

UNIVERSITY OF CAPE COAST

BARRIERS TO EFFECTIVE INTEGRATION OF COMPUTER
TECHNOLOGY INTO CLASSROOM INSTRUCTION IN THE KETA
MUNICIPALITY

BY

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of Education Degree in Information Technology

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DECLARATION

Candidate's Declaration

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

Candidate's Signature: Date:

Name: David Kwaku Besah

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.

Principal Supervisor's Signature: Date:

Name: Prof. C.K. Agezo

ABSTRACT

It is an undeniable fact that the world is now being ruled by technology. Without IT, our lives in this modern world will be miserable. The purpose of the study was to find out the state of ICT infrastructure in our schools, what teachers believe are the barriers to computer technology use in their classroom instruction and what suggestions they had to offer in order to bridge the barriers. Descriptive survey design was used. Teachers in public JHS in the Keta municipality were used. The sample comprised 270 participants of whom 67 were heads of schools and the rest of them, 203, were classroom teachers. The simple random sampling technique was used to select the sample. Questionnaire was the main instrument used for data collection for the study. Data collected were analysed using IBM SPSS version 21. Frequencies and percentages were used. The study revealed that infrastructure for ICT was inadequate. Even though a lot of schools sampled had electricity, the number of computers and other ICT tools were insufficient in most schools. Respondents suggested that ICT infrastructure should be supplied to schools and teachers trained to use ICT in their classroom instruction. Parents should provide computers for their wards at home so pupils can use them to do projects and assignments. Provision of ICT infrastructure, training of teachers and provision of home computers for pupils were recommended.

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DEDICATION

To my family, especially my two daughters, Etornam and Elikplim.

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CHAPTER ONE

INTRODUCTION

Background to the Study

Technology has taken over industrialization as a key to development. In the not too distant past, industrialization was the envy of all nations both rich and poor but the excitement has been shifted to computer technology.

The pressures placed on our society to change to an informational and technological economy are clear for all to see. Industries and businesses are hard pressed to stay ahead of the learning curve with regards to information age. It is within this climate that teachers are expected to prepare students to become information “hunters and gatherers”.

The 21st century requires that individuals be technologically literate. Technology invades every aspect of daily life. The internet has been one of the most transformative technologies in history, reshaping business, media, entertainment and society in astonishing ways. Its effect on society is unprecedented.

Information and communication Technology (ICT) includes computers, the internet, and electronic delivery systems such as radio, televisions, and projectors among others and is widely used in today’s education field. Kent and Facer (2004) indicated that school is an important environment in which students participate in a wide range of computer activities. Increasingly, ICT is being applied successfully in instruction, learning and assessment. A number of previous studies have shown that an appropriate use of ICT can raise educational quality and connect learning to real-life situations among them are Lowther, et al (2008); Weert and Tatnall

(2005). As Weert and Tatnall (2005) have pointed out, learning is an ongoing lifelong activity where learners change their expectations by seeking knowledge, which departs from traditional approaches. ICT has the potential to satisfy learners. It provides learners the opportunity to collaborate and communicate effectively.

According to Castro, Sanchez and Aliman (2011), exposing our children properly to ICT will therefore prepare them for a lifelong learning as multiple resources are abundant on the internet. Current research has indicated that ICT assists in transforming a teaching environment into a learner-centred one. The Ghana ICT for Accelerated Development (ICT4AD) Policy (2003) developed under the able chairmanship of Prof Clent Dzidonu, shows that the government of Ghana is committed to a comprehensive programme of rapid deployment and utilization of ICT within the Education sector to transform education and by so doing improve the lives of the citizenry. The government acknowledged in this policy document that in order to make appreciable progress in its socio-economic development efforts, substantial resources are needed in the educational sector. It is well spelled out in this document that ICT will play a key role in widening access to education. One of the policy goals in Ministry of Education, ICT in Education Policy (2008 p. 13) is “to enable graduates from Ghanaian educational institutions (formal and non-formal) to confidently and creatively use ICT tools and resources to develop requisite skills and knowledge needed to be active participants in the global knowledge economy by 2015.” We would like to find out if we are on course.

Nationally, the push to integrate computers into our classrooms comes from government business and industries. The government of Ghana, in

response to the need to equip our students with computer technology, started supplying laptop computers to schools all over the country. These computers which are vital tools for teaching and learning may be left idle like the tool boxes supplied to schools in the early days of the JSS system.

Children, they say are digital natives. They are born into the technological era and are enthused about it. Schools, for that matter teachers, have to incorporate and integrate computer technology into their classroom instruction so that pupils do not feel to be living in a different world at school when they can play all sorts of games at home on the computer and other mobile devices. We nowadays deal with children of the digital or net generation, that is, the children that are born into a world where breath-taking digital technologies have become commonplace - the internet, smart phones, mobile learning and social networks.

As noted by Trilling and Fadel (2009), four powerful forces are converging and leading us towards new ways of learning for life in the 21st century:

1. Knowledge work - increasing demand for knowledge workers and innovators that businesses need to be successful in the knowledge economy of today;
2. Thinking tools – new technology, devices and services that comprise a knowledge worker’s equipment;
3. Digital lifestyles – different ways of delivering, watching, hearing, entertaining, communicating or solving everyday problems. Thus, new ways to make learning interactive, personalized, collaborative,

creative, and innovative are needed to engage net generation children to be actively learning in schools;

4. Learning research – our recent better understanding of how people learn.

Statement of the Problem

According to the Ghana ICT for Accelerated Development [*ICT4AD*] Policy, (2003), a recent survey indicated that the level of computer literacy and awareness in the country was very low and that it contributed to the low levels of development of the ICT industry in Ghana.

A policy statement cited in [*ICT4AD*] Policy, (2003), inter alia states that policy efforts would be directed at using ICTs to facilitate education and learning within the educational system and to promote e-learning and e-education as well as lifelong learning within the population at large. Again, the government through this policy resolved to strengthen science education at all levels of the educational system and to also promote technical and vocational training with emphasis on the use of ICT to facilitate the training and learning process.

