UNIVERSITY OF CAPE COAST

THE RELATIONSHIP BETWEEN TEACHERS' ICT COMPETENCY

AND ACADEMIC PERFORMANCE OF STUDENTS IN INFORMATION

AND COMMUNICATION TECHNOLOGY IN EAST AKIM

MUNICIPALITY

ALFRED AWUAH ABOAGYE

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BY

ALFRED AWUAH ABOAGYE

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DECLARATION

Candidate's Declaration

I hereby declare that except for the reference cited, this dissertation 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 Signature ……………………………. Date: …………..…………

Name: Aboagye Alfred Awuah

Supervisor's Declaration

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

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

Name: Professor John Nelson Buah

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ABSTRACT

Advances in Information and Communication Technologies (ICT's) are changing the way people share, use, and process information. Overtime, students' academic performance had been used to determine excellence in teacher teaching. This study was conducted to investigate the relationship between teachers' ICT competency and students' performance in ICT in East Akim Municipality in the Eastern Region of Ghana. It also sought to find out whether availability of ICT resources have influence on students' performance. In the study, 19 public Junior High Schools were sampled from 67 schools. Questionnaire was employed for data collection from the total sample of 322 students and 19 teachers of ICT. Descriptive research design was selected for quantitative research approach. The findings on the academic performance of students revealed that only 7(2.2%) out of 322 students and 9(2.8%) had a mark above 80 for term 1 and term 2 respectively. Majority of the students also rated themselves as either poor or very poor in performing computer related tasks. Most students' performance in both practical and end of term examination were low due to the unavailability of computers in their schools. This reflected in a positive linear relationship between the availability of ICT resources (computers) and students' academic performance. The null hypothesis H_0 was rejected at 0.05 level of significance with $p = 0.032$. The level of teachers' ICT competence on the six UNESCO standards generally recorded a low mean value of 3.77. It was recommended that teachers who do not have the required ICT qualification and practical skills in ICT usage should seek training to enable them competently and confidently use them in teaching the subject.

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DEDICATION

To the entire Awuah family as well as loved ones who have made impact in my

life.

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LIST OF ACRONYMS

BECE   Basic Education Certificate Examination.

CD ROM   Compact Disc Read Only Memory.

CK   Content Knowledge.

GES   Ghana Education Service.

HND   Higher National Diploma.

ICT   Information and Communications Technology.

IT   Information Technology.

ICT-CFT   Information and Communication Technology Competency

            Framework for Teachers.

ICT4AD   Information and Communication Technology for Accelerated

            Development.

ISCED   International Standard Classification of Education.

ISTE   International Society for Technology in Education.

JHS   Junior High School.

PCK   Pedagogical Content Knowledge.

PK   Pedagogical Knowledge.

PTA   Parent Teacher Association.

QCA   Qualification and Curriculum Authority.

SPSS   Statistical Package for Social Sciences.

TK   Technology Knowledge.

TPACK   Technological Pedagogical Content Knowledge.

TV   Television.

TVET   Technical and Vocational Education and Training.

UK   United Kingdom.

UNESCO   United Nations Educational Scientific and Cultural Organisation

WAEC   West African Examination Council.

CHAPTER ONE: INTRODUCTION

Background to the Study

Today's fast-paced world is progressively characterized by technology which has transformed the world in a large global connected community. Annan (2002) notes that, the information society is a way for human capacity to be expanded, built up, nourished and liberated by giving people access to tools and technologies with the education and training to use them effectively. About 200 years ago, the pace of technology changes in western society began to quicken. The new information and communications technologies are among the driving forces of globalization which are bringing people together, and bringing decision makers' unprecedented new tools for development Annan (2002). At the same time, however, the gap between information "haves" and "have-nots" is widening, and there is a real danger that the world's poor will be excluded from the emerging knowledge-based global economy. Due to the above transformation, the world has advanced and grown to a stage where a person without a basic computer literacy finds it almost impossible to feel comfortable in society. In today's high technology world, digital literacy is a requirement regardless of your career or education, computers and technology will most likely play an important role.

In Africa, many governments have focused on developing national ICT policies in educational sector as well as to support their socio-economic development. Successive governments in the country (Ghana) have therefore made effort to device strategies of improving quality delivery of education through policy formulation and implementation in the country to give it a face lift (Ankomah *et*

al., 2005) in hopes of developing technologically literate workforces able to participate in the information societies and economies of the present and future (Hosman, 2013). In pursuit of this the government put in place an ICT in education policy framework and implementation strategy with measurable outcomes. The policy seeks to underpin the vision and mission of the Ministry of Education with a view of identifying how the sector will use ICT's to develop the requisite human resources for the country which will meet the demand of the labour market, locally as well as internationally. ICT is often perceived as a catalyst for change, change in teaching styles and change in learning approaches and in access to information (Watson, 2005). In spite of the growing support for computers as tools for teaching and learning, scarce resources are being committed into these efforts which does not march with the desire to see results. Relevant policy insights into best practices regarding the implementation of these ICT in education may be gained from examining what has been learned in countries where the introduction of ICT as a subject or in delivering different subject content in the classroom has been both taking place and studied for many years (Hosman, 2013). As noted by Baylor and Ritchie (2002), "regardless of the amount of technology and its sophistication, technology will not be used unless the individuals have the skills, knowledge and attitudes necessary to infuse it into the curriculum" (p. 398). A large part of this problem is the result of not having the knowledge or expertise with computer-based instruction (Okinaka, 1992) and the concern for teacher ICT competency is raised as to whether they can inculcate this knowledge into the school children to reflect in their academic performance. Most teachers are not digitally literate. Effective

learning in schools would require effective teaching to accompany the efforts of the learners. Teacher competence need to be very high in order for meaningful teaching and learning to take place (Segun, 1986). The professional ICT teacher is expected to possess certain competence both professional and personal. Professional competencies are both academic and pedagogical. Academic competencies are the teachers' knowledge of his subject. Pedagogical competency is the art of teaching the subject, observing such principles as teaching from known to unknown, concrete to abstract and from simple to complex (Akpan, 2002).

In formal system of education in Ghana, a student has to depend on the teacher who transmits, interprets and facilitate subject matters knowledge. Overtime, students' academic performance in both external and internal examinations had been used to determine excellence in teacher teaching (Ajao, 2001). Teachers have been shown to have an important influence on students' academic achievements and they also play crucial role in educational attainment (Afe, 2001). Many studies have revealed that students' academic achievement is enhanced where the teacher possesses adequate knowledge of the subject matter and a good command of pedagogical skill have a strong positive effect on students' academic achievement in regular classroom teaching (Lockheed & Verspoor 1991; Yusuf *et al*, 2015).

In Ghana, computers are found in some of the well-endowed schools in the urban areas all over the country although they will be writing the same final examination in Information and Communication Technology (ICT) with their colleagues in less endowed schools. Others are learning the ICT without any

computer, ICT laboratory or even no electricity to power those few computers available. Lack of competent teachers who have been trained in the subject content is also a factor (Mfum-Mensah, 2003). ICT has barely taken a foothold in most basic schools. Computer illiteracy and lack of access to Information and Communication Technology (ICT) are widely recognized as an increasingly powerful obstacle to the academic performance of ICT in most schools in Ghana.

This research was conducted in selected basic schools where ICT is studied in East Akim Municipality which is located in the Eastern Region of Ghana. The municipality has a population size of about 167,896 according to the 2010 Population and Housing Census. It has about one hundred and nine basic schools (109) made up of both private and public schools. The municipality shares boundaries with Atiwa District, Fanteakwa District, West Akim Municipal Assembly and Suhum Kraboa Coaltar Municipal Assembly.

Statement of the Problem

We live in a dynamic global Information Technology (IT) world where the difficulty factor of keeping pace and preparing students to be successful in academics and securing jobs are becoming more challenging. This is because IT advancement has shown how technology influences human evolution. Teachers' primary role of transmission of knowledge and skills is never in dispute. Therefore a teacher would need to demonstrate efficiency in this primary role.

Today, ICT is changing the way people work and transforming education systems (Opoku – Agyemang, 2015). Modern information and communication technologies have found their ways to all spheres of human activity causing changes among

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individuals, organisations and society at large. Learning ICT as a subject in schools help pupils acquire basic computer literacy and also communicate effectively using ICT tools. Competent teachers are the most critical piece in improving students' achievement to close the gap in the digital world. The most important difference between the most and the least effective classrooms is the teacher (Wiliam, 2009). The quality of education is increasingly judged by focusing on pupils' performance, what students actually learn and how well they learn it.

East Akim Municipal Assembly is located in the Eastern Region of Ghana where majority of the basic schools face a lot of problems related to teaching and learning of ICT. The inclusion of ICT in the basic school curricula in 2007 Education reform made the subject an examinable one. This has in some way brought to fore challenges inherent in the teaching of the subject for most teachers. These challenges include inadequate qualified teachers with requisite skills in handling the subject, inadequate supply of teaching and learning materials, high cost of Information and Communication Technology (ICT) components, lack of internet connectivity in most schools to broaden access to information (Pelgrum, 2001). ICT teachers' incompetence, lack of skills, knowledge and attitude toward the teaching of the subject pose a barrier to the high performance of students in the subject (Pelgrum).

General performance of pupils in Information and Communication Technology (ICT) with the exception of some few private schools in the municipality has not been encouraging since 2011 as majority of the candidate have not been getting grades 1 and 2. The West African Examination Council (WAEC)

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Chief Examiner`s report on Information and Communication Technology (ICT) about candidates` weaknesses in the past years has consistently centered around the inability of candidates to answer practical and application questions correctly. Due to the increasing level of poor academic performance of basic schools in ICT especially in external examination like West African Examination Council (WAEC), parents and many educationists tend to shift the blame on lack of funds from the government to provide quality textbooks and infrastructures. However, these might not be the main or only reason why students perform poorly in examination. One may inquire whether the incompetence of teachers could be responsible for the observed poor performance of students in ICT. In view of this the study seeks to examine the relationship between teachers' ICT competency and students' performance in the teaching and learning of ICT in basic schools in the East Akim Municipality in the Eastern region of Ghana.

Purpose of the Study

The main purpose of the study was to examine the relationship between teachers ICT competency and academic performance of ICT of pupils in the junior high schools in the East Akim Municipality in the Eastern Region of Ghana.

Research Objectives

1. To determine the extent to which ICT academic qualification of teachers has influence on students' academic performance in ICT.

2. To examine the competence level of teachers in the teaching of ICT.

3. To identify the availability of information and communications technologies resources or tools and its related infrastructure in the various schools.

Research Questions

1. To what extent does teachers with ICT academic qualification influence the academic performance of their students in ICT in the Junior High School?

2. What are the levels of competence of teachers in the use and teaching of ICT?

3. What type of ICT resources are available in the school that has influence on students' performance?

Hypotheses

Based on the research questions, the following hypotheses were derived:

1. H_0. There is no significant relationship between ICT academic qualification of teachers and academic performance of students in ICT.

2. H_0. The required ICT resources and appropriate teaching and learning materials have no influence on students' performance.

Significance of the Study

The study will help teachers identify some problems that hinder effective teaching of Information and Communication Technology (ICT). It will also serve as a guide to teachers who teach ICT to be aware of the ICT in education policy and to use effective teaching methods and strategies which will improve upon the academic performance of pupils. It will also draw their attention to the ICT skill and competencies they should possess in handling of the subject. The results of the

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study may encourage stakeholders like PTA and other cooperate organizations to provide state of the art Information and Communication Technology (ICT) laboratory for their schools. Finally, it will serve as a push for Ghana Education Service to organise in-service training periodically for teachers on Information and Communication Technology (ICT).

Delimitation

The study covered nineteen Junior high schools who study ICT in East Akim Municipality. The school selected had taken part in BECE for the past six years.

Limitation

Leedy (2001) points out that during the research process, the researcher cannot avoid having data contaminated by one form of bias or another. It is however unethical and unprofessional to fail to acknowledge the possibility of such limitations. The most significant challenges to this study were some schools failing to permit the researcher to conduct the study there and the fact that the researcher did not have enough time in collecting the data and resources to cover many schools in the municipality.   Furthermore, a sheer reluctance on the part of some officials of Ghana Education Service in the municipality and some heads and teachers to release official documents to enable the researcher take actual figures pertaining to examination results and other data considered a confidential made it difficult for accurate data to be obtained. Some of the respondents were also unwilling to respond to the questionnaire with the fear of exposing themselves in relation to the

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questions being asked. In order not to affect the validity of the findings, they were however assured of full confidentiality.

Organization of Study

The study is organized into five (5) different chapters. The first chapter talks about the background to the study, the statement of the problem, the research objectives and questions, hypothesis, significance of the study, delimitations, limitations and organization of the study. Chapter two covers review of literature relevant to the topic. Chapter three deals with methodology; research design, the sample and sampling technique, administration of research instruments, the strategies adopted in data collection, validity and reliability of the instrument and data analysis plan. Chapter four presents the discussions and analysis of the findings while chapter five presents the summary of findings, conclusion drawn from the study and recommendations thereof.

CHAPTER TWO: LITERATURE REVIEW

Introduction

Mastering ICT skills and utilizing ICT towards creating an improved teaching and learning environment is of utmost importance to teachers in creating a new learning culture. This chapter will look at related literature which is the views and findings of different writers as documented in books, the internet, journals, articles, and periodicals about the problem. It also presents the concept and approaches in the development of a theoretical framework for teacher ICT competency. A theoretical framework is a conceptual model of how one theorizes or makes logical sense of the relationships among several factors that have been identified as important to the problem (Sekaran, 2003).

