded in the negative. The indication here is that whereas the Cape Coast Polytechnic trained their students in the use of ICT, it did not train its staff in the use of ICT.

On the part of the students, who received their ICT training from the Polytechnic, information from the students' handbook indicated that every Polytechnic student offered an ICT course. The course titled Computer Literacy (CLT 101) was taught in the first and second semesters of the first year in the Polytechnic. The course was aimed at exposing students to the concepts of ICT and also to foster their skills training in ICT. To achieve this aim, some of the topics taught according to the course outline included; basic concepts of ICT; introduction to the computer; input/output devices; data communications; networks; the internet; health and safety measures in the computer workplace and the basics of information systems (Wilson & Wilson, 2008).

However, on the part of the staff, who had not received ICT training by the Polytechnic, training in ICT was received outside the Polytechnic. The indication here was that the Polytechnic had not organised any ICT training for its staff. This is likely to cause some problems for the Polytechnic as stated by Kirkwood et al. (2000) that expecting teachers to train in their own time caused a slow uptake in the training.

Part B sought to find out from respondents how adequate their training was. In measuring how adequate the ICT training was, the options given to

respondents to select from were; strongly agree, agree, disagree and strongly disagree which were transformed into numerical scores of 4, 3, 2 and 1, respectively for analysis of the data (See Appendix D for frequency distribution of responses). Mean and standard deviation were the statistical procedures used to analyse the data. A mean score of above 2.5 indicated highly adequate and below 2.5 constituted low adequacy. Table 18 presents responses of respondents.

Table 18: Adequacy of ICT Training Received by Respondents

Adequacy of ICT training programme	Teaching Staff		Students	
	M	SD	M	SD
I am satisfied with the quality of the ICT training programme received	2.42	0.889	1.96	0.882
The duration of the ICT training programme received is adequate	1.18	0.567	1.93	0.829
The teaching methods adopted for the ICT training programme have enhanced my understanding	2.88	0.761	2.18	0.876
The ICT training programme provided me with new ways of being efficient in my job	2.80	0.879	2.50	0.890
I would have wished to receive such ICT training in Cape Coast Polytechnic	3.25	0.795	*	*
I make maximum use of ICT after the training	*	*	2.39	0.906

Source: Survey Data, 2011 M= Mean SD= Standard Deviation

Scale: 1= Strongly Disagree, 2= Disagree, 3= Agree 4= Strongly Agree.

* Respondents were not asked that particular question.

The first item sought to find out from respondents whether the quality of the ICT training programme received was adequate. With a mean of 2.42 on the part of the staff and 1.96 on the part of the students, respondents indicated that the quality of the ICT training received was not adequate. The British Educational Communications and Technology Agency (BECTA) (2004) contend that the issue of training teachers in how to use ICT to effectively manage student's learning, rather than simply training them in the skills of using ICT equipment, is an important one.

The data from staff (M=1.18, SD=0.567) and students (M=1.93, SD= 0.829) indicate that the duration of the ICT training programme received was not adequate. This situation could be so because the teaching staff did not have enough time to grasp all the content and so felt the need to have further training. The students also contended that the Computer Literacy course taken in the first year was a three credit course, thus only three hours in a week. They however posited that the course should be continued to the final year since each year of the academic calendar came with its own ICT challenges. The indication here is that the Polytechnic should organize periodic ICT training for the teaching staff to augment the ones they had received outside the Polytechnic. This finding is consistent to a study done by Manternach-Wigans et al. (1999) that teachers are very concerned about the lack of time for technology; they feel that they need more time to learn computer basics, plan how to integrate technology into their lessons and actually use the technology in the classroom. Schacter (1999) further posits that professional development programmes should be continuous to ensure effectiveness of the programme.

Another item in Table 18 was the issue of whether the teaching methods adopted for the ICT training programme had enhanced the understanding of respondents in using ICT facilities. With a mean of 2.88, staff indicated that the teaching methods were adequate whereas students indicated that it was not adequate with a mean of 2.18. This situation existed because the teaching method appropriate for the computer literacy course should be demonstration. However, due to the problem of unreliable service providers, most of the ICT facilities in the Polytechnic could not be accessed. This situation leaves the teaching of the course to no other teaching method than the lecturing method which did not foster effective delivery of the course content. This finding is consistent to the finding of a study conducted by Division of Higher Education (2002) that choosing and recommending ICT tools and teaching methods appropriate to individual learning objectives and managing learning environments that allow the use of different ICT tools and teaching methods promotes the achievement of individual learning objectives.

As to whether the ICT training programme provided respondents with new ways of being efficient in teaching and learning activities, the mean score of 2.80 from staff and 2.50 from students were obtained indicating that the training provided new ways for the respondents. This finding is in conformity to the result of the study of Division of Higher Education (2002) that the focus of professional development will be on developing the confidence and competence of teachers, building upon their previous education and professional development in applying ICT to teaching. It means that by providing ICT training to both lecturers and students, the Polytechnic would be developing the confidence and competence of lecturers and their students to

enable them to use ICT as professionals in the chosen professions. In addition, it would improve the efficiency in the educational system by improving memory retention, increase motivation and deepen understanding (Dede, 1998).

Consequently, the information gathered revealed that students did not make maximum use of ICT facilities after the training. This could be due to lack of ICT facilities for the students to practice what they had been taught. The staff also indicated that they wished to receive ICT training in the Polytechnic. This situation could be so because the ICT training received outside the Polytechnic might not have been practically/directly towed towards teaching and learning.