Among the objectives of the *ICT4AD* policy, is to facilitate the deployment, utilization and exploitation of ICTs within the educational system to improve on educational access and delivery and to support teaching and learning from primary school upwards. In fulfilment of this objective, the government of Ghana has started deploying laptop computers to basic schools all over the country. Computers in the schools present teachers with a great opportunity to provide learning materials to their students in ways that were not available a decade ago (Roblyer, 2004).

Review of the literature shows that there are lots of benefits that can be derived from using ICT in the classroom. In a study conducted for the Canadian educational authorities, Wellburn (1996) concluded that the current literature is overwhelmingly positive about the use of ICT as a key component in the achievement of educational goals.

Advancement in computer technology, coupled with the pervasive use of computers in every facet of life has made computer technology an important feature of the educational landscape, particularly in the developing countries because we have to keep pace with the advanced countries.

The government of Ghana has started supplying schools with laptop computers. This laudable plan may not work the way the government expect it if care is not taken to ensure that the computers are put to good use. In the Ministry of Education's ICT for Accelerated Development policy (ICT4AD), (2003), the government specifically mentioned the use of ICT as a tool to teach other subjects on the school curriculum other than ICT lessons.

It is therefore imperative that teachers start using these computers at this time that they are new to teach their subjects. However there is the fear that teachers may face a lot of difficulties in using the computers to teach their various subjects as most of them may not have training to this effect. It appears that no research has been conducted within the Keta Municipality about barriers that prevent teachers from using ICT in teaching their subjects. Thus, there is a gap in research in this area. Hence this study was to fill the gap. This study sought to find out the barriers preventing teachers from using the computer technology in teaching their subjects in the Keta Municipality.

Purpose of the Study

The purpose of the study was to investigate the state of ICT infrastructure in our schools, investigate the barriers that affect effective integration of computer technology in classroom instruction and find out how these barriers can be removed for our children to benefit from the supply of laptop computers to schools. Another important issue of relevance to the study was to find out the adequacy of computers and their accessories in the schools that will help the teachers and students do effective teaching and learning using them. The study was also to find out the level of computer technology skills teachers in the public schools have that they can use to integrate into their regular subjects.

Research Questions

The following questions guided the study.

- 1) What is the state of ICT infrastructure in schools in Keta Municipality?
- 2) What do teachers in Keta Municipality believe are the barriers to computer use in classroom instruction in Keta Municipality?
- 3) What are some teacher-suggested strategies to improve the use of computers in classroom instruction in Keta Municipality?

Significance of the Study

The significance of this study is to provide education administrators the needed information about factors determine computer use by teachers in classroom instruction. The findings will also inform stakeholders in education about the barriers that impede teachers' use of computers in teaching in the classroom. The study will also bring to the fore a list of strategies and

recommendations to improve computer use by public junior high school teachers.

Delimitation of the Study

The study has been delimited to the barriers to effective use of computer technology in classroom instruction in the Keta Municipality. It is also delimited to JHS teachers within the Keta Municipality who are teaching in the public schools. The reasons for the decision was lack of funds and the limited time within which this research work should be undertaken.

Limitations of the Study

Teachers in the private JHSs within the Keta Municipality did not form part of the population therefore the findings of the study would not be generalised to all J.H.Ss in the Municipality.

Definition of Terms

Access: For the purpose of this study, access refers to the availability of computers in the classroom and computer laboratory and the ease with which students and teachers can obtain and use them at any time they choose.

Availability: This means that students and teachers have access to or can use computers whenever they want.

Computer: This refers to a desktop or laptop microcomputer with multimedia capability and or internet connectivity located in the school.

Computer technology: This refers to computers with multimedia capability, internet connectivity, and peripherals (printers, scanners, projectors, and digital videos) that function harmoniously together, used as a tool to enhance teaching and learning in the implementation of school curricula across subjects in the public schools. Computer technology may also mean educational

technology so the two terms may be used interchangeably. It may also be interchanged with Information communication technology (ICT).

Internet: This refers to a system of computers networked together with cable or wireless to enable electronic communication between and among computers that are near or far facilitating data transfer, and electronic need.

Barriers: This refers to the hindrances or impediments that do not allow teachers to implement computer technology use in classroom instruction to their satisfaction and that of the educational authorities.

Organisation of the Study

The study is made up of five chapters. The first chapter focuses on the introduction to the study and deals with the background to the study, the statement of the problem, purpose of the study, research questions, and significance of the study. Others are delimitation, limitations and definition of terms.

The second chapter is the literature review. This deals with review of relevant literature from books, and materials from the internet.

The third chapter is the methodology. This focuses on the method used for the study, the type of study or design and the rationale for using the design. The population is specified and the sample and sampling techniques used, instrumentation as well as the data collection procedure and data analysis are all explained in the chapter.

The fourth chapter deals with the results and the discussion of the study. The data collected are summarized and presented in the form of tables for proper and easy analysis and explanation.

The fifth chapter deals with the summary of key findings conclusion, and recommendations. Suggestions for further study has also been stated in this chapter.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter examines scholarly literature concerning the barriers to effective integration of computer technology in classroom instruction. The chapter outlined the theoretical framework and the use of technology in classroom instruction. It also examines the effects of technology usage for classroom instruction on students' achievement, the necessary and sufficient conditions to support ICT for teaching and learning. It moves on to critically review the barriers to integration of computers in education and how to overcome these barriers.

Importance of Information communication Technology

Undoubtedly, technology has been a growing force in education, business and private life for quite some time now. People no longer write letters that they have to send to the post office to be posted. Instead, they send messages in the form of emails, Whatsapp, Facebook, among others from computers and digital devices, which are instantly received and replied in a twinkle of an eye. A lot of mobile phones come with digital cameras that can be used to take photographs as well as record videos all of which can be shared among users of these devices. According to Shelly, Cashman, Gunter and Gunter (2006), in order to facilitate effective learning for today's digital students, teachers must understand them and how they learn and how teachers can reach them. They are of the view that, "Educational technology and digital media can be valuable tools when they are integrated into the curriculum appropriately to achieve learning gains, particularly when they are combined

with a 21st century curriculum,” p. 229. We will make a lot of progress if we use the technologies that our students are using already in teaching them.