Background Information on ICT

The Qualification and Curriculum Authority(QCA) in the United Kingdom (UK) in partnership with Ofqual and Qualification and Curriculum Development Agency(QCDA) (cited in Kennewell, Parkinson, & Tanner, 2000, 2002) defines ICT as "the range of tools and techniques relating to computer-based hardware and software; to communications including both directed and broadcast; to information sources such as CD ROM and the Internet; and to associated technologies such as robots, video conferencing and digital TV." This means ICT is an extension of Information Technology (IT) that includes hardware, software and Internet connectivity. Connectivity provides access to the internet, local networking infrastructure, and videoconferencing and thus provides communication within IT (Shelly, Cashman, Gunter & Gunter, 2002). Annan (2002) notes that the

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information society is a way for human capacity to be expanded, built up, nourished and liberated by giving people access to tools and technologies with the education and training to use them effectively. The term "Information Technology" evolved in the 1970s (online). Its basic concept however can be traced to the Second World War in alliance with the military and industry in the development of electronic computers and information theory. After 1970s, the military remained the major source of research and development funding for the expansion of automation to replace man power with machine power. Today, modern societies are increasingly based on information and knowledge (Plessis & Webb, 2012) and the fast-paced world is becoming increasingly characterized by technology driven communication which has transformed the world into a large global connected community.

ICT in Education Policy

Globally, ICT is controlling every facet of life. Worldwide countries have developed ICT policies in the curriculum. In UK ICT curriculum aims at supporting innovation in schools for improving effectiveness of schools and teachers in particular, by using ICT to reduce the burdens placed on teachers and to modernise delivery (Becta, 2002; Brooker, 2003). The Canadian ICT policy expects that the introduction of ICT in schools will improve the academic performance equity among students and ultimately, students' ability to use and apply technology and software in the jobs (Corbett & Willms, 2002).

In Southern African region ICT policies that seem to exist are very few, and even those that exist are vague to interpret and make little reference to how ICT implementation is to take place (Howie, Muller & Paterson, 2005).

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In Ghana Information and Communication Technologies (ICT's) have undergone a lot of transformation. Education in ICT will offer people the needed skills to contribute to their respective national economies. It is in the light of this that the Education Reforms 2007 of Ghana has stressed on the need for greater emphasis to be put on ICT. The ICT policy for all sectors of the economy including education is termed ICT4AD (ICT for Accelerated Development). This has led to the inclusion of ICT in the basic school curricula where the subject is now an examinable one. It was the desire of government that through the development of ICT in our educational institutions, the culture and practice of traditional memory-based learning will be transformed to education that stimulates thinking and creativity necessary to meet the challenges in the 21st century. This policy document seeks to inform sector stakeholders as to why Information and Communication Technologies (ICT's) are an important part of our modern society and the role it plays in the education sector. The policy also seeks to underpin the vision and mission of the Ministry of Education with a view of identifying how the sector will use ICTs to develop the requisite human resources for the country which will meet the demand of the labour market, locally as well as internationally. Existing policy and strategy documents for the sector have also been reviewed, ensuring attention to equity, access and quality which are key priorities for the sector Ministry. In defining the strategic use of ICT's to achieve developmental objectives for the sector, a number of guiding principles have been adopted. These have been used to reflect national needs and priorities as they relate specifically to the education sector.

The Effects of ICT Problems on Education in Ghana

Problems on ICT have adverse effects on education in Ghana. Due to inadequate computers in learning ICT, practical work is seldom done.

The theoretical framework proposed by Bandura (1999) attests that learning is the result of associations formed by conditioning, reinforcement, punishment and observing the actions of others. This theory can also be termed as observational learning or modeling. Since some teachers lack confidence in teaching ICT, pupils cannot observe and imitate their actions such as practical works related to ICT. Situated Cognition theory posits that all knowledge is situated in activity bound to social, cultural and physical contexts and that knowing is inseparable from doing. Learning is naturally tied to authentic cultural activities. (Brown, Collins & Duguid, 1989). Hence, Hennessy, Deaney, & Ruthven (2005) affirms that situated cognition recognizes the important role played by the social and physical aspects of learning environments. In these environments, students collaborate with one another and their teachers to cultivate a culture of learning within a community of practitioners. Concepts learnt are within the context of the activity and cognitive processes are related to the learner's interaction with materials and others. Mental images that learners create are the result of the learner`s interaction, perceptions and behavior. Mills (2011) noted that within a community of practice, member of the community learns from their interactions with each other as they share information and develop unique practices.

Lack of Competent ICT Teachers and Training

Often mentioned by a number of researchers, is the lack of ICT competent teachers who are able to study, use and teach ICT comfortably with confidence (Hennessy, Ruthven & Brindley, 2005; Loveless, 2003 & Lee, 2002). Incompetence seems to lead to lack of confidence. According to Somekh "teachers need to be convinced of the value of ICT because many teachers tend to perceive themselves to be technologically incompetent and often feel deskilled and demoralized when they first begin to use computers in the classroom" (as cited in Lee, 2002). The major problem with or without ICT related tools in the teaching-learning process is the complexity of a key aspect of curriculum knowledge in ICT (Webb & Cox, 2004). Howie *et al*., (2005) argue that the incompetence of teachers is due to insufficient training they receive. Pelgrum, (2001) posits that inadequate trained personnel to handle and facilitate the subject is one of identified challenges in the teaching of ICT.

Availability of ICT Resources and Student's Learning

For teachers and their students, the availability of modern computers, peripherals, networking and resources within an increasingly diverse range of technologies is an essential part of learning and teaching in the 21st century. ICT constitutes an input in the student learning process that should help produce better learning output. The availability of ICT resources can enhance learning by making education less dependent on differing teacher quality and by making education available at home throughout the day (Mbwesa, 2002). The availability and use of ICT can help students exploit enormous possibilities for acquiring information for

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schooling purposes and can increase learning through communication (Riel, 1998). Teaching ICT in schools without knowing what those tools are will be a burden on both the teacher and the students as well. Bennett and Dunne (1991) argues that the availability of visual digital technology (such as animation, simulation and moving images) involves students and reinforces conceptual understanding. Davis (2000) asserts that increased availability of ICT is especially useful for students who suffer from learning disabilities since ICT use allows teachers to prepare suitable tasks for individual needs and each individual more effectively. However, authors like Cox and Marshall (2007) believe that allowing certain students to use computers distracts them from focusing on the task at hand. The researcher will also point out that learning ICT as a subject in schools, the content demands that the students are exposed to the tools and use them effectively. Central to the argument of availability are the issues of whether or not the teachers and students have ample and convenient access to computers and their accessories let alone the software that is necessitated in the context of their day-to-day research, collaboration, teaching and student evaluation (Fabry & Higgs, 1997). Furthermore, students and teachers should have confidence in these facilities, which is in turn reliant on the facilities'' reliability or degree to which the teachers and students are sure that they will have access to them at all expected times and utilise them predictably to the betterment of their academic work, an issue on which consensus is enormous as is clear from ICT in education scholars like Mumtaz (2000) and Pelgrum (2001). Whilst the above studies attempted generally to explain how the availability of ICT affects

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learning, it does not look at how particular ICT tools clearly affects students learning.

Theoretical Review and Conceptual Framework

The research was based on the theory of Cognitive Flexibility (Spiro, et al, 1992), emphasized by Kirkpatrick's four levels of evaluation (Kirkpatrick, 1994). Kirkpatrick emphasizes reactions, learning, transfer and results. Level one is reactions and just as the word implies, learning at this level measures how students in a class react to it. It attempts to answer questions regarding the learners' perceptions - did they like it? Was the material relevant to their work? In addition, the learners' reactions have important consequences for learning (level two), although a positive reaction does not guarantee learning; a negative reaction almost certainly reduces its possibility (Winfrey, 1999).

At level two, teaching moves beyond learner satisfaction and attempts to assess the extent to which students have advanced in skills, knowledge, and attitude to determine the amount of learning that has occurred. Level three is transfer; this level looks at the transfer that has occurred in learners' behavior due to the teaching process. Teaching at this level attempts to answer the question - are the newly acquired skills, knowledge, or attitude ready to be used in the everyday environment of the learner? Cognitive Flexibility means the ability to spontaneously restructure one's knowledge in many ways, in adaptive response to radically changing situational demands. The Theory largely concerns with transfer of knowledge and skills beyond their initial learning situation. Skills transfer can be described as students desire to use the knowledge and skills mastered in the

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training program on the job (Noe & Schmitt, 1986 in Yamnill & McLean, 2001). Behavioral change would likely occur for students who learn the material presented in class and desire to apply that new knowledge or skills to work activities. Two different types of transfer have been proposed, near transfer and far transfer. Near transfer is applying the learnt information or skills in a new environment that is very like the original one. Teachers need to design ICT instruction that teaches the steps of a task that are always applied in the same order. The advantage of this is that the skills and knowledge are easier to train and transfer of learning is usually a success. Far transfer is being able to use learned knowledge or skills in very different environments (Alessi & Trollip, 2001). With far transfer teachers need to design ICT instruction where learners are trained to adapt guidelines to changing situations or environments. Thus once the skills and knowledge are acquired, the learner is able to make judgments and adapt to different situations. This is most ideal for the dynamic ICT evolution in the world today. To support the degree of transfer of knowledge desired, it is important to understand that it is every learners wish to apply the trained skills acquired in doing their work. But this applies only when the learner acknowledges the relevancy of the skills to his/her nature of work expected of him in the field. Level four is results, frequently thought of as the bottom line, this level looks at the success of the instructions. According to Holton 1996 (in Yamnill & McLean, 2001), one cause of failure to transfer is that sometimes the training rarely provides for transfer of learning. That is, cognitive learning may well occur, but learners may not have an opportunity to practice the

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training or may not be taught how to apply their knowledge outside. So the teaching itself can have a direct influence on transfer of trained skills.

Independent variable Teacher ICT competency	**Dependent variable** Students' academic performance in ICT

ICT Profile of Teacher - ICT training. - ICT use outside the teaching. - ICT academic qualification. - Length of ICT experience. **Teaching profile** - Teaching experience. - Teaching methods	**Students Learning** - Students attitude. - Application of skills and knowledge. - Access to ICT tools after school. - Performance of task using computers. - Performance in examination

Figure 1: Conceptual framework showing relationship between teacher ICT competency and students' academic performance in ICT.

Source: Adapted from Spiro et al., 1992.

Teachers' ICT Skills and Competency

School leaders still perceive the lack of ICT related knowledge of teachers as one of the main obstacle that obstruct the realization of ICT related goals (Pelgrum, 2001). Regardless of the quantity and quality of technology available in classrooms, the key to how ICTs are used is the teacher; therefore, teachers must have the competence and the right attitude towards technology (Kadel, 2005). Competence is defined as the ability to combine and apply relevant attributes to

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particular tasks in particular contexts. These attributes include high levels of knowledge, values, skill, personal dispositions, sensitivities and capabilities, and the ability to put those combinations into practice in an appropriate way (Commonwealth Department of Education, Science and Training, 2002). An ICT competency describes what a teacher should know to be able to use technology in his/her professional practice. Kirschner & Woperies (2003) highlighted some major ICT competencies teachers require. These include competency in:

a) making personal use of ICT

b) mastery of a range of educational paradigms that make use of ICT

c) making use of ICT as minds tools.

d) using ICT as tool for teaching.

e) mastering a range of assessment paradigms which involves use of ICT.

f) understanding the policy dimensions of the use of ICT for teaching and learning.

Similarly, Marija and Palmira (2007) classified ICT competencies into two: basic and educational ICT competence. In Ghana, higher education institutions still have a long way to make optimal use of ICT in the learning process as the ICT competencies of the majority of teachers at this level is at the basic level, if they have any at all. Successful integration of ICT in the school system depends largely on the competence and the attitude of teachers towards the role of modern technologies in teaching and learning. Thus, experienced, and newly qualified teachers need to be confident in using ICT effectively in their teaching (Kyriakidou, Chrisostomou & Bank 2000). Simply having ICT in schools will not guarantee their

effective use. Regardless of the quantity and quality of technology placed in classrooms, the key to how those tools are used is the teacher; therefore teachers must have the competence and the right attitude towards technology (Kadel, 2005). Attitudes refer to one's positive or negative judgment about a concrete subject. Attitudes are determined by the analysis of the information regarding the result of an action and by the positive or negative evaluation of these results (Ajzen & Fishbein, 1980). Studies have established close links and affinities between teachers' attitude and their use of ICT. More positive attitudes towards the computer were associated with a higher level of computer experience (Teo, 2008). Students' confidence on ICT can be explained through the attitude and behaviors of their teachers. Teachers' behavior is a critical influence on students' confidence and attitude towards ICT as they provide important role model to their students. The literature suggests that lack of adequate training and experience is one of the main reasons why teachers do not use technology in their teaching. This also eventuates in teachers' negative attitude towards computer and technology. In addition, lack of confidence leads to reluctance to use computers by the teachers let alone teach student how to use it (Kumar & Kumar, 2003). Moreover, computer technology availability should not be mistaken for technology adoption and use. As noted by Baylor and Ritchie (2002), "regardless of the amount of technology and its sophistication, technology will not be used unless we have the skills, knowledge and attitudes necessary to infuse it into the curriculum" (p. 398). A large part of this problem is the result of not having the knowledge of or expertise with computer-based instruction (Okinaka, 1992). Albirini (2004) confirmed in his study that

teachers' computer competence predicted their positive attitudes toward technology in education. A number of studies have shown that teacher's lack of confidence (Winnans & Brown, 1992; Mumtaz, 2000; Pelgrum, 2001; Aduwa-Ogiegbaen and Iyamu, 2005) is one of the major obstacles in implementing computers in teaching and learning process.