Part C further required the respondents to indicate how proficient they were in using ICT to facilitate teaching and learning. In measuring how proficient respondents were in the use of ICT, the options given to them were; strongly agree, agree, disagree and strongly disagree which were transformed into numerical scores of 4, 3, 2 and 1 respectively for analysis of the data (See Appendix E for frequency distribution of responses). Mean and standard deviation were the statistical procedures used to analyse the data. A mean score of above 2.5 indicated high proficiency and below 2.5 constitute low proficiency. The responses from the respondents are presented in Table 19.

Table 19: Respondents Proficiency in ICT

	Teaching Staff		Students	
Proficiency in ICT	M	SD	M	SD
Using computers help me to improve my presentations during lectures.	3.17	0.740	3.36	0.770
I always require the assistance of an expert when I use a computer	2.02	0.770	2.51	0.990
I can solve most application problems when I use computers	2.75	0.600	2.82	0.878
I use ICT facilities to meet specific teaching and learning objectives	2.32	0.750	*	*
I teach lessons in which students apply ICT/Computer technology tools	2.35	0.732	*	*
I use ICT in giving and receiving assignment	2.00	0.736	*	*
I have never used ICT/Computers	*	*	3.65	0.690

Source: Survey Data, 2011 M=Mean SD=Standard Deviation

Scale: 1= Strongly Disagree, 2= Disagree, 3= Agree 4= Strongly Agree.

* Respondents were not asked that particular question.

The first item in Table 19 sought to find out whether using computers helped respondents to improve upon their presentations during lectures. The mean obtained for the item was 3.17 for the staff and 3.36 for students which show that respondents were of the view that the use of computers helped them to improve their presentations during lectures. However, an observation made from the various departments indicated that there were inadequate projectors to

enhance presentations during lectures. This finding is in conformity to what Lever-Duffy et al., (2005) indicated that whether for teacher-led presentations or student-led class reports, presentation software can help to organize and enhance the delivery of content.

Similarly, with a mean of 2.75 obtained from staff and 2.82 obtained from students, respondents indicated that they could solve most application problems when they used computers. In a study, Plomp et al., (1996) and Voogt (2003) observed that ICT should be used to develop students' skills for cooperation, communication, problem solving and lifelong learning.

However, the result from Table 19 indicate that the teaching staff were not able to use ICT facilities to teach lessons or meet specific teaching and learning objectives and they always required the assistance of an expert whenever they used a computer. This situation existed because even though the teaching staff acquired some level of proficiency in ICT from the training received outside the Polytechnic, the course content might not have been towed towards the teaching and learning situation in the Polytechnic. Besides, it seemed difficult for most of the teaching staff to switch to new educational methodologies especially with the use of ICT in teaching due to the ongoing speed of technological developments.

Furthermore, the study sought to find out whether the teaching staff taught lessons in which students applied ICT/Computer technology tools and resources to enhance teaching and learning. The results obtained showed a mean of 2.35 and standard deviation of 0.732. This implied that the teaching staff were not able to incorporate the use of ICT facilities to enhance teaching and learning.

In addition, with a mean of 2.00 and standard deviation of 0.736, the teaching staff indicated that they did not use ICT facilities in giving and receiving assignments. This finding is in conformity to a study done by The Centre for The Advancement of Teaching and Learning (2003) which revealed that the reasons why ICT is not used in giving and receiving assignment could be because attached assignments may contain viruses; transmission problems may cause extra work for lecturers if students have to be contacted to resend assignments and not all students may have e-mail address.

Institutional Support for the Use of ICT in Facilitating Teaching and Learning at the Cape Coast Polytechnic

One of the research questions sought to find out whether the staff and students were aware of the institutional support given by the Cape Coast Polytechnic with regard to facilitating the use of ICT in teaching and learning. This question tried to determine whether the respondents knew that there were Committees and Units that were responsible for all issues related to ICT and also whether the staff and students knew the appropriate bodies to seek redress or channel their grievances in their use of ICT in the Cape Coast Polytechnic.

In soliciting views on this research question, respondents were provided with options ranging from strongly disagree, disagree, agree, and strongly agree which were given numerical values of 1,2,3,4, respectively (See Appendix F for frequency distribution of responses). The tools which were used in analyzing the data were the mean and the standard deviation. The average mean score obtained was 2.5 and values higher indicated that respondents agreed with the statement and values below the mean score

indicated that the respondents disagreed with the statement. Table 20 presents responses of respondents on the institutional support given by the Cape Coast Polytechnic.

Table 20: Institutional Support for ICT Use

	Teaching Staff		Students	
Institutional support for ICT use	M	SD	M	SD
There are Sections/Units that monitor Cape Coast Polytechnic's ICT facilities	2.28	0.783	2.09	0.923
There are Sections/Units that are responsible for the maintenance of ICT facilities in the Cape Coast Polytechnic	2.12	0.761	2.17	0.943
There is access to wireless internet connection in Cape Coast Polytechnic.	1.87	0.833	1.57	0.825
I am satisfied with the provision of ICT facilities by Cape Coast Polytechnic	1.52	0.701	1.57	0.757
There is reliability of ICT facilities for use in Cape Coast Polytechnic	*	*	1.70	0.804
Students are entitled to free hours of browsing at the computer laboratory	*	*	1.60	0.826
Cape Coast Polytechnic has an ICT policy	2.18	0.813	*	*

Source: Survey Data, 2011 M= Mean SD=Standard Deviation

Scale: 1= Strongly Disagree, 2= Disagree, 3= Agree 4= Strongly Agree.