The medium for these exchanges is the internet which is now available in Ghana and can be accessed at most places though expensive for some people. Most of the technologies that I have mentioned can be used in the classroom for instructional purposes and are being used as such in classrooms across the country.

There is no denying the fact that there is a high demand for technologically skilled workers and a technologically savvy workforce. A high percentage of all jobs in the workforce now requires some degree of technological skill. The classroom is where the acquisition of these skills should start from. It will be naïve therefore to leave the school out of this technology revolution.

Benefits of Using Technology in Classroom Instruction

As stated by Koc (2005), using technology in classroom instruction promotes collaboration among learners. This in turn promotes active learning, deepens project-based activities, develops teamwork and leadership skills, emphasise the value of social skills and feeds the young learners’ needs for social interaction and personalisation.

Teachers help students to use collaboration content building technologies such as Wikispace, Etherpad, and Googledocs among others to build content that they can use collaboratively. Other technologies such as Facebook, Twitter, Wordpress (blogs) and Edublogs are used for discussions and reflection which all help to bring students together in other to solve complex problems.

Brush, Glazewski and Hew (2008) state, ICT is used as a tool for students to discuss learning topics, solve problems and provide solutions to problems in the learning process. ICT makes knowledge acquisition more accessible and concepts in learning areas are understood while engaging students in the application of ICT.

According to Castro, Sanchez and Aleman (2011), students are now more frequently engaged in the meaningful use of computers. They build new knowledge through accessing, selecting, organizing and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources, and critically assessing the quality of the learning material.

ICT develops in students' new understanding in their areas of learning (Chai, Koh & Tsai 2010). ICT provides more creative solutions to different types of learning inquiries. For example, in a reading class, e-books are commonly used in reading aloud activities. Learners can access all types of texts from beginning to advanced levels with ease through computers, laptops, personal digital assistants (PDAs), or iPads. More specifically, these e-books may come with some reading applications, which offer a reading-aloud interface, relevant vocabulary-building activities, games related to reading skills and vocabulary acquisition and more. Therefore, ICT involves purpose-designed applications that provide innovative ways to meet a variety of learning needs.

Based on a constructive learning approach, ICT helps students focus on higher-level concepts rather than less meaningful tasks. Levin and Wadmany (2006), showed that there were statistically significant correlations

between studying with ICT and the acquisition of critical thinking skills. Thus, schools are strongly advised to integrate technology across all the learning areas and among all learning levels. Where this is done, students are able to apply technology to the attainment of higher levels of cognition within learning contexts.

According to Reid (2002), ICT offers students more time to explore beyond the mechanics of course content allowing them to better understand concepts. The use of ICT also changes the teaching and learning relationship. Based on findings of Reid's study, teachers reported that the relationship between teacher and learner is sometimes reversed with regards to information technology. This relationship boosts students' confidence when they are able to help teachers with technical issues in the classroom. Therefore, ICT changes the traditional teacher-centred approach, and requires teachers to be more creative in customizing and adapting their own material.

Theoretical Framework

"Evidence indicates, that when technology applications are used effectively and efficiently; they can support higher-order thinking skills by engaging students in genuine, complex tasks within collaborative learning contexts" (Means et al. 1993, p. 2). Cognitive research has shown that learning is most effective when four critical characteristics are present: (a) active participation (b) group participation (c) immediate feedback and interaction with educators and (d) real world connections. Technology allows all four characteristics to take place.

Characteristics of Technology

The traditional way to disseminate information to students was in a lecture and text format. This type of structure creates a passive learning environment, not conducive to deeper learning. "Some students, who are taught in lecture and text format often do not develop deeper understanding of the subject material and have difficulty applying it in real world situations" (Roschelle et al. 2000, p. 79).

Active participation

Technology can be used in a variety of different ways to encourage active learning and participation. One of the first systems to add functionality to the basic classroom response system was a product called Classtalk. Classtalk allowed students to work individually or in groups, at their own pace using sets of questions. "This program was able to handle open-ended questions formats and was structured for group collaboration" (Wallace 2004, p. 171). Another example is a science lab in which students can conduct experiments and then plot results on a graph using the computer. This allows students to see their results immediately. "In widely replicated studies, researchers have noted significant improvements in students' graphing skills, the interpretation and understanding of scientific concepts and an increase in motivation when using the computer software" Roschelle et al. (2000, p. 79). Presenting classroom reports using PowerPoint also encourages active participation and creates a deeper understanding of content. Technology use in the classroom creates flexibility which provides for an environment that is fun and exciting for teachers and students. Instead of research papers, students

produce research based websites and “discuss points of literature in BLOGS instead of traditional handwritten journals” (Maninger, 2006, p. 40).

Fosters Group Participation

The second characteristic technology fosters is group participation. Traditionally, teaching is focused on individual learning. Experts see group work as one major place where computers can enhance traditional instructional practices. Ungerleider and Burns (2002, p. 22), state that "The participation required when children are grouped around a computer, as opposed to working in isolation at individual computers, can have a positive effect on performance" Research has shown that when students work in groups, they develop complex critical thinking skills. Becker (2006) found that when students used computer supported intentional learning environments, students developed greater comprehension of subject matter, showed increased motivation and the ability to tackle difficult questions. By working in groups, students are able to hold informal discussions about the topics at hand. Roschelle et al. (2000, p. 80) assert “that much learning focuses on the meaning and correct use of ideas, symbols, and representations.” Through informal social conversations, students and teachers can provide explicit advice, resolve misunderstandings and ensure mistakes are corrected. Wallace (2004), asserts that in one classroom the teacher had students answer a series of questions. The answers were put into a computer system and the results of student responses posted in a pie graph. After the students had used the communication system to register their responses to the question, the instructor would ask them to turn to their neighbour to discuss the reasons why they chose a particular answer. After discussion, the class would answer the

same question again. When the question was posted a second time, the number of correct answers increased Encouraging group participation through social interaction and discussion of current topics creates motivation and leads to more productive learning environments.