UNESCO ICT Competency Framework for Teachers

At the global level UNESCO designed a competency framework for teachers (ICT-CFT), which was launched in 2008 to help educational policy-makers and curriculum developers identify the skills teachers need to harness technology in education (UNESCO, 2008).   The Competency Standards were developed in cooperation with Cisco, Intel, and Microsoft, as well as the International Society for Technology in Education (ISTE). The framework emphasizes that, it is not enough for teachers to have ICT competencies and be able to teach them to their students. Teachers needs to be able to help the students to become collaborative, problem -solving , creative learners through using ICT so they will be effective citizens and members of the workforce. The framework was created by crossing three approaches to ICT integration in education. The first is Technology Literacy: enabling students to use ICT to learn more effectively. The second is Knowledge Deepening: enabling students to acquire in-depth knowledge of their school subject and apply it to complex, real world problems and the third is Knowledge Creation: enabling students citizens and the workforce they become to create the new knowledge required for more harmonious fulfilling and prosperous societies with the six components of the educational system

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(Understanding ICT in Education, Curriculum & Assessment, Pedagogy, ICT, Organization & Administration, and Teacher Professional Learning). This is shown in the figure 2.
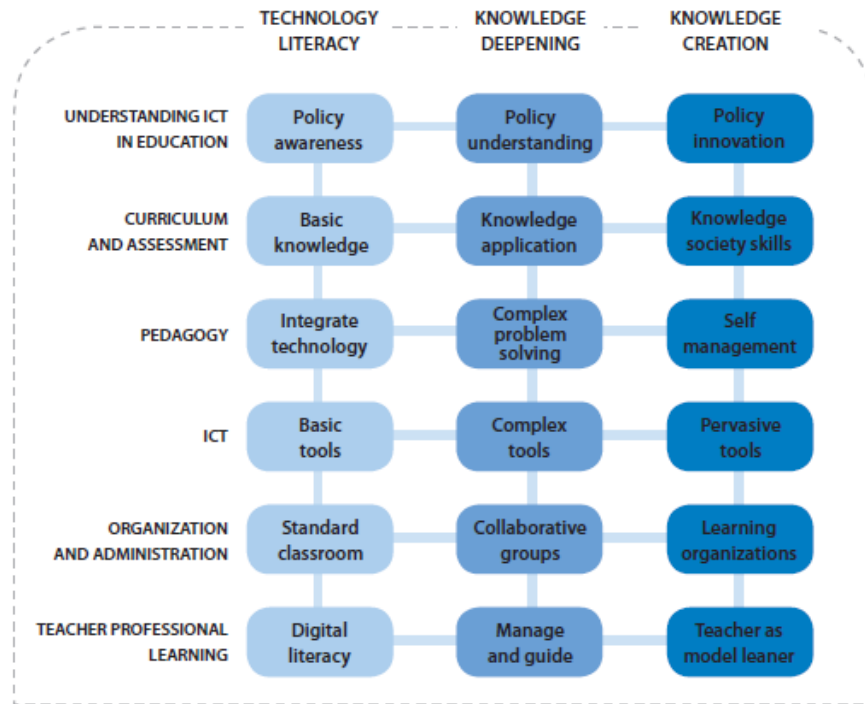
Figure 2: UNESCO ICT Competency Framework for Teachers.

Source: UNESCO, 2008, London.

The guidelines recommend that the identification of ICT competencies for teachers should be based on a clear understanding of a country's overall approach to ICT use in education.

i)   to develop a technology-literate workforce to enhance national economic productivity and competitiveness;

ii)   to develop knowledge workers, or individuals who can apply knowledge to add value to the economy and society; and

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iii)   to develop innovators and knowledge creators for the knowledge society.

Lee (1997) found that a great number of students were not equipped with basic computer operational skills. In a similar research conducted in Nigeria on the above problem, Ozoemelem's (2010) study revealed that there is a low level of skillfulness in the use of ICT among students of Nigerian schools. Similarly, Yusuf (2005) reported that teachers in Nigerian high schools are not competent in basic computer operations and in the use of generic software. Teacher preparation programmes should focus on the need for student-teachers to have ICT skills for their own use, in the preparation of materials for teaching and learning activities; the need to facilitate the direct use of ICT in students' learning activities within the classroom situation; and the need for teachers to develop in their students a critical awareness of ICT applications and the social implications (Robbins, 1998).

The TPACK Framework

Technological Pedagogical Content Knowledge (TPACK) identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. It builds on Shulman's (1986, 1987) idea of Pedagogical Content Knowledge (PCK) to describe how teachers' understanding of educational technologies and PCK interact with one another to produce effective teaching with technology. The conception of the framework has developed over time and through a series of publications, Mishra and Koehler (2006). At the heart of the TPACK framework, is the complex interplay of three primary forms of knowledge: Content

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(CK), Pedagogy (PK), and Technology (TK). The TPACK approach goes beyond seeing these three knowledge bases in isolation. The TPACK framework goes further by emphasizing the kinds of knowledge that lie at the intersections between three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).
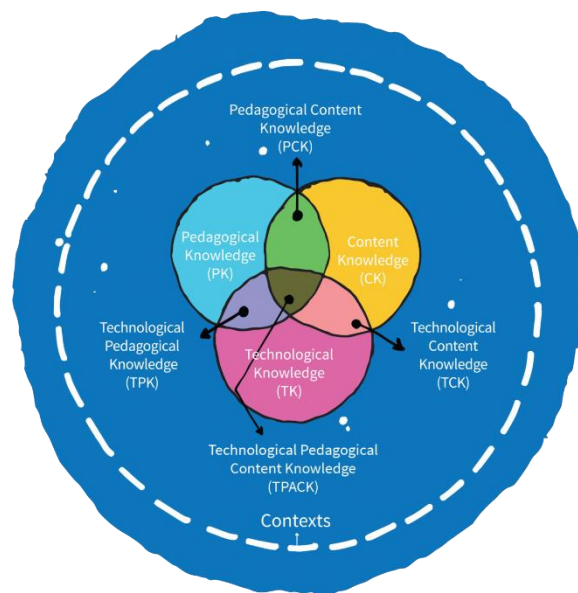
Figure 3: The TPACK framework and its knowledge components.

Content Knowledge

Content knowledge (CK) is teachers' knowledge about the subject matter to be learned or taught. The content to be covered in high school science or history is different from the content to be covered in an undergraduate course. Knowledge of content is of critical importance for teachers. As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge. (Koehler & Mishra, 2009).

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Knowledge and the nature of inquiry differ greatly between fields, and teachers should understand the deeper knowledge fundamentals of the disciplines in which they teach.

Pedagogical Knowledge

Pedagogical knowledge (PK) is teachers' deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This generic form of knowledge applies to understanding how students learn, general classroom management skills, lesson planning, and student assessment. (Koehler & Mishra, 2009). It includes knowledge about techniques or methods used in the classroom; the nature of the target audience; and strategies for evaluating student understanding. A teacher with deep pedagogical knowledge understands how students construct knowledge and acquire skills and how they develop habits of mind and positive dispositions toward learning. As such, pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom.

Technology Knowledge

Technology Knowledge (TK) is the Knowledge about certain ways of thinking about, and working with technology, tools and resources. Working with technology can apply to all technology tools and resources. This includes understanding information technology broadly enough to apply it productively at work and in everyday life, being able to recognize when information technology

can assist or impede the achievement of a goal, and being able continually adapt to changes in information technology (Koehler & Mishra, 2009).

Pedagogical Content Knowledge

Pedagogical Content Knowledge is consistent with and similar to Shulman's idea of knowledge of pedagogy that is applicable to the teaching of specific content. Central to Shulman's conceptualization of PCK is the notion of the transformation of the subject matter for teaching. Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students' prior knowledge. PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy" (Koehler & Mishra, 2009).

Technological Content Knowledge

An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies" (Koehler & Mishra, 2009).Understanding the impact of technology on the practices and knowledge of a given discipline is critical to developing appropriate technological tools for educational purposes. The choice of technologies affords and constrains the types of content ideas that can be taught. Likewise, certain content decisions can limit the types of technologies that can be used. Technology

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can constrain the types of possible representations, but also can afford the construction of newer and more varied representations. Furthermore, technological tools can provide a greater degree of flexibility in navigating across these representations. Teachers need to master more than the subject matter they teach, have a deep understanding of the manner in which the subject matter can be changed by the application of particular technologies and understand which specific technologies are best suited for addressing subject-matter learning in their domains. According to Cox & Graham (2009), studies should be conducted with current teachers with all levels of technological knowledge and in all school situations from wealthy suburban schools to struggling urban schools to spare rural schools.

Technological Pedagogical Knowledge

TPK is an understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies (Koehler & Mishra, 2009).To build TPK, a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed. TPK becomes particularly important because most popular software programs are not designed for educational purposes. Software programs such as the Microsoft Office Suite (Word, PowerPoint, Excel, Entourage, and MSN Messenger) are usually designed for business environments. Web-based technologies such as blogs or podcasts are designed for purposes of entertainment, communication, and social networking. Teachers need to reject functional

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fixedness (Duncker, 1945) and develop skills to look beyond most common uses for technologies, reconfiguring them for customized pedagogical purposes.

Technology, Pedagogy, and Content Knowledge

TPACK is an emergent form of knowledge that goes beyond all three core components (content, pedagogy, and technology). Technological pedagogical content knowledge is an understanding that emerges from interactions among content, pedagogy, and technology knowledge. Underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge of all three concepts individually. Instead, TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones (Koehler & Mishra, 2009).

By simultaneously integrating knowledge of technology, pedagogy and content, expert teachers bring TPACK into play any time they teach. Each situation presented to teachers is a unique combination of these three factors, and accordingly, there is no single technological solution that applies for every teacher, every course, or every view of teaching. Rather, solutions lie in the ability of a teacher to flexibly navigate the spaces defined by the three elements of content, pedagogy, and technology and the complex interactions among these elements in

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specific contexts. Ignoring the complexity inherent in each knowledge component or the complexities of the relationships among the components can lead to oversimplified solutions or failure. Thus, teachers need to develop fluency and cognitive flexibility not just in each of the key domains but also in the manner in which these domains and contextual parameters interrelate, so that they can construct effective solutions. This is the kind of deep, flexible, pragmatic, and nuanced understanding of teaching with technology we involved in considering TPACK as a professional knowledge construct. The act of seeing technology, pedagogy, and content as three interrelated knowledge bases is not straightforward. These components exist in a state of dynamic equilibrium or, as the philosopher Kuhn (1977) said in a different context, in a state of ''essential tension''…. Viewing any of these components in isolation from the others represents a real disservice to good teaching. Teaching and learning with technology exist in a dynamic transactional relationship (Bruce, 1997) between the three components in the framework; a change in any one of the factors has to be ''compensated'' by changes in the other two. (Mishra & Koehler, 2006). This view inverts the conventional perspective that pedagogical goals and technologies are derived from content area curricula. Things are rarely that simple, particularly when newer technologies are employed. The introduction of the Internet, for example – particularly the rise of online learning – is an example of the arrival of a technology that forced educators to think about core pedagogical issues, such as how to represent content on the Web and how to connect students with subject matter and with one another (Peruski & Mishra, 2004). Teaching with technology is a difficult

thing to do well. The TPACK framework suggests that content, pedagogy, technology, and teaching/learning contexts have roles to play individually and together. Teaching successfully with technology requires continually creating, maintaining, and re-establishing a dynamic equilibrium among all components. It is worth noting that a range of factors influences how this equilibrium is reached.

Empirical Study on Teachers' ICT Competency

Teacher ICT competency has been viewed as a prerequisite for the acceptance and use of ICT in school systems (Archibong, Ogbiji, & Anijaobi-Idem, 2010). According to Rogers (2003), individuals' decision to accept and use a new technology is related to the skills and knowledge one has regarding how to operate that technology appropriately. Based on the Jegede, Dibu-Orjerinde, and Illori (2007) empirical study, the finding indicated that there was a significant positive relationship ($r = .663$, $p < .05$) between ICT competence and the general computer attitudes and practices of an individual. In line with the Jegede *et al.* (2007) study, Sa'ari, Luan, and Roslan (2005a) also found that teachers who demonstrated high level of competency in using computers find information systems to be more useful. These teachers approached the information system with greater confidence and displayed a lower level of anxiety and aversion to using it. Besides, the results showed that there was a weak positive correlation ($r = .127$, $p < .05$) between teachers' attitudes and their perceived competence toward computer usage (Sa'ari, Luan, & Roslan, 2005b). Therefore, the researchers argued that being competent in using computers is also an important asset rather than only having positive attitudes toward technology usage. This showed that both attitudes and ICT competency

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played a significant part in establishing the concrete development of teacher acceptance and use of technology.

Next, another study conducted by Lau and Sim (2008) further clarified that teachers who are more competent in using ICT have reported more favorable perception toward the acceptance and ICT use in Malaysian secondary schools. Hence, the authors suggested that to develop their ICT competency teachers' perception must change and their ICT usage must increase. This result is consistent with the findings of the previous study which concluded that teachers who are more competent in using computers also have more favorable attitudes toward computers (Jegede *et al*., 2007; Sa'ari *et al*., 2005b; Varol, 2013).

Based on a survey conducted by Buabeng-Andoh (2012) to examine teachers' competency, perceptions, and practices toward ICT usage in second-cycle institutions in Ghana, the correlation analysis showed a positive significant correlation ($r = .68$, $p < .01$) between teachers' ICT use and their ICT competence. This result is consistent with Sorgo, Verckovnik, and Kocijancic (2010), who found a high correlation between teacher ICT competency with the frequency of use of ICT and perceived importance of ICT among Biology teachers. They concluded that teacher ICT competency and confidence were predictors of ICT usage in teaching.

In contrast, Drent and Meelissen (2008) found that teachers' ICT competence has no direct influence on their innovative ICT usage. However, we found that the teachers' ICT competence defined by these researchers is only the basic computer skills and knowledge regarding how to operate the computer and software; it was

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more appropriate to focus on the end-user ability to apply ICT in carrying out routine tasks.

Summary and Literature Gap

The literature reviewed highlighted on the policies and the attempt made by governments in the various countries in integrating technology in their education curriculum. In spite of the growing support for computers as tools for teaching and learning, scarce resources are being committed into these efforts which does not march with the desire to see results. A number of studies have revealed that there are challenges that hinders the teaching and learning of ICT in the various schools.