* Respondents were not asked that particular question.

The first item sought to find out whether there were Sections/Units that monitored Cape Coast Polytechnic's ICT facilities. With a staff mean of 2.28 and student mean of 2.09 respondents indicated that they did not have

knowledge about the existence of Sections/Units that monitored the Polytechnic's ICT facilities.

As to whether there were Sections/Units that were responsible for the maintenance of ICT facilities in the Cape Coast Polytechnic, a mean of 2.12 from staff and 2.17 from students were obtained. This indicates that respondents were not aware that there were Sections/Units that were responsible for the maintenance of ICT facilities in the Cape Coast Polytechnic. This finding corroborates a study done by BECTA (2004) on the barriers to ICT usage which revealed that if there is lack of technical support available in a school, then it is likely that preventative technical maintenance will not be carried out regularly, resulting in a higher risk of technical breakdowns.

The next item was whether respondents had access to wireless internet connection in Cape Coast Polytechnic. A mean of 1.87 from staff and 1.57 from students were obtained. This, therefore, implies that respondents disagreed that there was access to wireless internet connection in the Cape Coast Polytechnic. The Computer Information Systems (2010) argues that institutions in their quest to support ICT usage should pursue their causes by availing resources which include computer laboratories, network resources and wireless network access.

The results from Table 20 indicate that students were not entitled to free hours of browsing at the computer laboratory. This item had a mean of 1.60 and standard deviation of 0.826.

As to whether the teaching staff were aware that the Cape Coast Polytechnic had an ICT policy, the mean score obtained was 2.18 with a

standard deviation score of 0.813. The finding indicates that majority of the teaching staff were not aware of the existence of the ICT policy in the Cape Coast Polytechnic. Deelstra et al. (2003) argues that the basic assumption, among many scholars in policy research, is that the policy design is fundamentally a process of collaboration and negotiation. Commenting on this, educational policymakers should invite the diverse and different viewpoints of the various stakeholders, involve stakeholders in all stages of the policy to enhance active participation and avoid experiencing difficulties in reaching the focal objectives of policies.

On the issue of whether respondents were satisfied with the provision of ICT facilities by Cape Coast Polytechnic, the mean obtained was 1.52 for staff and 1.57 for students. This implies that respondents were not satisfied with the provision of ICT facilities by the Cape Coast Polytechnic.

It was clearly established from both staff and students that the institutions support for ICT was low. This emanated from the fact that Sections/Units that were to monitor and maintain the Cape Coast Polytechnic's ICT facilities were not seen to be working, there was non reliability of ICT facilities for use in Cape Coast Polytechnic and there was no wireless internet connection in Cape Coast Polytechnic. In addition, students were not entitled to free hours of browsing at the computer laboratories in Cape Coast Polytechnic and there was no awareness of the ICT Policy Plan. In all, respondents were not satisfied with the provision of ICT facilities by Cape Coast Polytechnic.

This indicates that even although the Polytechnic had a 5-year Strategic Plan from 2007-2011 and a 3-year ICT Policy Plan from September 2007 - September 2010, the framework for achieving these policies had not been

executed. The 5-Year Strategic Plan and 3-Year ICT Policy Plan of the Cape Coast Polytechnic are not likely to be achieved as both staff and students were not aware of their existence. Whittaker (1999) asserts that failure of ICT projects are attributed to many factors such as poor planning, lack of top management support and failure to address risk areas. Similarly, Lewarn (1999), McCarter (1999), Moreby (1999), Zec et al. (2000) contend that some of the rationales for the failures of policy objectives could be attributed to the fact that the policy itself was not clear about the responsibilities of different parties and the terms and provisions in the convention of the policy are vague and opened to diverse interpretation. Thus the

Challenges Faced By Staff and Students of the Cape Coast Polytechnic in the Usage of ICT in Facilitating Teaching and Learning

Another important research question that the study sought to answer was the challenges or barriers that the staff and students of the Cape Coast Polytechnic faced in their use of ICT facilities. Challenges could prevent the accomplishment of task and the achievement of goals.

In soliciting views on the challenges faced by respondents in their use of ICT facilities, respondents were provided with options ranging from strongly disagree, disagree, agree, and strongly agree which were given numerical values of 1,2,3,4, respectively (See Appendix G for frequency distribution of responses). The tools which were used in analyzing the data were the mean and the standard deviation. The average mean score obtained was 2.5 and values higher indicate that respondents agreed with the statement and values below the mean score indicate that the respondents disagree with

the statement. Table 21 presents responses of respondent on the challenges they faced in ICT use.

Table 21: Challenges Faced by Respondents in their use of ICT Facilities

Challenges	Teaching Staff		Students	
	M	SD	M	SD
Inadequate computer peripherals for teaching and learning	3.48	0.567	3.43	0.939
Unreliable internet service providers/ telecommunication connectivity problems	3.48	0.813	3.35	0.858
Lack of maintenance of ICT infrastructure	3.40	0.741	3.29	0.928
Inadequate computers for teaching and learning	3.35	0.633	3.43	0.994
Inadequate professional training	3.20	0.840	3.25	0.929
Constant interruption of electricity supply	3.03	0.780	2.99	0.890
Teaching time schedule prevents maximum utilization of ICT for teaching and learning	2.58	0.850	*	*
Inadequate financial support to develop instructional materials	3.25	0.795	*	*
Students pay too much to access computers/ICT facilities off-campus	*	*	3.16	0.922
Students pay too much to access computers/ICT facilities on campus	*	*	3.16	0.939

Source: Survey Data, 2011 M=Mean SD=Standard Deviation

Scale: 1= Strongly Disagree, 2= Disagree, 3= Agree 4= Strongly Agree.