Immediate Feedback

Immediate feedback and interaction with the educator is the third critical factor technology promotes in the classroom. In the traditional mode of teaching, there is very little interaction between the teacher and the student. Students complete work independently and hand it in to the teacher. Typically the teacher would return the assignment later. However, with technology implemented in the classroom, students can turn in homework assignments electronically and receive a grade instantly. Immediate feedback provides students the opportunity to “witness their mistakes and gives teachers the opportunity to reinforce learning” (Maninger 2006, p. 37). Wallace (2004) examined how the internet in public schools affects teachers and students. When students were asked to use the Internet to research topics for discussion, interaction between the students and teachers increased. Because the students were researching the lesson themselves, the teacher had more time to answer individual questions concerning content and explain a process or a concept in more detail. Research, according to Roschelle et al. (2000), suggests that the learning process develops quicker when learners have frequent opportunities to apply the ideas they are learning and when feedback is provided immediately.

Connections to real world situations

Finally learning is most effective when students have the ability to make connections to real world situations. The traditional model of teaching encourages learning facts and reciting them. However, when students go out in the real world they often have problems making connections and applying what they have learned in school to their real lives. Computer technology provides students with the opportunity to increase their knowledge on how to accomplish tasks, create critical thinking skills and provides the ability to improve learning strategies. Ungerleider and Burns (2002, p. 11) state that “the development and implementation of successful metacognitive skills can significantly influence learning and scholastic performance, which can be applied throughout life.” In their research, Roschelle et al. (2000 p. 82) state, “Computer technology provides students with an excellent tool for applying concepts in a variety of contexts, thereby breaking the artificial isolation of school subject matter from real-world situations”.

Computer Technology Usage in Classroom Instruction

The use of information communication technology creates a powerful learning environment and it transforms the learning and teaching process in which students deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001).

Integrating technology into curricula with the intent of positively influencing teaching and learning has been in a state of evolution over the past twenty years. Driven primarily by hardware and software evolution, accessibility to computers in educational settings, and popular instructional technology trends, technology integration has covered the continuum from

instruction on programming skills, self-directed drills and practice, interactive learning software, online training, testing, instructional delivery augmentation and internet-based accessibility to information, communication and publication.

Teachers play a very significant role in integrating technology into instruction. Their knowledge is not only about what technology can do but also (and perhaps more importantly) what technology can do for them. In their study, Buadu, et al. (2014) found out that history teachers they interviewed acknowledged the importance of technology in the teaching of their subject but did not use them or even when they did, just a little because of the various difficulties. The usefulness of a technology lies only in its uses. Thus teachers' technology knowledge consists of three elements: knowledge of problems that can be solved by technology, knowledge of a technology that can solve their problem and knowledge of how technology can solve their problems.

Teachers who are sufficiently equipped with this knowledge should be able to decide when to use technology and when not to use it. They should also be able to select technologies appropriate for the current problems. Thus, what technology teachers should know should interface directly with what teachers do in their teaching. In other words, technology knowledge should be integrated with their pedagogical knowledge.

Teachers use technology for classroom management: databases for record keeping, communication technologies for exchanges with parents, and managing class projects. More importantly, technology is used for instruction: presentation tools to provide multi-media information and simulations, communication tools for students to collaborate on projects, and information

accessing technologies for student research. There is also technology for teachers to know more about their students' misconceptions, technologies for communication with students and assessment technologies to better and more accurately gauge student learning. There are specific technologies for different subject matters. For example, web-based archives of historical documents can be used for teaching history, live data from the internet for teaching weather and earthquakes, computer simulations for teaching abstract concepts, writing tools for literacy, and speech technologies for teaching foreign language.

Many students today spend much of their time interacting with technological devices or in technology mediated environments: watching TV, playing video games, chatting on the internet, writing on the computer and reading on the Web. Teachers' knowledge of technology should therefore be expanded to include technologies that students interact with.

According to DATEC project criteria of developmental appropriateness based on Siraj-Blatchford and Whitebread, (2003), ICT tools should:

1. be educational
2. encourage collaboration
3. support integration
4. leave the child in control
5. transparent and interactive
6. avoid violence and stereotyping
7. support play
8. support the development of awareness of health and safety issues
9. support the involvement of parents

If these considerations are carefully looked at, integration should not be a problem for teachers of today.

Much has changed during the decades between the first efforts to use programming languages like Logo with young students to develop mathematical thinking skills, and the world today. Digital tools including personal computers, smart phones, and other devices are increasingly prevalent and in some countries ubiquitous; in homes, classrooms and society.

It is worth noting, however, that some teachers express safety concerns with respect to integration of ICT in early years of education. Byron (2008) and Stephen and Plowman (2003) talked about harmful physical effects of prolonged computer use; possible exposure to unsuitable content, risky content; displacing other important learning and play activities; negative impact on social development as well as cognitive development.

As a result of this, care should be taken to ensure that safety structures are maintained by teachers to protect our young ones from harm.

Effects of Technology on Student Achievement

Research that has been conducted on the ways in which technology can improve what children learn focuses on programs that aide in students' comprehension of core subjects like science, math, and reading, by presenting subject material in more easily understood formats. The largest volume of research on the impact of technology in core subject areas has been conducted on mathematics instruction. "Mathematics instruction also has the longest history of using technology for instructional purposes and boasts several impressive systems" (Ungerleider & Burns 2002, p. 15). They assert that computer-based applications can also be applied in science classrooms.

Research has shown that students receive higher test scores and have greater understanding of the subject material. Roschelle et al. (2000, p. 86) assert that “computer-based applications using visualization, modelling and simulation have proven powerful tools for teaching scientific concepts.” When certain technology applications were used in the classroom, such as ThinkerTools, it was discovered that students’ understanding of subject matter increased well beyond their grade level. Researchers found that elementary school students who used this computer assisted learning program had developed the knowledge to understand and explain concepts that were usually taught well above their grade level.

The impact technology has on the academic performance of public school children in the core subject area of mathematics is also positive. In the traditional teaching of mathematics, students were required to apply basic knowledge such as adding, subtracting, multiplying, and basic division. Using technology to check an equation can provide immediate feedback if the equation is incorrect instead of writing the equation out in pencil and waiting for a response from the teacher. A high school in Pittsburg implemented a computerized Cognitive Tutor in its mathematics classes. This program developed students higher order thinking skills by allowing them to use real world situations to solve problems (Ringstaff & Kelley 2002). According to Hubbard (2000), Algebra students who used computer assisted learning programs outperformed students in traditional classes, achieving gains of up to 25 per cent in skill and up to 100 per cent in problem solving.