Based on the literature discussed, the majority of studies reported a significant relationship between teacher ICT competency with teachers' application or acceptance and use of ICT (Lau & Sim, 2008; Sorgo *et al*., 2010) and teachers' attitude toward computers (Jegede *et al*., 2007). Although teacher ICT competency has been reviewed not many empirical studies reported on the relationship between teacher ICT competency and students' academic performance. Hence, this study sought to examine the relationship between teacher ICT competency and academic performance of students in Information and Communication Technology in East Akim Municipality.

CHAPTER THREE: METHODOLOGY

Introduction

This chapter deals with the research methodology used in teachers' ICT competency and students' academic performance in ICT in the Junior High Schools in East Akim Municipality in the Eastern Region of Ghana. It is significant to note that a good research method produces the relevant data which in turn yields the expected results or findings. The chapter discusses profile of the study area, the research design, population, sample and sampling technique. It further talks about the research instruments used, data collection method, validity of instruments, reliability of instrument, ethical consideration, procedure or data collection and data analysis.

Profile of the Study Area

This research was conducted in some selected public basic schools that offer ICT in East Akim Municipality in the Eastern Region of Ghana. The municipality has a population size of about 167,896 according to the 2010 Population and Housing Census. It has one hundred and nine (109) basic schools made up of forty two (42) private and sixty seven (67) public schools, thirteen (13) senior high schools both private and public, four Technical and Vocational Education and Training (TVET)   , a nursing training and a college of education. The municipality shares boundaries with Atiwa District, Fanteakwa District, West Akim Municipal Assembly and Suhum Kraboa Coaltar Municipal Assembly.

Research Design

The design indicates whether there is an intervention and what the intervention was, the nature of any comparisons to be made, the method to be used to control extraneous variables and enhance the study's operability, the timing and frequency of data collection and the setting in which the data collection is to take place. According to Katundu (1998) the purpose of a research and its objectives determine the type of research design employed for a study. Considering the nature of the research problem and the purpose of this study, the most appropriate research methodology that was used was the quantitative research methods and instruments in eliciting of data. Descriptive research design was selected for quantitative research approach. The purpose was to generalise from a sample to a population so that inferences could be made about some characteristics, attitudes or behaviour of the population. This cannot be measured directly but through eliciting the expressions of what they say. It is against this background that the descriptive research survey was used (Best & Khan, 2006). In addition, the descriptive survey affords the opportunity to select a sample from the population being studied and then makes generalisation from the study of the sample (Ary, Jacobs & Razavieh, 1994; Best & Kahn, 2006). The quantitative research method was adopted for this study to ensure that the research is enriched by the strength of the approach as well as to provide answers to research questions guiding the study.

Population

Population has been defined by McMillan and Schumacher (2001) as a group of elements or cases, whether individuals, objects or events that conform to

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specific criteria in research. Blaikie (2009) defined research population as an aggregate of all cases that conform to some designated set of criteria. It is whatever group the investigator wishes to make inference about. In this study, the target population was made up of all teachers and students of Information and Communications Technology in the public basic schools in the East Akim municipality.

The population was two thousand and sixty-nine (2,069), made up of 1,997 JHS 3 students in the 67 public junior high schools and 72 Information and Communication Technology (ICT) teachers. This population was the targeted group of interest.

Sample and Sampling Technique

Sampling is the use of a definite procedure in the selection of part for the expressed purpose of obtaining from its description or estimate certain properties or characteristics of the whole (Kumakpor, 2002). In a similar scenario Blaikie (2009) further expatiated that a sample is a selection of elements from a population and may be used to make statements about the whole population. The ever increasing demand for research has created a need for an efficient method of determining the sample size needed to be representative of a given population (Krejcie & Morgan, 1970). In this study, nineteen (19) public Junior High Schools (JHS) were sampled from 67 public Junior High Schools. The sample size was found to be appropriate on the basis of Alreck and Settle (1994) who indicated that a sample size of 10% of a population is enough to obtain adequate confidence. A research conducted by Gay and colleagues (2009) also pointed out that for a

descriptive study, between 10% - 30% of the available population was sufficient enough to be used as a sample. Hence, this sample was considered representative to characterize the target population (schools). The sampled schools represented 28.6% of the total 67 basic schools. The sampling technique used to select the 19 basic schools from the 67 public basic schools was simple random sampling, specifically, using the lottery method. All the 67 public Basic schools were assigned a number and were put in a bowl. Nineteen numbers were picked one after the other from the bowl without replacement. The corresponding schools were then selected. For the student's population, the focus was on JHS three (3) students of the sampled schools.   This was because they were supposed to have almost completed their syllabus and were being prepared for the BECE. They had also written series of mocks to test their academic performance. The BECE which is taken upon completion of basic school in Ghana is one of the indicators to measure academic performance in this study. The study employed Krejcie and Morgan's table (1970) to select three hundred and twenty-two (322) correspondents from the target population of 1,997 JHS 3 students. By so doing the researcher builds up a sample that is satisfactory to specific needs. The sample is very representative of the population possible and sampling technique employed considered other relevant factors (all things being equal) in the population that might threaten the validity of the study.

The total estimated sample was 341 respondents. This sample was made up of 322 students and 19 teachers of ICT. Seventeen (17) students were picked from 18 of the 19 schools whiles sixteen (16) from the remaining school. The selection was

randomly done until it reached the required sample. The ICT teachers were automatically picked because each school had one ICT teacher at the junior high level. ICT teachers formed part of the study because they were involved in the teaching and learning process and the fact that their competency which is the exogenous variable had an influence on the academic performance of the students.

Research Instrument

A questionnaire was designed and used to collect data for the study. The instrument was designed to elicit from the students on their performance in ICT and from the teachers their competence in teaching of ICT. The basic structure of the instrument was based on the five-point Likert-type scale as described by Best and Kahn (2006). This however, was appropriate to be used by the researcher in determining the level of teacher competency in the teaching of ICT and the academic performance as well.

Questionnaire

Best and Kahn (2006) highlighted that a questionnaire is used when factual information is desired. It relates to the aims of a study, the hypotheses and research questions to be verified and answered. Questionnaires are fast and convenient and given the level of education of both the teachers and students in the schools, it was not likely for them to misinterpret the questions and give misleading answers. The use of questionnaires ensured that quantifiable responses were obtained for the purpose of establishing relationships between the identified variables and the responses. The closed ended questions were employed in the collection of data from the various schools. Closed-ended questions were used to control responses. The

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questionnaire for the teachers was developed with guidelines from UNESCO's ICT competency framework standards for teachers (2008) and a related study (Badau & Sakiyo 2013) on assessment of ICT teachers' competence to implement new curriculum in Northern Nigeria, an online journal.

The respondents were ask to evaluate their level of competence on a Likert-type scale. For the teachers, the questionnaire was grouped into the following sections with 44 question items: Section A: Background Characteristics, Section B: ICT Training, Section C: Level of Teacher ICT competence with the use of UNESCO's ICT competency standards. The questions on ICT competency in this section was subdivided into Understanding ICT in education, Curriculum and Assessment, Pedagogy, Technology, Organization and administration and teacher professional learning Section D: Availability of ICT Facilities whiles the students had Section A: Background Characteristics, and Section B: Performance in ICT with 26 question items.

Validity of Instrument

Validity is very important in the development and evaluation of research instruments (Ary *et al*, 1994). It is used to determine if an instrument measures what it is intended to measure. To establish the validity of questionnaire, draft copies were given to friends and two supervisors of MEd. IT Department (University of Cape Coast) who read through and evaluated the relevance of each item in the instruments to the objectives and made the necessary corrections. Their recommendations to rephrase complex sentences and constructions into simpler sentences were incorporated to finally modify

questions and the format of the tool that had the ability to solicit the expected data as a benchmark for validity.

Reliability of Instrument

To ensure reliability of the instrument used for the study, a pilot testing was conducted at Asiakwa Salvation Army Junior High School. The researcher chose this school because it was one of the schools which exhibited similar characteristics that were of interest to him. In the pilot testing, two ICT teachers and 11 students were supplied with the draft copies of the questionnaires. There was thorough discussion on any ambiguity, doubt and incoherencies that would confront the respondents on any aspect of the draft. Respondents were given time to complete and return the questionnaires. The pilot study helped to remove ambiguous statements. Further reliability of the instrument was established with Cronbach Alpha Reliability Co-efficient (α) using SPSS computer program. The results was $\alpha = 0.81$ and $\alpha = 0.78$ for teachers and students questionnaires respectively which was found to be reliable. All the necessary corrections and changes were made before the data collection.

Procedure for Data Collection

According to Creswell (2002), respecting the site where the research takes place and gaining permission before entering a site is very paramount and ethical in research. A written introductory letter was therefore obtained from the coordinator of Med IT department, University of Cape Coast (found in the appendix C) and sent to the Heads of the selected Junior High Schools (JHS) where the research was carried out. Copies were also sent to the statistical department of

Ghana Education Service (GES) through the municipal director to solicit for other relevant information that would enhance the research. To establish a close relationship with the teachers and students, the Heads conveyed a short meeting with the ICT teachers to seek their maximum support. The respondents were assured of confidentiality of their responses. They were also assured that all information obtained would be used for the intended purpose. According to Kelley *et al* (2003), these are the most important ethical issues to adhere to when conducting a survey. The questionnaires were then administered to the students and the teachers. Some of the respondents requested enough time be given to them. Others also sought more explanation to some of the questions.

Data Analysis

The data collected were analyzed using both descriptive and inferential statistics. The appropriate descriptive and analytical tools which were used to synthesize and transform the data include frequency tables, bar graphs as well as pie charts given a relative proportions where appropriate. On the other hand, Pearson Product Moment Correlation approach was used in determining relationships. Analysis of the data provided the facts and figures for interpretation of the results. All items of the questionnaires were grouped and coded. The coded items and their corresponding frequencies were fed into the computer using the IBM Statistical Package for Social Sciences (SPSS) version 22 software program.

Ethical Consideration

Ethics defines what is or is not legitimate to do, or what a 'moral' research procedure involves (Neuman 2006). Social researchers according to Neuman need

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to prepare themselves and consider ethical concerns as they design a study so that sound ethical practice is built into the study. Ethical issues catered for in this study were: right to privacy, voluntary participation, anonymity and confidentiality. The participants were informed of what the study was about before their permission were sought. The names and information that could easily aid in identifying the participants were not be included in the instrument to ensure the maintenance of confidentiality. The participants were also educated on their rights to discontinue with the study whenever they wanted without any explanations.

CHAPTER FOUR: RESULTS AND DISCUSSION

Introduction

The research focused on the relationship between teachers' ICT competency and students' academic performance in ICT. This chapter presents the analyses of the data collected for the study. Discussions of the findings are also presented. The results are presented and discussed in accordance with the research objectives and questions in various sections of the chapter with respect to the questions in the questionnaires.

A total of 341 copies of the questionnaires of which 19 and 322 were for teachers and pupils respectively fully completed. This represents 100 percent of the total number administered.

The presentation of findings were of two parts; Section A and B. Section A consist of analysis and discussion of findings from students respondents whiles section B presents that of the teacher respondents.

Section A: Analysis and discussion of findings from student respondents.

Table 1: Gender of Student Respondents

Gender	Frequency	Percent (%)
Male	142	44.1
Female	180	55.9
Total	**322**	**100.0**

Source: Field Survey, 2018.

Even though the main focus for this research was not on gender difference, it was very appropriate to consider gender balance or equality in this presentation. From

Table 1 it can be seen that for the 322 students respondents surveyed, 180 representing 55.9 % were females whiles 142 representing 44.1% were males, indicating that there were more female students than male students in the schools visited and both male and female students were fairly represented.

Age distribution of students' respondents

Figure 4 showed the age distribution of the students respondents. Students were asked to indicate their age range by placing a tick next to the relevant option provided. All the 322 participants (100%) responded. Of the 322 respondents the results showed that 249 (77.3%) which constituted the bulk of the samples were between the ages of 10 - 15 years, those between the ages of 16 -20 years constituted 73 (22.7%). In Ghana, the entry age for JHS is 12 years with 3 years of completion which is in accordance to the levels and grade of education as classified by the International Standard Classification of Education (ISCED) 1997 and 2011 (UNESCO, 2006). This means that by the time you complete JHS you should be at least 15years. As indicated in the figure, majority of the respondents were young, which is 10 -15 years. This age range is a clear reflection of appropriate grade level in most Ghanaian Basic schools. It is obvious that those aged between 16 - 20 years might have had a delay in their education and other related factors.

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Responses
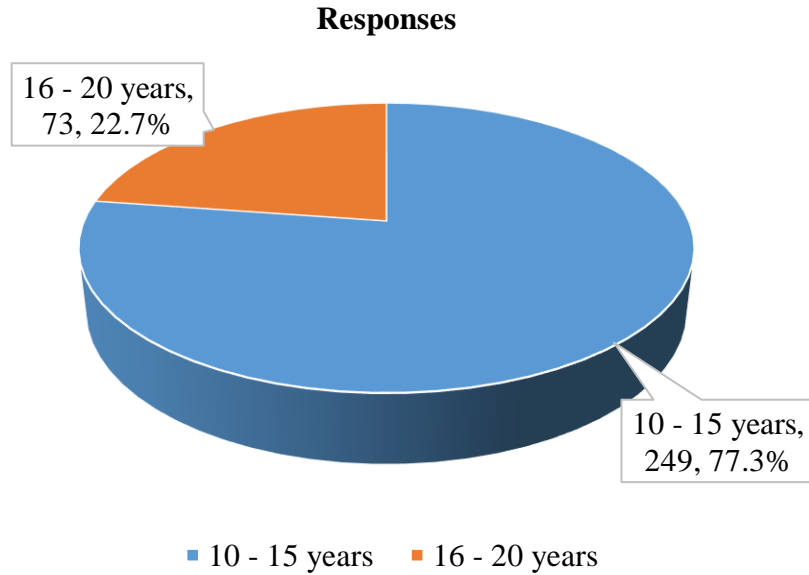
Figure 4: Distribution of age range of student respondents

Source: (Field Data 2018)

Distribution of Years Student Respondents Have Been Learning ICT

Figure 5 indicates the number of years the students respondents had been learning ICT in their respective schools. The results showed that 58 representing 18% of the total respondents had been learning ICT for less than a year. Those who had been learning ICT for the period of 1 to 5 years constituted 28%. Also, 174 representing 54% had been learning ICT for 5 years and more. A large number of them had been learning ICT for a long time and this indicates that the respondents started learning ICT when they were in primary school.