* Respondents were not asked that particular question.

From the findings of the study, the respondents stated that inadequate computers and computer peripherals such as printers, scanners and projectors for teaching and learning were their biggest challenge. In a worldwide study of the obstacles to the integration of ICT in education, Pelgrum (2001) found that the most frequently mentioned problem when teachers were asked about obstacles to their use of ICT was the insufficient number of computers available to them.

In addition, respondents indicated unreliable internet service providers / telecommunication problems as another challenge. This finding supports a study by Cuban (1999) which found out that in schools that cannot afford technicians, there were often software glitches and servers that crash, torpedoing lessons again and again.

Also, respondents indicated inadequate professional training to support ICT use as one of the challenges faced. This finding supports a study by Preston et al. (2000) which revealed that teachers felt that they had not had adequate training, particularly in their ability to solve technical problems and in understanding the basic workings of the technology.

Furthermore, respondents reported lack of maintenance of ICT infrastructure as a challenge. This finding supports a study done by BECTA (2004) into barriers of ICT usage. The study revealed that another barrier originates from actual breakdowns of equipment, and the subsequent disruption that these can cause. If there is lack of technical support available in a school, then it is likely that preventative technical maintenance would not be carried out regularly, resulting in a higher risk of technical breakdowns (BECTA,

2004). Inadequate financial support was a challenge faced by both staff and students in their use of ICT facilities at the Cape Coast Polytechnic.

Another barrier as indicated by both staff and students was constant interruption of electricity supply. Vota (2011) argues that electrical power is an issue across Africa or more accurately, the lack of reliable, affordable electricity is one of the greatest barriers to the adoption of ICT. Similarly, News Africa's Report on January 5, 2011 indicates that lack of electricity is a significant barrier to ICT take-up in developing countries.

Finally, the teaching staff indicated that teaching time schedule prevented maximum utilization of ICT for teaching and learning and inadequate financial support to develop instructional materials as challenges they faced in the use ICT facilities. The students also indicated that they paid too much to access computers/ICT facilities on and off-campus.

This chapter discussed the analysis of the findings of the study. The next chapter which is the final chapter discusses the summary and conclusion of the study and also recommendations for the study and ends with suggested areas for further study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter deals with the summary of the research findings, conclusions, and recommendations. In addition, the chapter offers suggestions for further research.

Overview of the Study

The study investigated the utilisation of ICT facilities in facilitating teaching and learning at the Cape Coast Polytechnic. Specifically, the study:

1. Identified ICT facilities and application programmes that were used in teaching and learning at the Cape Coast Polytechnic.
2. Ascertained the location of ICT facilities and application programmes at the Cape Coast Polytechnic.
3. Examined the staff and students' proficiency in ICT in facilitating teaching and learning at the Cape Coast Polytechnic.
4. Examined the institutional support that the Polytechnic gave its staff and students in facilitating teaching and learning at the Cape Coast Polytechnic.
5. Identified the challenges faced by staff and students of the Cape Coast Polytechnic in their use of ICT facilities in the teaching and learning situations.

The design used for the study was the descriptive survey. A sample size of 60 staff and 300 students was selected from a population of 72 staff and 3,463 students of the Polytechnic. The census method was used to select all academic staff. The selection of the students was done through the use of

stratified sampling technique with proportional allocation. Simple random technique, using the lottery method was used to select the respondents from each stratum. A set of questionnaire developed by the researcher with the assistance of the supervisors, was the main instrument used in the study. The questionnaire was made up of closed–ended and open–ended items. The first part of the questionnaire sought to find out the demographic data of respondents while the second part was meant to solicit information on the main research questions.

The questionnaire was pilot-tested at the Takoradi Polytechnic. Two set of questionnaires were given to 20 teaching staff and 20 students. The reliability coefficients for the instrument as measured by Cronbach's Alpha during the pilot-testing were .648 for the teaching staff and .661 for the students. The pilot-testing helped the researcher to revise and edit the questionnaire used in the main study making it more specific and effective in eliciting the needed responses. The main data collection was done at the Cape Coast Polytechnic. The researcher administered the questionnaire to 60 staff and 300 students and the return rate of 83% for staff and 100% for students were obtained. The descriptive statistics such as percentages, frequency, mean and standard deviation were used where applicable.

Key Findings

The key findings of the study were:

On the type of ICT facilities and application programmes used by staff and students, the results show that both staff and students had personal computers in addition to using computers at their offices, café or their friends'

computers. The application software mostly used by both staff and students in their teaching and learning activities was word processing, followed by internet access and the e-mail while the presentation software, spreadsheets and database management systems were the least used ones.

ICT facilities with respect to computers, printers, software and internet access were located at the ICT Centre, Head of Department's office, computer laboratory and library. However, none of these facilities were located at the lecture rooms.

The staff had acquired a level of ICT proficiency outside the Polytechnic whereas the students had acquired their proficiency in the Polytechnic.