While there are only a few studies that measure the effectiveness of technology in the area of language arts, the impact of technology can still be

seen through the application of literacy programs and word processing systems. Ringstaff and Kelley (2002) assert that computers may not be the best means to read complete books; however they are helpful in examining small sections of text and material. When typing a report, students are able to instantly see incorrect spelling and grammar. Technology also provides students with a wider array of resources; they can access virtual libraries and have access to information that their school does not have. Students who use email see an increase in their reading and writing skills. Communicating and interacting through email, has proven to be a motivating factor in the improvement of language skills.

A study was conducted in rural West Virginia at Hundred High School, on the impact of technology on academic success and showed favourable results. The school took advantage of a program called NETSchools and received funding from the E-rate program. NETSchools provided every student and teacher with a laptop. Once ports were installed, all the students and teachers connected to a Local Area Network. The results were astonishing. The desire to learn increased and students who had previously been disinterested in school became more active participants. After only six months, eighty per cent of the students were accessing the Internet daily to gain supplemental instruction. In the past, their only source of information had been from the school library which contained out of date texts. “Over the course of that first year the 144 students at Hundred High scored higher and ranked above the national mean in every subject, as well as in total basic skills on the SAT” (Web-based Education Commission 2001, p. 12).

Another study called Project Child (Computers Helping Instruction and Learning Development), examined the impact computer integrated instructional programs had on student achievement. "Students showed positive results at both high and low achieving schools, having higher grade point averages and on average scoring higher on standardized tests" (Ringstaff & Kelley 2002, p. 4). In addition to these studies, other research studies examine the impact of drill-based remedial software on academic performance. Students, who used drill and practice technology to contribute to already learned-skill sets, improved their academic performance on standardized tests, (Attewell, 2001).

All these notwithstanding, there are sceptics and opponents of computer use in classroom instruction. Among them are (Cuban, Kirkpatrick & Peck, 2001), who argued a decade ago, that computer use in education does not improve students' achievement. Others such as Angrist and Levy (2002), added their voices on lack of effects of computer technology on student achievement when they studied the effect of computer-aided instruction (CAI) on mathematics achievement of fourth-grade students in Israel. Fuch and Woessmann (2004) attribute reported positive effects of computer use on students' achievement to claims made by politicians and software vendors.

To sum up, Bebell, Russell and O'Dwyer (2004) cautioned that before the effect of computer use in education is analysed, policymakers must first clearly understand how students and teachers should use technology. Knowledge of how computer technology integration and how teachers are using the technology is important because full participation and the extensive

use of computers by schoolteachers are key components to improved classroom learning and instruction.

Necessary and Sufficient Conditions to Support ICT for Teaching and Learning

For integration of ICT into classroom teaching to be successful, a lot of changes are required in the various aspects of the learning environment. In a study of ICT integration in Singaporean schools, Lim (2007), analysed the necessary and sufficient conditions for the effective integration of ICT in the classroom and the supporting context of the school. These conditions include availability of ICT tools, revised school policies, classroom management issues, establishment of disciplinary and educational rules, and division of labour among teachers and teacher assistants and students. In this section, I will discuss these conditions in terms of policy and school leadership, curriculum, assessment, physical and technological infrastructure and professional development.

Policy and School Leadership

Lim (2007), suggests that policy-makers and school administrators need to apply strategies to address the various barriers to successful integration of ICT in the classroom, and support the creation of necessary and sufficient conditions for that purpose. Tondeur et al. (2008), point out, that school-related policies, such as an ICT plan, ICT support and ICT training have a significant effect on classroom use of ICT.

At a national level, policies are needed to create a shared vision among school practitioners, to build a good physical and technological infrastructure, initiate industry-school partnerships, and provide training to teachers, Lim

(2007) and Vallance (2008). Lim (2007), proposes three policy recommendations on the national level to promote ICT integration in teaching and learning: (a) develop strategies for student ICT competency development in selected government and government-aided schools; (b) set ICT competency standards for teachers and students; and (c) redesign the mode of assessment and de-emphasize examination grades in order to optimize the potential of ICT for teaching and learning.

To execute national plans and government policies successfully, school-based ICT plans and policies are necessary, Gülbahar (2007); Tondeur et al. (2007); (Vanderlinde & van Braak, 2011). Tondeur et al. (2008), suggest five areas of school-level ICT policy that are key to the integration of ICT in the classroom: (a) ICT policy plan; (b) school leadership by the principal; (c) supporting conditions such as sufficient access to ICT facilities, skilled staff and ICT coordinators; (d) evaluation of ICT integration practices; (e) cooperation with other schools. Lim's (2007) recommendations for school policy stress the importance of a shared vision by all members of the school community; learning and sharing among teachers and staff; and setting up an incentive mechanism to encourage innovative practices. Throughout the process, school leadership is a key factor Tondeur et al., (2008); (Yuen, Law & Wong 2003). School heads are especially important as they are often the person who initiates ICT plans on both strategic and action levels.

Physical and Technological Infrastructure

The physical and technological infrastructure of ICT is a fundamental condition for implementing changes to use ICT in education. Setting up the infrastructure requires consideration of availability of physical infrastructure

(e.g. rooms for servers, computer rooms, placing of cables and network points, electricity supply points), ICT hardware and software, human resources to set up and maintain the infrastructure and support every day running (Lim, Chai & Churchill 2010). Lim, et al. (2010), propose a guide for teacher education institutions to set up infrastructure and hardware that is also applicable to primary schools. Their guide includes description of some key components of schools' ICT infrastructure and hardware including networks, Internet access, computer rooms, open access rooms, staff computers, computers for students, and digital media production facilities.

Given sufficient ICT infrastructure for both teachers and students, schools need to have technical assistants and coordinators to maintain systems and ensure that the infrastructure remains compatible with developments in software (Divaharan & Lim 2010). While technical assistants help to maintain ICT equipment and ensure everything works, ICT coordinators help to keep up-to-date with new innovations in the ICT field, decide the direction of ICT use for their schools, and organize in-school training for teachers (Lai, Trewern & Pratt, 2002). Through planning, allocating resources and budget, and giving technical and curriculum support, such coordinators lead the community of teachers in the integration of ICT-based teaching (Lai & Pratt, 2004).