Responses

■ Less than a year   ■ 1 - 5 years   ■ 5years and above
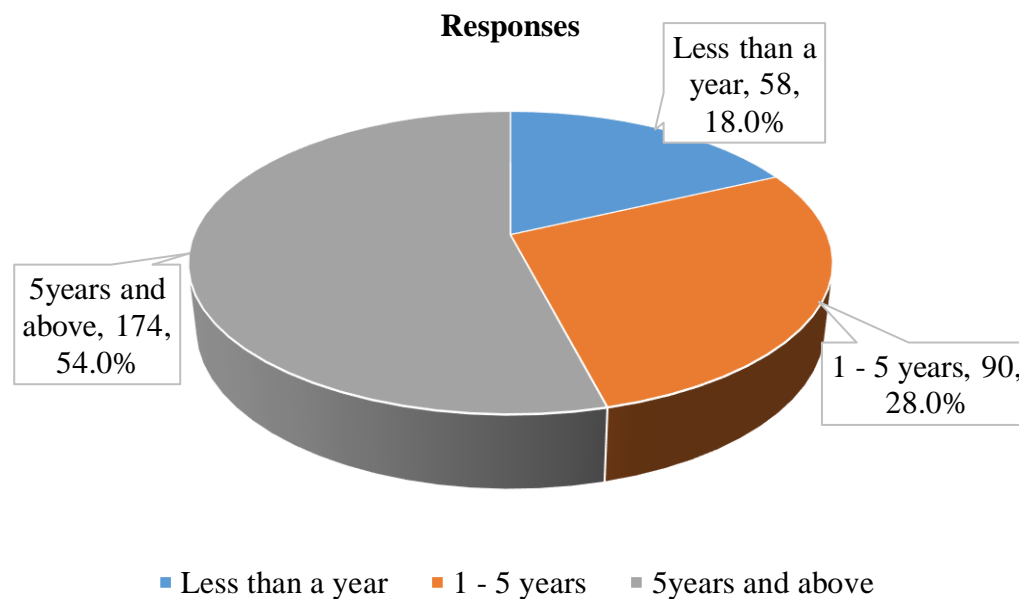
Figure 5: Years of Students learning ICT

Accessibility of Computers to Student Respondents

Table 2 indicates the accessibility of computer to the students' respondents at home to practice what they are taught in school.

Table 2: Accessibility of Computers to Student Respondents

	Frequency	Percent (%)
I use my personal computer	21	6.5
I use computer at the café	3	0.9
I use a friend's computer	47	14.6
I have no access to computer	251	78.0
Total	**322**	**100.0**

Source: Field Survey, 2018.

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As evident from the table, 251 respondents representing 78% said they do not have access to computer after school. Even though computers are sold almost in every district of Ghana, most parents cannot afford to buy for their children. On the other hand 47 respondents (24.6%) are able to have access to a computer from their friends. The results also showed that 3 representing 0.9% of the total respondents have access to the computer by visiting internet cafe. Those who had been using their personal computer constituted 6.5%. A greater percentage (78.0%) of the respondents had no access to computer to practice what they learn in school.

Performance in End of Term 1 and 2 ICT Examination.

Good teaching and learning conditions in schools are supposed to enhance pupils' performance and achievement levels in various tests and examination in schools. The trend in Ghana education Service is that, teachers are to assess pupils after delivering instructions to test their understanding and evaluate their performance. This is done through the use of both formative and summative assessment. How pupils are learning and how much they are learning throughout their years in school are very paramount to their academic achievements. As a result the researcher used their end of term ICT examinations as one of the indicators in determining their academic performance. The pupils were asked to indicate with a tick on the appropriate mark range they had in ICT for both term 1 and term 2. A summary of the outcome for both term 1 and 2 are detailed in Table 3.

Table 3: Performance of Students in End of Term 1 and 2 ICT Examination

Marks	Frequency		Percent (%)	
	Term1	Term 2	Term1	Term 2
Above 80%	7	9	2.2	2.8
71 – 80%	10	27	3.1	8.4
61 – 70%	76	61	23.6	18.9
51 – 60%	49	43	15.2	13.4
30 – 50%	118	122	36.6	37.9
Below 30%	62	60	19.3	18.6
Total	**322**	**322**	**100.0**	**100.0**

Source: Field Survey, 2018.

As shown in Table 3, only 7 out of 322 students representing 2.2% and 9 students representing 2.8% had a mark above 80 for term 1 and term 2 respectively. Those who had from 71 – 80 were 10 (3.1%) and 27 (8.4%) for term 1 and 2 respectively. 17 more students who had a mark range of 71 – 80 in term 1 had a mark in the same range in term 2. This implies that most of the students did better in term two compared to term 1. Also, 2 more students had 80 and above in term 2 as compared to term 1. With West African Examination Council (WAEC) grading system, you need to get 80 and above for equivalent grade of 1. If this should be used for grading only 7 to 9 out of 322 student respondents would get grade 1. It is surprising to see an alarming number of students' respondents 180 (55.9%) and 182 (56.5%) scoring 50 and below in their end of term 1 and 2 respectively.

Analysis of Results on the Perceived Performance of Student Respondents in ICT.

Students' performance in performing ICT related task (practical skills) on the computer apart from their end of term examination score were examined using a subscale in section B of the students questionnaire. The respondents were asked to rate their level of performance on a 5 point Likert scale; 5 for Very Poor, 4 for Poor, 3 for Fair, 2 for Good and 1 for Very Good. It is significant to note that, being able to use computer to perform series of tasks in the Basic school gives an added advantage when you progress to senior high school. Table 4 presents a summary of the outcome.

Table 4: Analysis of Results on the Perceived Performance of Student Respondents

SN	Task	Level of Performance				
		VG	G	F	P	VP
1	Answering ICT questions in class	63(19.6)	82(25.5)	66(20.5)	36(11.2)	75(23.3)
2	Use the computer to type documents.	25(7.8)	61(18.9)	56(17.4)	59(18.3)	121(37.6)
3	Edit, format and save documents	24(7.5)	83(25.8)	43(13.4)	80(24.8)	92(28.6)
4	Create folders on the computer	24(7.5)	83(25.8)	43(13.4)	80(24.8)	92(28.6)
5	Organise electronic files into folders	15(4.7)	52(16.1)	80(24.8)	70(21.7)	105(32.6)
6	Locate and run application programs	11(3.4)	39(12.1)	50(15.5)	144(44.7)	78(24.2)

Table 4: Analysis of Results on the Perceived Performance of Student Respondents (Continued)

SN	Task	Level of Performance				
		VG	G	F	P	VP
7	Search for files and folders on the computer	21(6.5)	48(14.9)	57(17.7)	132(41.0)	64(19.9)
8	Access information on a storage media	8(2.5)	31(9.6)	75(23.3)	125(38.8)	83(25.8)
9	Move files between drives (e.g. From C: to D :)	9(2.9)	23(7.1)	67(20.8)	134(41.6)	89(27.6)
10	Access files from the web using the internet	8(2.5)	27(8.4)	56(17.4)	155(48.1)	76(23.6)
11	Download files from the web using the internet	10(3.1)	29(9.0)	48(14.9)	144(44.7)	91(28.3)
12	Access and read emails	10(3.1)	27(8.4)	53(16.5)	112(34.8)	120(37.3)
13	Compose and send emails with attachment	5(1.6)	14(4.3)	57(17.7)	146(45.3)	100(31.1)
14	Use web search engine to search for relevant information	8(2.5)	36(11.2)	25(7.8)	134(41.6)	119(36.9)

KEY: VG = Very Good   G = Good   F = Fair   P = Poor   VP = Very Poor

During or after instructions, teachers need to ask questions to help motivate student's curiosity about the topic and at the same time help assess pupils understanding on the lesson presented. As indicated in the Table 4, those in the better position (either Very Good or Good) in answering ICT questions in class

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were seen to be 45% as compared to 34.5% of the respondents who rated themselves as either poor or very poor. On the other hand those who rated themselves as fair were 66 representing 20.5%. Students in this category are likely to fall into the category of good or poor in answering questions in the near future.

In rating students' performance in using the computer to create document, the table revealed that only few rated themselves as very good (7.8%) and Good (18.9%). This means students hardly use the computer or finds it difficult to create, produce and organize documents for printing. Only 58 students representing 17.8% rated themselves fair in creating documents with the computer. More than half (180) of the students 55.5% rated themselves as either poor or very poor in using the computer in creating documents. The cause might have been the fact that they have little or no knowledge in the use of basic keyboard and word processing software.

Introduction to the internet and the worldwide web is one of the topics in the ICT syllabus which starts from primary 6 to JHS 3. Students are taught ways in accessing information from educational sites and the use of search engines. As such on the item 24 of the students' questionnaire, students respondents were therefore asked to rate their performance in the use of web search engine to search for relevant information pertaining to their study areas. It is evident from the Table 4, 253 students' respondents representing 78.5 % rated themselves as either poor or very poor in using search engine to access information on the web. This result was expected because almost all the teachers (94.7%) indicated non availability of internet access in their questionnaire when they were asked on the availability of ICT resources (as indicated in Table 11) in the school where internet facilities was

one of the indicators. On the other hand 13.7% rated themselves as either Good or very good in using search engine to access information on the web. Those who rated themselves as fair were 7.8%. If this topic is being treated at all then it would be difficult for the student to understand it since its practical oriented. Teachers will have problems in teaching whiles students will also be learning in abstract.

Emailing is also one of the topics in the syllabus. After a successful teaching students are expected to create email addresses, access, read, and reply emails, compose and send emails with attachments to their peers or to the teacher on any assignment or project work given. It was therefore necessary for the researcher to access students' performance on such areas. As indicated in Table 4 below, 3.1%, 8.4%, 16.5% , 34.8% and 37.3% rated themselves as very good, good, fair, poor and very poor respectively in accessing and reading emails whilst 72.1% rated themselves as poor or very poor in accessing and reading emails. These also point to the fact that accessibility to computers and the internet has been a challenge.

The table also revealed that the highest reported percentages of students' respondents on composing and assessing email with attachments are those who rated themselves as poor (45.3%). This percentage is more than half of the total respondents. It followed closely by those who rated themselves as very poor (31.1%). The lowest reported percentage are those who rated themselves as very good and good with 1.6% and 4.3% respectively whilst 57 students respondents representing 17.7 % rated themselves as fair.

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Section B: Analysis and Discussion of Findings from Teacher Respondents.

ICT Teachers Gender

Among the nineteen (19) ICT teachers, 15(78.9%) were males while only 4(21.1%) were females. This scenario is associated with the fact that, in the area of technology, females are not seen to develop enough interest in ICT. Kay (2006) asserts that male teachers used more ICT in teaching and learning than their female counterparts. However the situation was different in Western US basic schools where Breisser (2006) found that females' teacher's self – perception about technology competence improved while males' teacher's self-perception about technological dominance went down. The sample used here is in line with (Kay, 2006). The results is indicated in Table 5.

Table 5: Distribution of ICT Teachers by Gender

Gender	Frequency	Percent (%)
Male	15	78.9
Female	4	21.1
Total	**19**	**100.0**

Source: Field Survey, 2018.

Age range of teachers' Respondents

As shown in Table 6, 52.6% of the respondents were in the 30 – 34 years age category and constituted the bulk of the sample, 36.8% were in 25 – 29 years range while only 10.5% were 35 years and above.

Table 6: Age Range of Teachers

Age	Frequency	Percent (%)
25 – 29years	10	52.6
30 – 34 years	7	36.8
35years and above	2	10.5
Total	**19**	**100.0**

Source: Field Survey, 2018.

Teachers' Highest Educational Qualification.

Table 7 shows the distribution of ICT teachers according to their educational

qualifications.

Table 7: Distribution of Teachers by Highest Academic Qualification

Qualification	No. of Teachers	Percent (%)
Cert "A"	-	0.0
Diploma	13	68.4
HND	1	5.3
First Degree	4	21.1
Master's Degree	1	5.3
Total	**19**	**100.0**

Source: Field Survey, 2018.

It is shown in Table 7 that none of the respondents possessed teacher certificate

"A" as a highest qualification. The study also established that more than half of the

respondents 13 (68.4%) had attained diploma as their highest qualification, while 4

representing 21.1% had Bachelor's Degree. One respondent (5.3%) had Higher

National Diploma (HND) and one also had Master's Degree. This implies that quiet a majority of teachers had at least a Diploma qualification in the basic schools. It is also not surprising that, none of the teachers had Cert "A". This is due to the introduction of Diploma Certificate after completing College of Education (Ghanaweb, 2004).