Both staff and students indicated that the institution's support for ICT was low. This was because Sections/Units that were to monitor and maintain the Cape Coast Polytechnic's ICT facilities were not seen to be working, there was non reliability of ICT facilities for use in Cape Coast Polytechnic, there was no wireless internet connection in Cape Coast Polytechnic, students were not entitled to free hours of browsing at the computer laboratories in Cape Coast Polytechnic and there was no awareness of the ICT Policy Plan. In all, respondents were not satisfied with the provision of ICT facilities by Cape Coast Polytechnic.

The staff stated unreliable internet service providers/telecommunication problems and inadequate computer peripherals for teaching and learning was their biggest challenge. Consequently, students indicated inadequate computers for the number of students on campus and inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT for teaching

and learning as their biggest challenge. In addition, respondents indicated inadequate professional training to support ICT use as one of the challenges faced.

Conclusions

Based on the findings of this study, it was concluded that:

1. The Cape Coast Polytechnic had not succeeded in furnishing the lecture rooms where teaching and learning activities were predominantly done with ICT facilities.
2. The staff of Cape Coast Polytechnic had acquired a level of ICT proficiency on their own where as the students had acquired their proficiency through the efforts of the Polytechnic. However, provision had not been made by the Management of the Polytechnic in making all their teaching and learning activities ICT oriented. The Polytechnic had not really computerized all its teaching and learning activities and as a result, much of teaching and learning were done without using ICT.
3. The Polytechnic had embraced the information revolution with the development of a 3-year ICT Policy Plan from September 2007 - September 2010 and a 5-year Strategic Plan from 2007-2011. However, the framework for achieving these policies had not been executed.
4. The Cape Coast Polytechnic's support for ICT was low.
5. ICT use was hampered by factors such as unreliable internet service providers/telecommunication problems, inadequate computers and computer peripherals for the number of staff and students, inadequate

professional training and inadequate awareness of the existence and effective implementation of the ICT Policy Plan.

Recommendations for Policy and Practice

The findings from the study and the conclusions provide a basis for a number of recommendations for consideration. The following recommendations are made:

1. The Cape Coast Polytechnic should negotiate with a good service provider to furnish all departments with computers and their accessories and make installations on all computers in the system that are not being used.
2. The Management of the Cape Coast Polytechnic should employ internet service providers to provide the Polytechnic with reliable and stable intranet and internet connections to enhance connectivity at all places on campus. This can be done by using a percentage of the academic user fee paid by students for ICT.
3. The framework for achieving the 5-year Strategic Plan and ICT Policy Plan (2007-2011) should be reviewed by the Management of the Polytechnic and extensive measures taken to implement the policy.
4. The Cape Coast Polytechnic should provide an alternative source of power so that ICT facilities can be used in the event of power failure from the national grid.
5. There should be easy and increase access to ICT facilities by increasing infrastructure and equipment as well as making the existing equipment more available to the staff and students.

6. The Cape Coast Polytechnic should organise regular training sessions in ICT use for the staff and students to update their knowledge and skills in it since the area is a fast changing one because of innovations and discoveries. This among other things will make the staff and students abreast with the current trends in ICT.
7. The staff should be encouraged to deliver lectures using power point. In this light, the Cape Coast Polytechnic should invest into this venture by buying projectors and telejectors for the lecture halls and training the existing staff with required ICT skills in delivery of lectures and practicals.
8. ICT must be included in the Polytechnic's curricula at all levels and staff should be trained and prepared to teach ICT as a course at different levels.
9. Government should build ICT infrastructure for the polytechnic. However, since the cost of ICT infrastructure is too high for government alone to bear, the private sector should be encouraged to collaborate with the educational institutions to develop the infrastructure for training of staff and students.
10. Governmental policies on human resource management at Polytechnics should provide an organisational structure and sufficient financial means for polytechnics to have an adequate ICT staff unit. This is however crucial for deployment of ICTs in education.

Suggestions for Further Research

1. The study should be replicated by other researchers to know the state of the utilization of ICT in teaching and learning in the other Polytechnics in Ghana.
2. A comparative study could be conducted in other Polytechnics to give a general picture of the situation.
3. Research could also be carried out to find out how the ICT Policy Plan and 5-Year Strategic Plan of the Cape Coast Polytechnic is being carried out.

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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST
FACULTY OF EDUCATION
INSTITUTE FOR EDUCATIONAL PLANNING AND ADMINISTRATION

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Ghana

23rd February, 2011

Our Ref. EP/ 144.8/V.2/171

The Rector
Cape Coast Polytechnic
Cape Coast

LETTER OF INTRODUCTION

The bearer of this letter, **Afua Anima Gyamera** is a graduate student of the Institute for Educational Planning and Administration of the University of Cape Coast. She requires some information from your outfit for the purpose of writing a Thesis as a requirement of M.Phil Administration in Higher Education degree programme.

We should be grateful if you would kindly give her the necessary assistance to enable her collects the information she requires from your outfit.

While anticipating your cooperation, we thank you for any help that you may be able to give.

Mr. Y. M. Anhwere
Assistant Registrar
For: Director

APPENDIX B

QUESTIONNAIRE FOR STAFF

The purpose of this study is to have an over view of the state of the utilization of ICT by staff as it relates to teaching and learning in the Cape Coast Polytechnic. You are assured of the confidentiality of your responses, so you are kindly requested to answer the questions as candid as possible.