ICT Curriculum

Various parties play a role in facilitating the development and execution of ICT curricula, including government, schools, and teachers. Many countries have official policies in place pertaining to the use of ICT to improve the whole system of education. A formal and compulsory ICT

curriculum is an important part of these policies. A positive development of such curricula is when ICT changes from being viewed as a means of technical support, to having a role in pedagogy which stresses both teachers' and students' competences to use ICT for teaching and learning (Vanderlinde, van Braak & Hermans, 2009).

Curriculum goals in national policies need to be implemented through concerted plans and actions on the school level involving school leaders, administrators and teachers. As noted by Vanderlinde and van Braak (2011), an essential condition for ICT policy implementation to be successful is good communication between educational policy officials, schools and teachers, and having consistent information supplied to schools and teachers in order to link general ICT policy to local school level ICT policy. Especially, when rapid changes are brought about by ICT integration in the whole curriculum, encouragement and support for teaching staff is indispensable, (Divaharan & Lim, 2010). One potential problem in the process is that a proposed national ICT curriculum can become inconsistent with the one implemented at the school level. Tondeur et al. (2007), suggest that schools should pay attention to a few key issues to avoid this problem: (a) the planning of the ICT curriculum across the school; (b) the strategies to redirect education practices; (c) access to courseware for ICT integration within the curriculum; and (d) opportunities for professional development of teachers and staff. Pelgrum (2001) also proposes a number of principles for guiding schools in their assessment of the ICT curriculum: ICT-related objectives of the school, presence of teaching and learning practices, use of ICT applications by students, and so on.

ICT-based Assessment

Integration of ICT in the classroom involves development of ICT-based assessment across the school curriculum. The practice of assessment and its effect on learning outcomes are influenced by the roles of ICT as defined by the school's ICT policy – whether ICT is considered as a set of skills, a vehicle for teaching and learning, or an agent for delivering other changes.

Considering the potential effects of both teachers' and students' experiences with ICT-based assessment, good design of computer-based assessment is of great importance. As Terzis and Economides (2011) note, social environment and the facilitating conditions are important for the use and acceptance of ICT-based assessment; and the effectiveness of assessment tools depends greatly on users' acceptance of them. Many studies find that students prefer computerized assessment over traditional methods because it is more credible, objective, fair, interesting, fun, fast, and less stressful. However, the results of some studies show that when ICT tools become more complex, the frequency of teacher and then student usage will decrease (Hsu, 2011). Therefore, the ease of use is crucial to a widely acceptable computer-based assessment tool.

Professional Development

Professional development is needed for all school staff to support the process of ICT integration in schools. Teachers' competencies are of special importance. ICT professional development for teachers can be inadequate because the computer is traditionally often considered as a simple mechanism for delivery of course content, but not a mediation tool. This has led to

situations where the use of ICT becomes limited by the course design itself. Littlejohn (2002), suggests several ways for professional development to help teachers incorporate new teaching methods with the use of ICT. Such professional development programmes aim to: (a) encourage focus on outcomes which can be evaluated; (b) provide a practical introduction to educational theories; (c) develop project-based professional development in which academics plan students' activities in the course; and (d) offer ICT skills. Although professional development programmes are usually designed by academic educators, actual changes in pedagogical content knowledge start from teachers' perspectives and require teacher ownership, so consideration from the teacher point of view is often required (Rodrigues, Marks & Steel, 2003).

Similar to the development of ICT policy, localisation is also key to developing professional development programmes. Although both governments and school officials play a role in fostering ICT in education, the ultimate implementation relies on teachers in the front line, because successful implementation of ICT is eventually dependent on teachers' ICT skills and their intentions for ICT use (Divaharan & Lim, 2010). Primary schools often have limited availability of ICT resources, which may cause primary teachers to make less use of ICT, especially when they lack skills to make use of these resources. Innovation in education that is not directed at existing, down-to-earth school practices tends to end up being a failure. Therefore, professional development needs to be local and context-based on specific subjects in particular schools, so that the professional development is of intrinsic value to individual teachers (Rodrigues et al., 2003).

A problem with ICT professional development programmes has been a lack of consideration of pedagogy for using ICT. Research (Loveless, 2003; O'Rourke, 2001) suggest the importance of focusing on pedagogy rather than on technology itself; and the need to innovate teaching styles when building teachers' ICT competences. One example of such innovative teaching practices is to have teachers engage in online forums during professional development. This can facilitate the development of ICT teaching, and teacher online communities which can foster both critical discussion and collegiality (Prestridge, 2010). Controversy, humour, personal experience and feedback all play positive roles in transforming teachers' beliefs about the use of ICT, and boost confidence for using ICT to transform traditional pedagogy. In the end, it is teachers' beliefs about ICT and education, and their understanding of the value and purpose of ICT, which will determine if and how they will use ICT in classrooms.

Barriers to Integration of Computers in Education

In a 2006 study, Hew and Brush found six general barriers typically faced by K-12 schools in the United States and other countries when integrating technology into the curriculum for instructional purposes. These include lack of resources, inadequate knowledge and skills, institutional barriers, attitudes and beliefs, assessment and subject culture.

Lack of Resources

Many educators bemoan the lack of resources in the classroom, whether it comes in the form of limited technology, limited access, insufficient time, or inadequate technical support. For educators in lower socio-economic

districts, this can be particularly difficult to overcome, as ever increasing budget cuts necessitate even fewer resources than before. This lack of resources is evident in four areas.

Lack of Technology: Without adequate hardware, software, internet access, and the like, teachers and media specialists may find it difficult to truly integrate technology. For schools and teachers with limited budgets, this may seem to be an insurmountable issue. Yildirim (2007) found out in his study that appropriate hardware and software and materials were barriers to integration of technology into instruction.