Teachers Professional Status

In response to the questions regarding the professional status of teachers respondents, the study revealed that an overwhelming number of teachers 16 (84.2%) were professionally trained in the various educational institution in Ghana from colleges of education or in the various universities where education was a major course whereas 3(15.8%) were not professionally trained. This implies that, the schools in the municipality did not have much problem in relation to teachers. The municipality has more professionally trained teachers than non-professional teachers. The details are depicted in figure 6.
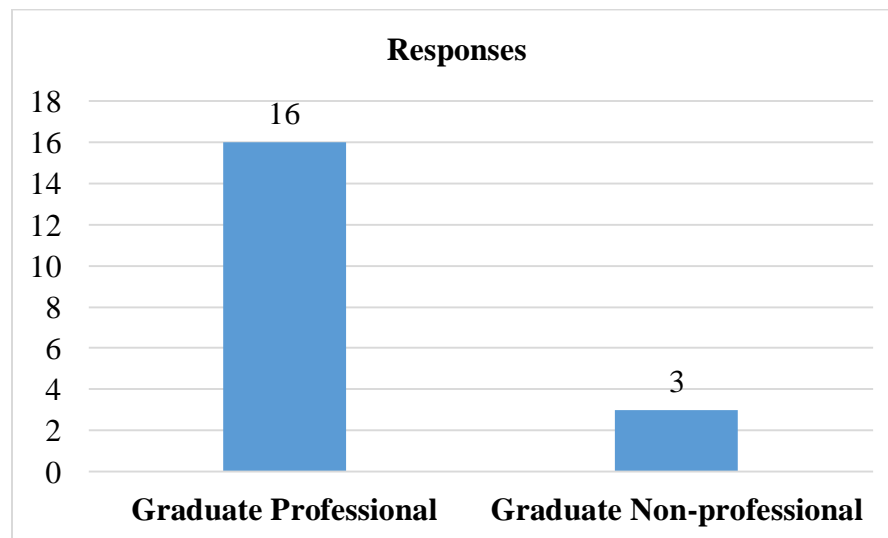
Figure 6: Professional Status of teacher Respondents

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Teachers Experience in Teaching ICT

Table 8 presents distribution of teacher respondents by the number of years of teaching ICT in their various schools.

Table 8: Distribution of Teachers by Number of Years in Teaching ICT

Range of Years	Number of Teachers	Percent (%)
Less than 1year	1	5.3
1 – 3years	7	36.8
4 – 6years	7	36.8
7 – 9years	3	15.8
10years and above	1	5.3
Total	**19**	**100.0**

Source: Field Survey, 2018.

Years of teaching experience is an important factor in most institutions such as Ghana Education Service (GES) as teachers turn to gain more experience by working on their deficiencies from their previous years of teaching in their subsequent years to gain more experience. Table 8 indicates that out of the 19 respondents, 1(5.3%) had taught ICT for less than a year. Seven each (36.8%) had taught for 1 – 3 years and also for 4 – 6 years. Only 1(5.3%) respondent had more than 10 years teaching experience in respect to ICT. There is an indication that the sample was representative of teachers of all categories of working experience in terms of years of teaching of ICT. However table 8 shows that most of the respondents had had up to 9 years teaching experience with only few with less than 1 year and more than 1year teaching experience.

ICT Training Received by Teachers Before Joining the Teaching Profession.

Again they were asked to indicate whether they had any training in ICT before joining the teaching profession. Fifteen representing 78.9% responded affirmative that, they had training in ICT before joining the teaching profession whiles 4 (21.1%) had no training in ICT. The training teachers had before joining the teaching profession was part of their syllabus in the colleges of education where trainees were introduced to ICT to be able to perform basic computer task. This in some way does not guarantee that teachers could effectively handle the subject without any difficulty since they did not specialize in learn and teach ICT when posted to their various schools.
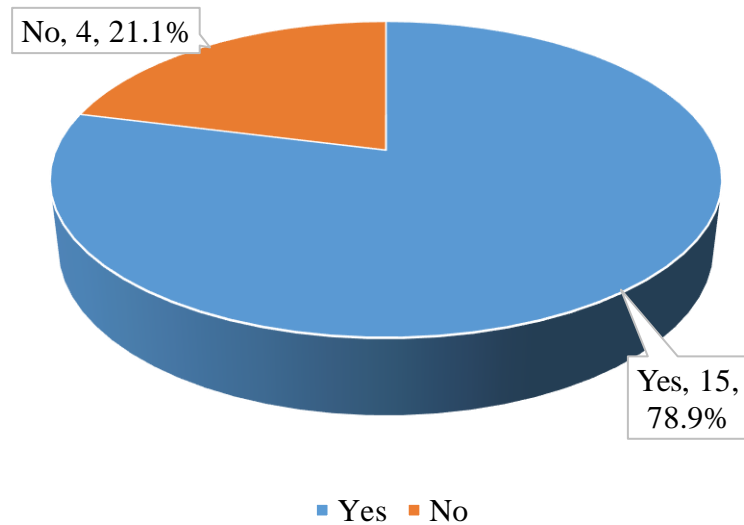
Figure 7: ICT Training Received by Teachers before joining the teaching profession**.**

ICT Training Received by Teachers After Joining the Teaching Profession.

Teachers were further asked to indicate whether they have had any training in ICT after joining the teaching profession. Out of the 19 teachers, ten (10) representing 52.6% said they had and 9 representing 47.4% said they had not. From the results, almost the same number of respondents who said they have had training also said no. The results is shown in figure 8.
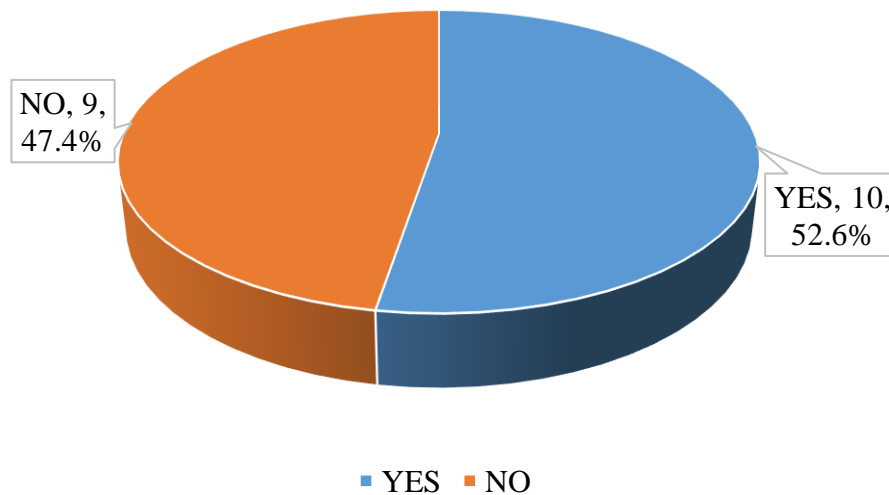
Figure 8: ICT Training Received by Teachers after joining the teaching profession

Use of Computers in Teaching ICT

Figure 9 sought to probe into how often teachers used computers in teaching and delivering lessons in ICT.

Responses
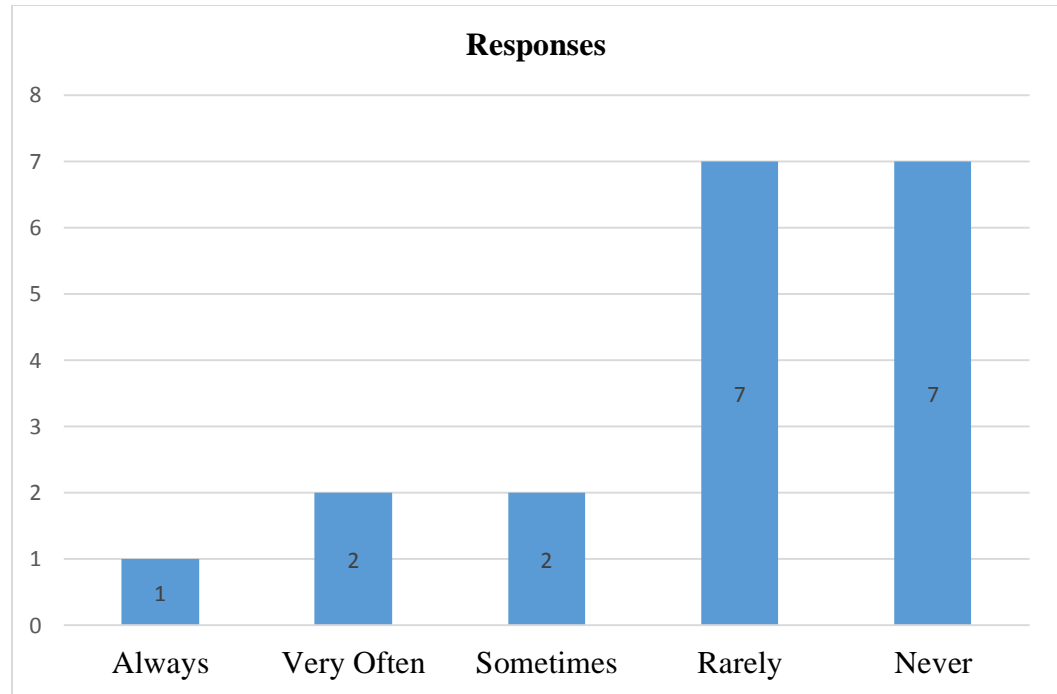
Figure 9: Frequent use of computers in teaching ICT

From Figure 9 above, only 1 teacher representing 5.3% had been using computer regularly in teaching ICT. Two each (10.5%) used computer very often and sometimes to teach ICT. 7 respondents representing 36.8% responded that they had never used computer at all in teaching ICT in their schools. This same percentage 7 (36.8%) of the respondents also said they rarely used computers in delivering lessons on ICT. This result confirms a similar research conducted in Rhodes University, South Africa which revealed that only 21%, 27%, and 32% of three different categories of teachers were more likely to use computers for teaching and learning purposes (Maholwana-Sotashe, 2007).

How Teachers Engage Students in Practical Lessons in ICT.

Figure 10 details the responses of teachers in engaging students in practical lessons.
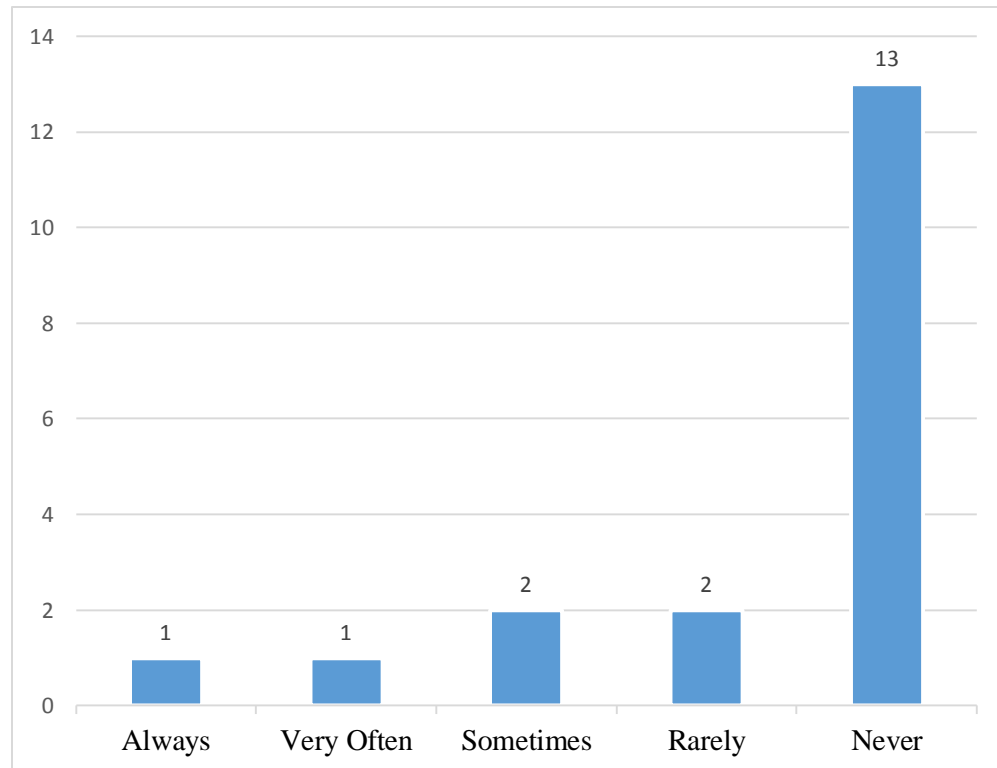
Figure 10: How teachers engaged students in Practical lessons in ICT

Only 1 respondent said he always engaged students in practical lessons. This same number applied to those who engaged students in practical lessons very often. 2 respondents said they sometimes engage students in practical lessons as well as those who selected rarely. An alarming number of the respondents 13(68.4%) do not engaged students in practical lessons. Probably there were no computers available in their respective schools.

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Research Question 1: The extent to which teachers ICT academic qualification influence the academic performance of ICT of students in the Junior High School.

ICT Professional or Academic Qualification of Teachers.

Being able to teach ICT well demands that teachers know the content, show mastery of the subject and able to deliver. With these it became imperative to ask teachers whether they have had any qualification in ICT or not. Teachers who said they don't have either professional or academic qualification in ICT were 15 out of the 19 respondents representing 78.9% while 4 representing 21.1% said they have. The highest academic qualifications of the teachers (Table 7) do not indicate whether their focus was only on ICT teaching or not. The qualification they indicated were general academic qualification. This is unfortunate because ICT teaching requires special content expertise to deal with the subject for effective delivering in teaching and learning. This shows that, they are teaching ICT simply because they have some sort of knowledge in the subject since there are no qualified ICT teacher in the school (Figure 11). In relating this to the extent at which their qualification influence the performance of students in ICT it can be concluded that majority of the teachers who do not have ICT academic or professional qualification to a large extent has influence on academic performance of students since both their practical and end of term exams were low (Table 3 and 4).

Responses

YES, 4, 21.1%

NO, 15, 78.9%

▪ YES ▪ NO
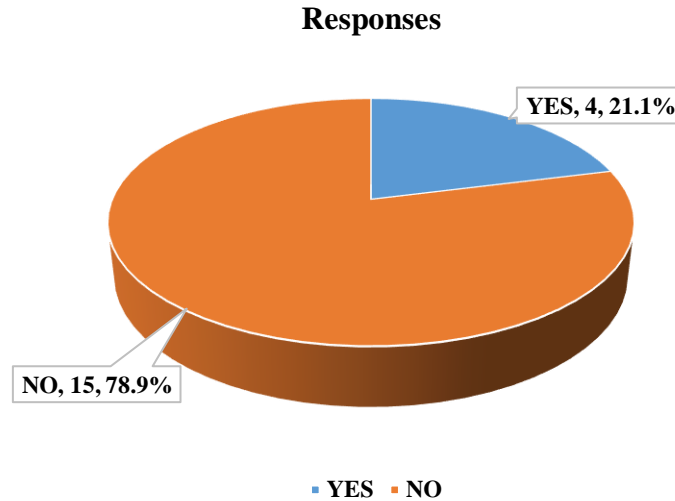
Figure 11: ICT professional or academic qualification of teacher respondents

Research question 2: What are the Levels of Competence of Teachers in the use and teaching of ICT?