SECTION A. DEMOGRAPHIC DATA

1. Gender

   a) Male [ ] b) Female [ ]

2. Age as at last birthday

   a) 20- 29 years [ ]

   b) 30- 39years [ ]

   c) 40- 49 years [ ]

   d) 50- 59years [ ]

   e) 60years + [ ]

3. Highest educational qualification attained

   a) PhD [ ]

   b) Masters Degree [ ]

   c) Bachelors Degree [ ]

   d) Higher National Diploma [ ]

4. Academic Rank (Please State) …….....

5. School (Please State)……

6. Department (Please State)……

7. How many years have you been working in this Polytechnic?

   a) 1 – 5years [ ]

   b) 6 – 10years [ ]

   c) 11 – 15years [ ]

   d) 16 – 20years [ ]

8. Present Status

   a)Full time [ ] b) Part time [ ] c) On contract [ ]

SECTION B. ACCESSIBILITY AND LOCATION OF ICT FACILITIES

9. How accessible are computers to you? (Tick (√) as many as applicable).

   a) I have a personal computer [ ]

   b) I use computer at the café [ ]

   c) I use computer at the office [ ]

   d) I have no access to computers [ ]

10. Which of the following ICT tools/application software do you use for your work? (Tick (√) as many as applicable).

    a) Word processing [ ]

    b) Spreadsheet [ ]

    c) Database management systems [ ]

    d) Presentation software [ ]

    f) Email [ ]

    g) Internet access [ ]

11. Indicate by ticking (√) in the space provided where ICT facilities in the Cape Coast Polytechnic can be located.

Facilities	**Lecture room**	**Computer laboratory**	**Library**	**Head of Department's Office**	**ICT Centre**
Computer					
Internet access					
Printer					
Software					

SECTION C. PROFICIENCY IN ICT (TRAINING PROGRAMMES)

Please indicate by ticking (√) your levels of agreement on training programmes you have received in ICT.

12. I have received training on the use of ICT facilities in Cape Coast Polytechnic

a. Yes [ ] b. No [ ]

If you tick Yes [√] for question 12, please answer questions 13-17;

Item	**Adequacy of ICT Training Received in the Polytechnic**	**SA**	**A**	**D**	**SD**
13.	I am satisfied with the quality of the ICT training programme received in Cape Coast Polytechnic.				
14.	The duration of the ICT training programme				

	in Cape Coast Polytechnic is adequate.				
15.	The teaching methods adopted for the ICT training programme in the Cape Coast Polytechnic have enhanced my understanding.				
16.	The ICT training programme provided me with new ways of being efficient in my job.				
17.	I make maximum use of ICT facilities after the training.				

If you tick No [√] for question 12, please answer questions 18-22

Item	Adequacy of ICT Training Received Outside the Polytechnic	SA	A	D	SD
18.	I am satisfied with the quality of the ICT training programme received outside the Polytechnic.				
19.	The duration of the ICT training programme received outside the Polytechnic is adequate.				
20.	The teaching methods adopted for the ICT training programme outside the Polytechnic have enhanced my understanding.				
21.	The ICT training programme provided me with new ways of being efficient in my job.				
22.	I would have wished to receive such ICT training in Cape Coast Polytechnic.				

SECTION C: PROFICIENCY IN ICT (ICT IN TEACHING AND LEARNING)

Please, in the continuum of strongly agree to strongly disagree (where SA = Strongly Agree; A = Agree; D=Disagree; SD=Strongly Disagree), kindly tick (√) the appropriate responses that best reflect your proficiency in ICT with each of the following statements.

Item	Statement	SA	A	D	SD
23.	Using computers help me to improve my presentations during lectures. E.g. Projectors,				
24.	I always require the assistance of an expert when I use a computer.				
25.	I can solve most application problems when I use computers.				
26.	I use ICT facilities to meet specific teaching and learning objectives.				
27.	I teach lessons in which students apply ICT/computer technology tools.				
28.	I use ICT in giving and receiving assignment				

SECTION D: ICT INSTITUTIONAL SUPPORT

Please, in the continuum of strongly agree to strongly disagree (SA=Strongly Agree; A = Agree; D=Disagree; SD=Strongly Disagree), kindly state your level of agreement with each of the following statements.

Item	Statement	SA	A	D	SD
29.	Cape Coast Polytechnic has an ICT policy.				
30.	There are Sections/Units that monitor Cape Coast Polytechnic's ICT facilities.				
31.	There are Sections/Units that are responsible for the maintenance of ICT facilities in the Cape Coast Polytechnic.				
32.	There is access to wireless internet connection in Cape Coast Polytechnic.				
33.	I am satisfied with the provision of ICT facilities by Cape Coast Polytechnic.				

SECTION E BARRIERS TO ICT UTILIZATION

Questions 34 – 41 are statements that describe the barriers to ICT utilization in this Polytechnic. Please, in the continuum of strongly agree to strongly disagree (where SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree), kindly state your level of agreement with each of the following statements.

Item	Statement	S A	A	D	SD
34.	Teaching time schedule prevents maximum utilization of ICT for teaching and learning.				
35.	Inadequate computers for the number of academic staff on campus.				

36.	Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT for teaching and learning.				
37.	Lack of maintenance of ICT infrastructure.				
38.	Inadequate financial support to develop instructional materials				
39.	Unreliable Internet Service Providers/ telecommunication connectivity problems.				
40.	Inadequate professional training to support ICT use.				
41.	Constant interruption of electricity supply.				