Insufficient Access: Educators can also find lack of access to technology a barrier. When the school does not have appropriate amounts and suitable types of technology in locations where teachers and students can use them in appropriate ways, then the technology is meaningless. For example, Zhao, Pugh, Sheldon, and Byers (2002) found that although schools often have computer labs, teachers might not have easy access to them if they needed to compete with other teachers for laboratory time. Even in the library, which is the second most technologically dense area of the school after the computer lab, there is limited access (Harwood & Asal, 2007). In the library, students can typically only visit during their scheduled class visit time. When open access is permitted, it usually occurs before or after school. Even when computers are available, they are less meaningful if they do not have a variety of relevant and up-to-date software and a relatively fast internet connection.

Scarcity of Time: Integrating technology into a curriculum can be truly time-consuming, especially when it must be aligned with curriculum, standards and other goals. Amengor (2011) and Oppong (2009) also found out

in their study that insufficient time was a challenge. Educators must spend hours previewing websites, gaining familiarity with hardware and software, and acquainting themselves with various programs. Teachers who are willing to work longer hours to do this often pay a personal price in “burn out” and an eventual exit from the school (Hew & Brush, 2006).

Inadequate Technical Support: Teachers and media specialists rely on technicians to assist them in utilizing different technologies. In most schools, researchers find that these technical support personnel are often overwhelmed by teacher requests and are therefore unable to respond appropriately (Cuban, Kirkpatrick & Peck, 2001). Therefore, technology remains broken or functioning on a lower level while teachers wait for technical support. The time it takes for the educator to research and repair the technology personally is also daunting and serves as a further barrier to implementation. Ertmer and Otterbreit-Leftwich (2010), identified lack of teacher collaboration and pedagogical support, as well as, a lack of experience among cooperating teachers.

Inadequate Knowledge and Skills

Even when the proper resources are present, teachers often struggle with an inadequate knowledge of specific technology, technology-supported pedagogy, and technology-related-classroom management. Tezci (2011a) puts it as, large class sizes posed classroom management problems. For many educators, particularly those who did not grow up with computers or the internet, technology can be a frightening concept. It may be easier to pass up the use of a tool rather than admit to inadequate knowledge. Therefore, this

can serve as a significant barrier and may be demonstrated in three different ways.

Lack of knowledge of specific technology: When a teacher finds a specific technology to be overwhelming or frightening, he or she is unlikely to incorporate it into the curriculum. Hutchison & Reinking (2011), put it as lack of specific knowledge about technology and how to combine it with the existing pedagogical content knowledge to support learning. For example, teachers may not attempt to utilize any technology-related activities with their students if they have not first learned basic skills such as saving to a home drive. Particularly in a secondary school environment, teachers may worry that students are more adept at technology than they are and will thus be reluctant to teach with it. When teachers have not had training in specific technologies, or do not have the time to discover the features themselves, it can prevent technology integration into the curriculum.

Institutional Barriers

There are barriers that emanate from institutions. When principals are unsupportive or uninformed about technology usage in the classroom, students are less likely to utilize any type of digital tools Lim (2007), asserts. This is often because heads of schools hold the purse strings and, as such, have the power to finance different technology efforts. More commonly, however, leaders that are uninterested in technology will simply place focus elsewhere. If a headteacher places a strong emphasis on, for example, writing skills, technology integration can and does suffer greatly. Nuuyoma (2012) argued that lack of motivation from school authorities hampered the use of communication technology in classroom instruction.

Attitudes and Beliefs

According to Ertmer (2005), the decision of whether and how to use technology in the curriculum ultimately depends on individual teachers themselves and the beliefs they hold about technology. In one study, students expressed concern that it often appeared that their teachers did not understand that technology plays a significant role in students' lives outside of school. These students believed that if teachers had a better understanding of this, they would bring more technology into the classrooms (Spires, 2008). In other words, teachers' attitudes about student use of technology can serve as a significant barrier to its integration. Beyond their feelings regarding the technology tools themselves, the integration of digital tools into the curriculum is also shaped by the teachers' beliefs. Researchers have found that technology implementation is directly determined by the educational philosophies and pedagogy of the classroom teacher. Furthermore, teachers who view technology as "a way to keep kids busy" and who do not see the relevance of technology to the designated curriculum are unlikely to incorporate it. Teachers who held these beliefs commonly granted computer time only after regular classroom work was done as a reward for the completion of assigned tasks. They did this because they believed that other skills and content knowledge were more important. In other words, the specific feelings and preconceptions educators have about digital tools and their instructional purposes can serve as a significant barrier (or, conversely, an advantage) to their integration into the curriculum.

Assessment

Rigid assessment of our students encourages rote learning making it very difficult to use technology in classroom instruction.

Students increasingly experience pressure to meet higher standards and score well on standardized tests, along with the need to cover vast scope of material within a limited amount of time. As a result, many teachers feel they can cover more material when they are in front of the class lecturing to every student, rather than using technology. Because testing does not measure 21st century skills, educators feel that teaching technology, problem-solving, and critical thinking is a luxury, rather than a necessity. These types of skills have a long history of being ignored in schools because they are not measurable or are difficult to measure and are then marginalized or discarded from the curriculum. Since 21st century skills can appear to be difficult to measure and may not be included on standardized tests, they are not emphasized in schools. This creates a conflict for students' futures, especially in regards to their capacity as workers in a rapidly changing economy (Cowan, 2008).

Subject Culture

Subject culture refers to the “general set of institutionalized practices and expectations which have grown up around a particular school subject, and shapes the definition of that subject as a distinct area of study” (Goodson & Mangan, 1995, p. 614). Because of this set of institutionalized norms, teachers may believe that certain types of technology may naturally fit in with some course subjects or topics more easily than others. They are therefore unlikely to adopt types of technology that they do not believe fit in with

“their” subject. For example, Selwyn (1999) describes an art teacher who explained her avoidance of using computers by saying that painting is more natural when done physically with one’s own hand, whereas using a mouse makes one’s mind and hand disjointed. In other words, educators’ beliefs that certain technologies are not relevant to their subject can serve as a strong barrier.

Lack of resources, inadequate knowledge and skills, institutional barriers, assessment and subject culture can all serve as significant barriers to implementing a well-integrated technology program in the classroom. While many of these may seem insurmountable for the typical media specialist, in reality, there are numerous practical ways in which to overcome or circumvent these obstacles.