Twenty three (23) research questions were answered on the level of teacher competency on the six different components of UNESCO ICT competency framework for teachers; understanding ICT in Education, Curriculum and Assessment, Pedagogy, Technology, Organisation and Administration and Teacher Professional learning. The levels were determined using a grand mean and standard deviation. The real limits of the five point scale were Always – 1, Frequently – 2, Occasionally – 3, Rarely – 4 and Never – 5. Occasionally with a scale point of 3 has been accepted to be within the range of competence. Therefore 2.5 being the lower limit of 3 is the decision point. This means that any overall mean above 2.5 was regarded as low competence. 2.5 as the overall mean indicate moderate competence whiles those below 2.5 were regarded as high competence. The results is presented in the Table 9.

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Table 9: Level of Teachers' Competence in the use and Teaching of ICT

Competencies	N	Mean	Std. Deviation	Level
Understanding ICT in Education				
Aware of national ICT in education policy.	19	3.89	1.370	Low
Applying national ICT policy in the classroom.	19	4.21	1.134	Low
Grand mean		**4.05**		**Low**
Curriculum And Assessment				
Use ICT tools to support students understanding of subject concepts and their applications.	19	3.37	1.257	Low
Use ICT tools for formative and summative assessment and to provide students with feedback on progress.	19	3.95	1.433	Low
Grand mean		**3.66**		**Low**
Pedagogy				
Use ICT to design teaching and learning unit plans and activities.	19	3.95	1.353	Low
Use project based learning and ICT to support students thinking and social interactions.	19	3.95	1.129	Low
Use subject specific application to support student's collaboration.	19	3.79	1.134	Low
Grand mean		**3.90**		**Low**

Table 9: Level of Teachers' Competence in ICT (Continued)

Competencies	N	Mean	Std. Deviation	Level
Technology(ICT)				
Use ICT to manage, monitor, and assess progress of student's project	19	4.05	1.353	Low
Use internet to access and download information on the web.	19	2.21	1.34	High
Grand mean		**3.13**		**Low**
Organisation And Administration				
Develop procedure for ethical responsibilities and appropriate use of ICT to support teaching and learning.	19	3.63	1.535	Low
Identify the appropriate social arrangements (whole class, small group and individual activities) to use with various technologies.	19	3.84	1.214	Low
Grand mean		**3.73**		**Low**
Teacher Professional Learning				
Use ICT to enable staff to actively contribute knowledge that can be used to support classroom practices, research and professional development.	19	4.05	1.268	Low
Use virtual learning environment to link staff to eternal expert.	19	4.26	1.195	Low
Grand mean		**4.15**		**Low**

Source: Field Survey, 2018.   **Overall mean = 3.77**

Based on the results in Table 9, the grand mean of 4.05 indicates low competence

in understanding ICT in education. Questions asked under this category recorded

low competence. For teachers' competence in Curriculum and assessment, the data showed that the mean in each of the items was low which gave a grand mean of 3.66. This indicates low competence in curriculum and assessment in the use and teaching of ICT.

Research studies made by Ertmer (2005) and Talbert-Johnson (2006) emphasized the point that pedagogical skills of teachers are becoming increasingly important. Gore, William and Ladwig (2006) argue that for the most part pedagogy is neglected in the induction of early career teachers. Teachers' pedagogical competence was also tested giving a grand mean of 3.90 indicating low pedagogical competence in use and teaching of ICT. In addition teachers need to plan and design effective learning environments and apply technology enhanced instructional strategies to support the diverse needs of learners. The data in Table 9 shows that the grand mean (3.13) of all the items gave a low competence. Thus ICT teachers' technology competence in the use and teaching of ICT was low. Albirini (2004) confirmed in his study that teachers' computer competence predicted their positive attitudes towards technology in education. However, others researchers have concluded that although teachers may have positive attitudes towards technology (Office of Technology Assessment, 1995) they will still not consider themselves qualified to teach with it or comfortable using it. With teachers ICT competence in organisation and administration in the use and teaching of ICT, a grand mean of 3.73 of all the items was rated as low. This means that teachers are not able to use computer and its related technology to perform administrative work such as recording students' grades, students and teachers' personal information and

other related task effectively. The final components tested on teachers' level of ICT competence was Teacher professional Learning. From Table 9 the grand mean of 4.15 in each of the item showed low. This means that teachers professional learning or development in the use and teaching of ICT was low. Continuing professional development for all beginning teachers will be crucial, to support their retention in the teaching profession, and also ensure positive impacts on curriculum and pedagogy (Muijs & Lindsay, 2007; Talbert & McLaughlin, 1994). Carter and Francis (2001) argue that early support in pedagogy is "critical to the quality of their immediate professional experiences as well as to their longer-term professional learning".

A summary of a the six components of teacher ICT competence and their corresponding grand mean is shown in the Table 10   showing the average mean (mean of means) of teacher ICT competency.

Table 10: Overall Mean of Level of Teachers ICT Competence

SN	Competence	Mean	Remark
1	Understanding ICT in education	4.05	Low
2	Curriculum and assessment	3.66	Low
3	Pedagogy	3.90	Low
4	ICT	3.13	Low
5	Organisation and administration	3.73	Low
6	Teacher professional learning	4.15	Low
	Mean of Means	**3.77**	**Low**

Overall mean of means level of teachers ICT Competence on the six UNESCO standards in the East Akim Municipality recorded a value of 3.78. This implies that

the respondents have low competence in the use and teaching of ICT in their various schools. The findings were in line with Lang, Craig and Casey (2017) who lamented that, teachers often have little ICT competence and mostly associated with lack of confidence in using ICT in teaching and learning.

Research question 3: What type of ICT Facilities / Resources are Available for use in the School that has Influence on Students' Performance?

Research question three was about the ICT facilities/resources that were available for use by both teachers and students in the various schools. Their responses were summarized in Table 11.

Table 11: Availability of ICT Resources

SN	ICT Resources	Availability		
		Available and adequate	Available but not adequate	Not available at all
1	ICT Textbooks	3(15.8)	5(26.3)	11(57.9)
2	ICT laboratory	-(-)	7(36.8)	12(63.2)
3	Computers	-(-)	1(5.3)	18(94.7)
4	Projector	-(-)	-(-)	19(100)
5	Internet Access	-(-)	1(5.3)	18(94.7)
6	Printer	1(5.3)	4(21.1)	14(73.7)
7	Scanner	-(-)	3(15.8)	16(84.2)
8	Photocopier	-(-)	4(21.1)	15(78.9)

Source: Field Survey, 2018.

One major factor hindering effective teaching and learning of ICT is the availability or adequacy of ICT resources in the various schools. If the resources

are not available or adequate, it may have an adverse effect on teaching and performance as well. According to Mbwesa (2002), the availability of ICT resources can enhance learning by making education less dependent on deferring teacher quality and making education available at home throughout the day. When teachers were asked about the availability of ICT textbooks for use by the students, only 3(15.8%) from the 19 schools responded that textbooks are available and adequate. This should reflect in all the schools visited but surprisingly 11(57.9%) responded that ICT textbooks were not available at all while 5 (26.3%) said they were available but not adequate. It is likely that the managements of those schools with adequate ICT textbooks made tremendous effort for parents to purchase the books for their wards or through other means. Adequate access to textbooks is an important indicator of the quality of education. The Ministry of Education textbook policy states that, each pupil in basic education should have access to textbooks in each of the subjects (The Education Sector Report, 2010). While data on textbook ratio appears fragmentary and sometimes contradictory, on average, a Ghanaian child has fewer than 2 textbooks at the primary level and average of 2.5 textbooks at JHS level (World Bank, 2004). Several studies conducted in Northern Ghana suggest that the core textbook ratio is far worse in the deprived areas (RECOUP, 2008). It is evident from the table that, ICT textbooks are not available for use by students in the various schools visited. Another issue that was observed was unavailability of laboratory facilities in the schools within the municipality. The study revealed that out of the 19 basic schools visited, 12 schools representing 63.2% had no ICT laboratory. Seven schools representing 36.8% had ICT

laboratory but not adequate. These schools have converted a section of some of the classrooms and staff common room with two to three computers. None of the selected schools had laboratory facility. To be able to teach and learn ICT effectively, there is a need for the establishment of ICT laboratory to help in practical skills of the students.

Again, when asked to indicate whether computers were available in their schools, as seen in Table 11, computers in the laboratory seems to be one of the major concerns in the municipality. This is depicted by majority 18 (94.7%) of respondents who asserted that computers were not available at all for teaching and learning of ICT. Only one teacher respondent representing (5.3%) however responded that their school had computers but not adequate, while none of respondents consented to the presence of computers in their school. The above findings suggests that the general lack of computers in the various schools and the municipality as a whole directly hinders the effectiveness of the teaching and learning. Thus, the process of teaching and learning ICT in the schools can become significantly poorer and affect performance since students do not have access to computers to practice what they will be taught.

As shown in Table 11, out of the total of 19 teachers, 1(5.3%) responded affirmatively that they had internet access but not adequate. Surprisingly, as many as 18 (94.7%) respondents responded that internet access was not available at all in their school. This might be due to financial constraint in regards to subscription and unavailability of computers. This finding showed that most of the Basic schools did not have internet access. Though the percentages differ, this is in harmony with that

of a similar study conducted in South Africa which found that only 25% of the teachers from a sample of schools confirmed availability of internet access in their schools, in other words as many as 75% confirmed their schools did not have internet access (Maholwana-Sotashe, 2007).

The table further shows that projectors for presenting lessons were not available at all in the selected schools visited. All the 19 respondents representing 100% indicated non availability of projectors. For printers, 1(5.3%), 4(21.1%) and 14(73.7%) respondents said they are available and adequate, they are available but not adequate and they are not available at all respectively.

Test of Hypotheses

In this section the results of Pearson Moment Correlation analyses between teachers ICT academic qualification and academic performance of students in ICT is analyzed, interpreted and hence discussed accordingly. Table 12 presents the results of the analyzed data where the interpretation is followed. The assumption is that the availability of ICT resources such as computers for practical lessons, teachers with specialized ICT qualifications and a high level of competence, could either have a positive or negative impact on their academic performance.

Hypothesis one: There is no Relationship Between ICT Academic Qualification of Teachers and Academic Performance of Students in ICT.

Table 12 outlines the results of Pearson Moment Correlation analysis between ICT academic qualification and academic performance of students in ICT.

The results from the table will show whether the sample relationship will be fairly unlikely to be true with enough evidence for it to be rejected or otherwise.

Table 12: **Relationship Between ICT Academic Qualification of Teachers and Academic Performance of Students in ICT.**

Variable		Students End of term ICT performance		
		Teachers ICT academic qualification.	Term 1	Term 2
Teachers ICT academic qualification.	Pearson Correlation	1	.419*	.431*
	Sig. (2-tailed)		.040	.027
	N	19	19	19
Students Term 1 ICT mark	Pearson Correlation	.419*	1	.002
	Sig. (2-tailed)	.040		.978
	N	19	322	322
Students Term 2 ICT mark	Pearson Correlation	.431*	.002	1
	Sig. (2-tailed)	.027	.978	
	N	19	322	322

*Correlation is significant at the 0.05 level (2 tailed)

The results of the Pearson Moment Correlation analysis as reflected in Table 12 revealed that Teachers ICT academic qualification is significantly ($r =$ 0.419, $p <$ 0.05 for term 1), ($r =$ 0.431, $p < 0.05$ for term 2) related to academic performance of students in ICT. Therefore the null hypotheses is rejected in favour of the alternative hypotheses that there is a relationship ICT academic qualification of teachers and academic performance of students in ICT. The study further indicated a mild positive relationship between Teachers ICT academic qualification (independent variable) and academic performance of students in ICT (dependent variable) for both term 1 and 2 at a significant level of 0.05 with ($r = 0.419$, $p = 0.040$), ($r =$ 0.431, $p = 0.027$) respectively. This means when teachers attain high ICT academic qualification, students' performance will be high. This is to say that

when teachers update their knowledge to attain a good ICT qualification, teaching the subject will reflect on students' high academic performance in ICT.

Hypothesis two: There is no significant relationship between availability of ICT resources and its use and academic performance.

Table 13: Relationship between availability of ICT resources and academic performance

SN	Variables		ICT Mark for Term 2	ICT Mark for Term 1
1	ICT text books	Pearson Correlation	.041	.012
		Sig. (2-tailed)	.868	.960
		N	19	19
2	ICT laboratory	Pearson Correlation	-.249	.138
		Sig. (2-tailed)	.304	.573
		N	19	19
3	Computers	Pearson Correlation	-.229	.492*
		Sig. (2-tailed)	.345	.032
		N	19	19
4	Internet access	Pearson Correlation	-.157	.290
		Sig. (2-tailed)	.522	.228
		N	19	19
5	Printer	Pearson Correlation	.216	.065
		Sig. (2-tailed)	.375	.790
		N	19	19
6	Photocopier	Pearson Correlation	-.139	.463*
		Sig. (2-tailed)	.569	.046
		N	19	19

*Correlation is significant at the 0.05 level (2 tailed)

The results of the Pearson Moment Correlation analysis as reflected in table 13 show a positive linear relationship and a moderate strength between the availability of ICT resources (computers) and its use (independent variable) and students' academic performance (dependent variable) by a positive value of the computed correlation coefficient r = 0.492, p = 0.032 at a significant level of 0.05. Furthermore the p-value (0.032) being less than the level of significance alpha (α) level (0.05) implies that the results is statistically significant. Therefore the null hypothesis is rejected in favour of the alternative hypothesis based on the results presented in Table 13.   This proves that if computers are available for use by students for practical lessons in class, the more likely they would improve on their academic performance. As noted by Riel (1998), the availability and use of computers can help students exploit enormous possibilities for acquiring information for schooling purposes and can increase learning through communication. Jonassen (1996, 2000) explained that when computers and their related technology are made available in various schools, students are compelled to use databases, spreadsheets, emails, multimedia and network search engines to complete projects. Also according to Jackson, Edwards and Berger (2003), computers and their use have the potential to equip students with higher-order skills such as inquiry, reasoning, problem solving and decision making abilities, critical and creative thinking and learning how to learn. Research also showed that using computers has a positive effect on students achievement compared to traditional methods (Sterling & Gray, 1991 in Means, (ED.) 2004).