42. Kindly give any three suggestions that can lead to improvement in the utilisation of ICT by staff in facilitating teaching and learning in Cape Coast Polytechnic.

a. ……

b. ……

c. ……

APPENDIX C

QUESTIONNAIRE FOR STUDENTS

The purpose of this study is to have an over view of the state of the utilization of ICT by students as it relates to teaching and learning in the Cape Coast Polytechnic. You are assured of the confidentiality of your responses, so you are kindly requested to answer the questions as candid as possible.

SECTION A. DEMOGRAPHIC DATA

1. Gender

   a. Male [ ] b) Female [ ]

2. Age as at last birthday

   a) 20- 29 years [ ] b) 30- 39years [ ]

   c) 40- 49 years [ ] d) 50- 59years [ ]

   e) 60years + [ ]

3. School (Please State)……..……

4. Programme of study (Please State)……...…….

5. Level a) 200 [ ] b) 300 [ ]

SECTION B. ACCESSIBILITY AND LOCATION OF ICT FACILITIES

6. How accessible are computers to you? **(Tick (√) as many as applicable).**

   a) I have a personal computer [ ]

   b) I use computer at the café [ ]

   c) I use a friends computer [ ]

   d) I have no access to computers [ ]

7. Which of the following ICT tools/application software do you use for your work? **(Tick (√) as many as applicable).**

   a) Word processing [ ]

   b) Spreadsheet [ ]

   c) Database management systems [ ]

   d) Presentation software [ ]

   e) Email [ ]

   f) Internet access [ ]

8. Indicate by ticking (√) in the space provided where ICT facilities in the Cape Coast Polytechnic can be located.

Facilities	**Lecture Rooms**	**Computer laboratory**	**Library**	**Head of Department's Office**	**ICT Centre**
Computer					
Internet access					
Printer					
Software					

SECTION C. PROFICIENCY IN ICT (TRAINING PROGRAMMES)

Please indicate by ticking (√) your levels of agreement on training programmes you have received in ICT.

9. I have received training on the use of ICT facilities in Cape Coast Polytechnic

   b. Yes [ ] b. No [ ]

If you tick Yes [√] to question 9, please answer questions 10-14;

Item	Adequacy of ICT Training Received in the Polytechnic	SA	A	D	SD
10.	I am satisfied with the quality of the ICT training programme in Cape Coast Polytechnic.				
11.	The duration of the ICT training programme in Cape Coast Polytechnic is adequate.				
12.	The teaching methods adopted for the ICT training programme in Cape Coast Polytechnic have enhanced my understanding.				
13.	The ICT training programme provided me with new ways of being efficient in my job.				
14.	I make maximum use of ICT facilities after the training.				

If you tick No [√] to question 9, please answer questions 15-19

Item	Adequacy of ICT Training Received Outside the Polytechnic	SA	A	D	SD
15.	I am satisfied with the quality of the ICT training programme received outside the Polytechnic.				
16.	The duration of the ICT training programme received outside the Polytechnic is adequate.				

17.	The teaching methods adopted for the ICT training programme outside the Polytechnic have enhanced my understanding.				
18.	The ICT training programme provided me with new ways of being efficient in my job.				
19.	I would have wished to receive such ICT training in Cape Coast Polytechnic.				

SECTION C: PROFICIENCY IN ICT (TEACHING AND LEARNING)

Please, in the continuum of strongly agree to strongly disagree (where SA = Strongly Agree; A = Agree; D=Disagree; SD=Strongly Disagree), kindly tick (√) the appropriate responses that best reflect your proficiency in ICT with each of the following statements.

Item	Statement	SA	A	D	SD
20.	I use ICT facilities to meet specific teaching and learning objectives.				
21.	Using computers help me to improve my presentations. E.g. PowerPoint				
22.	I always require the assistance of an expert when I use a computer.				
23.	I can solve most application problems when I use computers.				
24.	I have never used ICT / computers.				

SECTION D: ICT INSTITUTIONAL SUPPORT

Please, in the continuum of strongly agree to strongly disagree (SA=Strongly Agree; A = Agree; D=Disagree; SD=Strongly Disagree), kindly state your level of agreement with each of the following statements.

Item	Statement	SA	A	D	SD
25.	There are Sections/Units that define and monitor Cape Coast Polytechnic's ICT facilities.				
26.	There are Sections/Units that are responsible for the maintenance of ICT facilities in Cape Coast Polytechnic.				
27.	There is reliability of ICT facilities for use in Cape Coast Polytechnic.				
28.	Students are entitled to free hours of browsing at the computer laboratory.				
29.	I have access to wireless internet connection in Cape Coast Polytechnic.				
30.	I am satisfied with the provision of ICT facilities by Cape Coast Polytechnics.				

SECTION E. BARRIERS TO ICT UTILIZATION

Questions 31 – 38 are statements that describe the barriers to ICT utilization in this Polytechnic. Please, in the continuum of strongly agree to strongly disagree (where SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly

Disagree), kindly state your level of agreement with each of the following statements.

Item	Statement	SA	A	D	SD
31.	Inadequate computers for the number of students on campus.				
32.	Inadequate computer peripherals such as printers, scanners and projectors for effective use of ICT for teaching and learning.				
33.	Lack of maintenance of ICT infrastructure				
34.	Students pay too much to access computers/ICT facilities on campus.				
35.	Students pay too much to use computers/ICT facilities off-campus				
36.	Constant interruption of electricity supply.				
37.	Unreliable Internet Service Providers/ telecommunication connectivity problems.				
38.	Inadequate professional training to support ICT use.				

39. Kindly give any three suggestions that can lead to improvement in the utilisation of ICT by students in facilitating teaching and learning in Cape Coast Polytechnic.

    a. ……..

    b. ……..

    c. ……..

APPENDIX D

FREQUENCY DISTRIBUTION OF RESPONSES ON ADEQUACY OF ICT TRAINING RECEIVED

	SD		D		A		SA		Total	
Adequacy of ICT training programme	TS	S	TS	S	TS	S	TS	S	TS	S
I am satisfied with the quality of the ICT training programme received	10	107	21	112	23	66	6	15	60	300
The duration of the ICT training programme received is adequate	53	103	4	126	2	60	1	11	60	300
The teaching methods adopted for the ICT training programme have enhanced my understanding	2	77	15	109	31	98	12	16	60	300
The ICT training programme provided me with new ways of being efficient in my job	3	52	21	75	21	144	15	29	60	300
I would have wished to receive such ICT training in Cape Coast Polytechnic	1	*	10	*	22	*	27	*	60	300
I make maximum use of ICT facilities after the training	*	58	*	96	*	117	*	29	60	300

Source: Survey Data, 2011 TS=Teaching Staff S=Students

Scale: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Agree (A) 4= Strongly Agree (SA)

* Respondents were not asked that particular question

APPENDIX E

FREQUENCY DISTRIBUTION OF RESPONSES ON PROFICIENCY IN ICT

	SD		D		A		SA		Total	
Proficiency in ICT	TS	S	TS	S	TS	S	TS	S	TS	S
Using computers help me to improve my presentations during lectures.	2	13	6	15	32	123	20	149	60	300
I always require the assistance of an expert when I use a computer	15	55	31	90	12	101	2	54	60	300
I can solve most application problems when I use computers	0	28	20	63	35	144	5	65	60	300
I use ICT facilities to meet specific teaching and learning objectives	6	*	32	*	19	*	3	*	60	300
I teach lessons in which students apply ICT/Computer technology tools	6	*	30	*	21	*	3	*	60	300
I use ICT in giving and receiving assignment	16	*	28	*	16	*	0	*	60	300
I have never used ICT/Computers	*	225	*	52	*	16	*	7	60	300

Source: Survey Data, 2011 * Respondents were not asked that particular question

Scale: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Agree (A) 4= Strongly Agree (SA) TS=Teaching Staff S=Students

APPENDIX F

FREQUENCY DISTRIBUTION OF RESPONSES ON INSTITUTIONAL SUPPORT FOR ICT USE

	SD		D		A		SA		Total	
Institutional support for ICT use	TS	S	TS	S	TS	S	TS	S	TS	S
There are Sections/Units that monitor Cape Coast Polytechnic's ICT facilities	11	97	22	97	26	88	1	18	60	300
There are Sections/Units that are responsible for the maintenance of ICT facilities in the Cape Coast Polytechnic	13	89	28	95	18	93	1	23	60	300
There is access to wireless internet connection in Cape Coast Polytechnic.	24	182	21	75	14	32	1	11	60	300
I am satisfied with the provision of ICT facilities by Cape Coast Polytechnic	34	168	23	101	1	22	2	9	60	300
There is reliability of ICT facilities for use in Cape Coast Polytechnic	*	146	*	109	*	35	*	10	60	300
Students are entitled to free hours of browsing at the computer lab.	*	175	*	83	*	30	*	12	60	300
Cape Coast Polytechnic has an ICT policy	13	*	25	*	20	*	2	*	60	300

Source: Survey Data, 2011 * Respondents were not asked that particular question

Scale: 1= Strongly Disagree (SD) 2= Disagree (D) 3= Agree (A) 4= Strongly Agree (SA) TS =Teaching Staff S=Students

APPENDIX G

FREQUENCY DISTRIBUTION ON CHALLENGES FACED IN THE USE OF ICT FACILITIES

Challenges	SD		D		A		SA		Total	
	TS	S	TS	S	TS	S	TS	S	TS	S
Inadequate computer peripherals for teaching and learning	0	23	2	26	27	50	31	201	60	300
Unreliable internet service providers/ connectivity problems	4	17	0	25	19	94	37	164	60	300
Lack of maintenance of ICT infrastructure	2	21	3	35	24	81	31	163	60	300
Inadequate computers for teaching and learning	5	30	0	21	29	40	26	209	60	300
Inadequate professional training to support ICT use	4	23	4	32	28	92	24	153	60	300
Constant interruption of electricity supply	2	18	11	66	30	117	17	99	60	300
Teaching time schedule prevents maximum utilization of ICT for teaching and learning	5	*	24	*	22	*	9	*	60	300
Inadequate financial support to develop instructional materials	2	*	7	*	25	*	26	*	60	300
Students pay too much to access ICT facilities off-campus	*	22	*	46	*	95	*	137	60	300
Students pay too much to access ICT facilities on campus	*	20	*	47	*	98	*	135	60	300

Source: Survey Data, 2011 * Respondents were not asked that particular question

Scale: 1= Strongly Disagree (SD), 2= Disagree (D), 3= Agree (A) 4= Strongly Agree (SA) TS=Teaching Staff S=Students