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

Rapid and continuing advances in Information and Communication Technologies (ICT's) are changing the way people share, use, develop and process information. In this digital age, young people need to be highly skilled in the use of ICT and there is a growing body of evidence that the use of ICT in the classroom can enhance learning. Overtime, students' academic performance in both external and internal examinations had been used to determine teachers' performance of the teaching of the subject. One major factor hindering effective teaching and learning of ICT is the availability or adequacy of ICT resources in the various schools.

It is essential that the contemporary teacher has good ICT skills and is able to integrate ICT into the teaching and learning process. Competent teachers are the most critical piece in improving students' achievement and closing the achievement gab in the digital world. There are currently an abundant knowledge-base to inform us that in schools, teachers play the crucial role in students' learning and achievement.

Summary

This study was conducted to investigate the relationship between teachers ICT competency and students' academic performance in ICT in some selected schools in East Akim municipality in the Eastern region of Ghana. It also sought to find out whether availability of ICT resources especially computers have a positive

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influence on students' performance or otherwise. The following hypothesis were derived from the research questions.

1. H_0. There is no significant relationship between ICT academic qualification of teachers and academic performance of students in ICT.

2. H_0. The required ICT resources and appropriate teaching and learning materials have no influence on students' performance.

In the study, 19 public Junior High schools were sampled from 67 public Junoir high schools. This sample was made up of 322 students and 19 teachers of ICT.

Descriptive research design was selected for quantitative research approach. The data collected were analyzed using both descriptive and inferential statistics.

Frequency tables, bar graphs as well as pie charts were used for the descriptive statistics and Pearson Product Moment Correlation approach was used in determining relationships for the inferential statistics. All the relationships were tested at a confidence level of 0.05.

Key Findings

The key findings outline the answers the research questions and the results of the hypothesis of the study. The findings on the academic performance of the students revealed that 180(55.9%) and 182(56.5%) students scored 50 and below in their end of term 1 and 2 respectively. Majority of the students also rated themselves as either poor or very poor in performing computer related tasks such as using the computer to create, edit, format and save documents, access, read, compose and send emails with attachment. On the accessibility of computers by students, 78%

of the respondent said they do not have access to computer after school to practice what they have been taught in school. Their low performance can also be attributed to the fact that the overall mean of teachers ICT Competence level on the six UNESCO standards recorded a value of 3.77. This value correspond to a low competence in the use and teaching of ICT in their various schools.

This was revealed when 78.9% of the respondents indicated that they do not have any ICT professional or academic qualification. This also had effects on the performance of the students as they scored low mark in their end of term examination. Most students' performance in both practical and end of term examination were low due to the unavailability of computers in the school. This was reflected when there was a positive linear relationship and a moderate strength between the availability of ICT resources (computers) and students' academic performance. The null hypothesis H_0 was rejected at 0.05 level of significance since $p = 0.032$. This is to say that unavailability of computers have effects on students' academic performance.

Conclusion

Majority of teachers do not have any ICT qualification to handle the subject efficiently. The lack of adequate ICT resources and host of other problems were found to be a hindrance associated with the teaching and   learning of ICT. This study has established a knowledge gap of ICT teachers with respect to UNESCO's ICT competency standards for teachers. It is evident from the literature that unless the issue of ICT competency and ICT resources are addressed, it can itself be a barrier to students learning.

In conclusion, enough training on ICT can address some of the barriers in the teaching and learning ICT. This is because acquiring the necessary skills through training will enhance teachers' knowledge base and competence level.

Recommendation

The recommendation made in this study were based on the study findings.

1.   The supply of teaching and learning materials such as textbooks to the basic schools must be given utmost attention and on time by the government in order to improve teaching and learning.

2.   The government and other stake holders of the education in Ghana should consider providing variety of Information and Communication Technologies or resources proportionally to all public basic schools to encourage more effective teaching and learning.

3.   Teachers who do not have practical skills in ICT usage should seek some training to enable them competently and confidently use ICT in teaching the subject.

4.   Stake holders in education such as government institutions, Non-Governmental Organisations (NGO's), parent associations among others should collaborate to set up ICT laboratories and equip them with sufficient modern technologies to encourage ICT in all basic schools.

5.   Ghana Education Service in collaboration with Ministry of Education should regularly organise in-service training workshops and course to update teachers' knowledge and skills on new effective teaching and learning methods to enable them deliver quality basic education.

Suggestions for Further Research

It may be necessary for further research to be conducted on different competence level for teachers' on specific basic operation of the computer in relation to the contents in the syllabus. Also, any further research can employ different research instrument specifically observation together with a questionnaire to gain insight into various techniques, strategies and methods used by the teachers in the ICT class for theory and practical lessons with the help of observational guide.

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APPENDICES

APPENDIX A: QUESTIONNAIRE FOR TEACHERS

Dear Teacher,

I am Alfred Awuah Aboagye, a final year graduate student of University of Cape Coast pursuing **Master of Education (Information Technology).** As part of the academic requirement, I am conducting a research on **Relationship between teachers' ICT Competency and academic performance of students in ICT in East Akim Municipality.**

You have been selected to take part in this study by providing your responses to the items in this questionnaire. Please feel free to give your views on the items. I therefore promise that it is for purpose of this study and hence any information provided will be treated private and with high level of confidentiality.

SECTION A - Background Characteristics

Please tick where applicable

1. Sex :   Male [   ]   Female   [   ]

2. Age :   20 – 24 years [   ]   25 – 29 years [   ]   30 – 34 years [   ] 35 years and above [   ]

3. Highest academic/Professional qualification

    Cert "A" [   ]   Diploma [   ]   Higher National Diploma [   ]

    First Degree [   ]   Masters Degree [   ]

4. **Rank**

    Superintendent II [   ]   Senior Superintendent II [   ]   Senior Superintendent I [   ]   Principal Superintendent [   ]   Others [   ]

5. **Status:**

   Graduate Professional [   ]   Graduate non Professional [   ]

   SECTION B - ICT Training

6. How long have you been teaching ICT?

   Less than a year [   ]   1 – 3 years   [   ]   4 – 6 years [   ]

   7 – 9 years [   ]   10 years and above [   ]

7. Do you have any ICT professional or academic qualification?

   Yes [   ]   No [   ]

8. Did you receive any training in ICT before you joined the teaching

   profession?

   Yes [   ]   No [   ]

9. Have you had any training in ICT after joining the teaching profession?

   Yes [   ]   No [   ]

10. How often do you use computers or any ICT tools in your day to day

    activities?

    Always [   ]   very often [   ]   Sometimes [   ]   rarely [   ]

    Never [   ]

11. Do you engage students in Practical lesson?

    Always [   ]   very often [   ]   Sometimes [   ]   rarely [   ]

    Never [   ]

12. Do you give students practical exercise after teaching?

    Always [   ]   very often [   ]   Sometimes [   ]   rarely [   ]

    Never [   ]

13. Do you enjoy teaching ICT?

Always [   ]   very often [   ]   Sometimes [   ]   rarely [   ]

Never [   ]

SECTION C – Level of Teacher ICT Competence

Please respond to the questionnaire below under the UNESCO teacher ICT competency labelled A, B, C, D, E and F. under the following scale:
Never, Rarely, Occasionally, Frequently, Always

S/N	Competence	Always	Frequently	Occasionally	Rarely	Never
A	**Understanding ICT In Education**					
14	Aware of national ICT in education Policy.					
15	Applying national ICT policy in the classroom.					
16	Aware of the three core pillars of ICT in education.					
B	**Curriculum And Assessment**					
17	Use tools for course design and lesson planning.					
18	Use ICT tools to support students understanding of subject concepts and their applications.					
19	Use ICT tools for formative and summative assessment					

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		Always	Frequently	Occasionally	Rarely	Never
	and to provide students with feedback on progress.					
20	Use ICT communication and collaboration tools to access and connect students to the world outside the classroom.					
21	Use ICT resources and assisted technologies.					
C	**Pedagogy**					
22	Use ICT to design teaching and learning unit plans and activities.					
23	Use project based learning and ICT to support students thinking and social interaction.					
24	Use ICT to design and implement collaborative project based unit plans and classroom activities.					
	Competence	**Always**	**Frequently**	**Occasionally**	**Rarely**	**Never**
25	Use open ended tools to support students collaboration					
26	Use subject specific application to support student's collaboration.					
D	**Technology(ICT)**					

27	Use ICT to manage, monitor and assess progress of students' projects.					
28	Use internet to access and download information on the web.					
29	Can use spreadsheet program very well.					
30	Can create presentation package.					
E	**Organisation And Administration**					
31	Use computers, televisions with the classroom and/ the school so as to support and reinforce learning activities and social interactions.					
32	Develop procedure for ethical responsibilities and appropriate use of ICT to support teaching and learning					
33	Identify the appropriate social arrangements (whole class, small group and individual activities) to use with various technologies.					
F	**Teacher Professional Learning**					
34	Use ICT to enable staff access to e- learning courses					

	for professional development.					
35	Use ICT to enable staff to actively contribute knowledge that can be used to support classroom practices, research and professional development.					
36	Use virtual learning environment to link staff to external expert.					

SECTION D – Availability of ICT Facilities

Please tick the appropriate options that correspond with your answer on the teaching and learning resources available in your school.

S/No	Resources	Available and adequate	Available but not adequate	Not available at all
37	ICT text books			
38	ICT laboratory			
39	Computers			
40	Projector			
41	Internet access			
42	Printer			
43	Scanner			
44	Photocopier			

THE END

THANK YOU

APPENDIX B: QUESTIONNAIRES FOR STUDENT

Dear Student,

I am Alfred Awuah Aboagye, a final year graduate student of University of Cape Coast pursuing **Master of Education (Information Technology).** As part of the academic requirement, I am conducting a research on **Relationship between teachers' ICT Competency and academic performance of students in ICT in East Akim Municipality.**

You have been randomly selected as a respondent to the above topic.

Please feel free to give your views on the items. I therefore promise that it is for educational purpose and hence any information provided will be private and strictly confidential. Moreover, you can decide not to take part in this study.

SECTION A - Background Characteristics

1. Sex :   Male [   ]   Female   [   ]

2. Age :   10 – 15 years [   ]   16 – 20 years [   ]   21 years and above [   ]

SECTION B – Performance in ICT

3. Have you seen a computer before?

   Yes [   ]   No   [   ]

4. How long have you been learning ICT?

   Less than a year [   ]

   1 – 5 years [   ]

   5 years and above [   ]

5. How accessible are computer to you to practice what you have been

   taught?

   I use my personal computer [   ]

   I use computer at the café [   ]

   I use a friend's computer [   ]

   I have no access to computer [   ]

6. How often do you use computers or any ICT tools in your day to day

   activities?

   Always [   ]

   Very often [   ]

   Sometimes [   ]

   Rarely [   ]

   Never [   ]

7. Do you have any interest in learning ICT in school?

   Yes [   ]

    No [   ]

8. Do you enjoy ICT lessons?

   Always [   ]

   Very often [   ]

   Sometimes [   ]

   Rarely [   ]

   Never [   ]

9. What has been you mark in ICT for the past two terms?

    i. **Term one**

      Below 30% [   ]   30 – 50% [   ]   51 – 60% [61 – 70% [   ]

      71 – 80% [   ]   Above 80% [   ]

    ii. **Term two**

      Below 30% [   ]   30 – 50% [   ]   51 – 60% [61 – 70% [

      ]   71 – 80% [   ]   Above 80% [   ]

Please rate yourself in terms of your performance in ICT under the following scale: **Very Good, Good, Fair, Poor, And Very Poor**

S/N	Performance	Very Good	Good	Fair	Poor	Very Poor
10	Answering ICT questions in class					
11	Switch on a computer correctly.					
12	Use the computer to type documents.					
13	Edit, format and save documents.					
14	Create folders on the computer.					
15	Organise electronic files into folders.					
16	Locate and run application programs.					
	Performance	Very Good	Good	Fair	Poor	Very Poor
17	Search for files and folders on the computer.					
18	Access information on a storage media.					

100

19	Move files between drives (e.g. From C: to D :)					
20	Access files from the web using the internet.					
21	Download files from the web using the internet.					
22	Access and read emails.					
23	Compose and send emails with attachment.					
24	Use web search engine to search for relevant information.					
25	Switch off the computer correctly.					

THE END

THANK YOU.

APPENDIX C: LETTER OF INTRODUCTION FROM COORDINATOR, MED IT UNIT

UNIVERSITY OF CAPE COAST

College of Distance Education

Tel No: 03321 - 36947
Fax: 03321 - 36946
E-mail   cce@ucc.edu.gh

University Post Office
Cape Coast

Our Ref. No: CCE/MED/17/Vol.1/077

14th June, 2018

Your Ref. No:

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Aboagye, Alfred Awuah** with registration number **ED/ITP/16/0016** is pursuing a two-year Master of Education Degree in Information Technology at the University of Cape Coast.

He is conducting a research on the topic **"Relationship between teachers' ICT Competency and academic performance of students in ICT in East Akim Municipality."**

We will strongly appreciate any courtesy extended to him.

Thank you

Paul Nyagorme (PhD)
Coordinator, M.Ed IT Unit