Overcoming the Barriers

In order to minimize the effect of lack of resources, most people create a hybrid technology setup by using cheaper suppliers, mixing technologies and changing the lab layout. Netbooks and laptop computers should be deployed because they are relatively cheaper rather than desktop computers. Some schools are going for tablets and smartphones. This is also very economical; however, management of these smaller devices is a problem.

Places where internet connectivity is impossible, they can set up network and share resources on it.

Professional development for teachers is very necessary in order to achieve a successful integration of ICT into classroom instruction. School and district staff development programmes should be organized for teachers in training so that they will come out with innovative ideas on integration of ICT

into classroom instruction. In their study, Hutchison & Reinking (2011), suggest that effective, timely and continuous training should be provided to teachers to improve ICT skills and manage a technology-rich classroom. Teachers must have the necessary technology-supported pedagogy knowledge and skills which can be provided through training.

Administrators should provide adequate technical support to teachers using ICT. They should also encourage positive attitudes about the significance of integrating ICT into instruction. Teachers who use technology in instruction should be encouraged to use it so that others can follow suit. Cunningham and Gonzalez (2009), argue that teachers who are actively using technology in their own classrooms will be more likely to accept the idea of adding new tools and working with the administration if there are concerns.

In the area of assessment, teachers who use technology in classroom instruction must data to show the positive impact of technology in order to advocate for its integration by all teachers. Cowan (2008) suggests that since standardized tests do not function well as a measure of technology integration or 21st century skills, alternative assessments can be utilized to demonstrate growth that might otherwise go unmeasured. Examples of these are rubrics, portfolios and published products.

Summary

The need for computer-savvy employees in the workplace is the driving force behind technology use in classroom learning. The passion with which society and the business community in particular have embraced computers and the Internet means that the educational institutions will have to continue providing the technology for learning. Resta et al. (2002), argue that

if teachers are not trained to acquire the necessary skills, have easy access to adequate computers in their classrooms and are given both the technical and moral support they need to effectively and routinely use computers in their everyday teaching, then the scarce resources invested in computer technology in the public schools will be wasted.

CHAPTER THREE

METHODOLOGY

This chapter talks about the methodology used for the study. Among the issues discussed here include the research design, the population of the study, the sample and sampling procedure, research instrument, data collection procedure and data analysis.

Research Design

Descriptive survey design was used to collect data in order to answer the research questions for the study. Quantitative research methodology was employed in the process of data gathering, analysis and presentation.

The study adopted the descriptive survey design for it is concerned with the gathering of people's perceptions. (Leedy, & Ormrod 2010) argue that where perceptions are sought, surveys are excellent vehicles for gathering data. It is also a common approach that is adopted in many areas of human activity.

Descriptive survey deals with interpreting the relationship among variables and describing their relationships. Descriptive survey as (Fraenkel & Wallen, 2000) put it, seeks to find answers to questions through the analysis or relationships between or among variables. As (Leedy, & Ormrod 2010) suggest, survey research concerns itself with acquisition of information about one or more groups of people perhaps about their characteristics, opinions, attitudes, or previous experiences - by asking the questions and tabulating the answers. By so doing, our ultimate goal is to learn about a large population by surveying a sample of that population.

However, there are difficulties involved in a descriptive survey, in that it is not comprehensive enough to provide answers to questions and cannot establish cause and effect relationships. Furthermore, there is so much bias in the use of this design. To eliminate bias, it is important to ensure that the questions to be answered are clear and not misleading, getting respondents to answer questions thoughtfully and honestly and getting sufficient number of questionnaires completed and returned so that meaningful analyses can be made (Fraenkel & Wallen, 2000). People may also answer questions in a way to satisfy the person posing the question or they would not like to report themselves in a negative light.

Despite the shortcomings identified above, the descriptive survey design was used because according to Fraenkel and Wallen (2000), an advantage of the design is that it has the potential to provide a lot of information obtained from quite a large sample of individuals. I chose the design because I was going to find out “what is” using a series of questions.

Setting

The study was conducted in the Keta Municipality. Keta Municipal Assembly with Keta as the administrative capital is one of the 25 municipalities and district assemblies in the Volta Region of Ghana. It lies within longitudes 0.30E and 1.05E and latitudes 5.45N and 6.005N. It shares boundaries with Akatsi South District to the north, Ketu South Municipality to the east, South Tongu District to the west and the Gulf of Guinea to the south. It has a total surface area of 1,086 km², about 30 per cent of which is covered by water.

Population

The research population was teachers in the public junior high schools in the Keta Municipality. There were 78 public junior high schools with a total population 420, made up of 342 trained teachers and 78 heads of schools spread across 10 circuits.

Table 1 illustrates the summary of public junior high school teachers in each circuit in the municipality.

Table 1 - *Number of schools and teachers in each circuit*

Circuit	No of Schools	No of Heads	Sampled heads	No of Teachers	Sampled Teachers
Abor/Tsiame	8	8	7	35	19
Anlo	8	8	7	26	11
Afia' gba/Anyako					
Anloga	9	9	7	70	33
Anyanui/Dzita	6	6	4	19	16
Atiavi/Hatorgodo	6	6	4	13	7
Dzelukope/Vui	5	5	5	35	23
Keta Urban	10	10	10	42	28
Kome/Srogboe	9	9	8	46	33
Shime	7	7	6	17	13
Tegbi/Woe	10	10	9	39	22
Total	78	78	67	342	203

Source: Municipal Education Office, Keta, (2016).

Sampling and Sampling Procedure

The sample size chosen for the study comprised 270 participants or respondents. This was made up of 63 heads of schools and 207 teachers. These samples were selected based on a table of sample size for a probability sample

by Krejcie and Morgan 1970, cited in (Cohen, Manion and Morrison, 2007). The sample size of 270 participants was based on a confidence level of 95 per cent and a confidence interval of 5 per cent. It is a bit large but was necessary because the population of 420 was divided into strata based on heads of schools and teachers. The population and sample from the various schools are illustrated in Table 1.

The chart was used to determine the sample size of each stratum. In each stratum, the schools in the municipality were numbered as clusters and a simple random sampling method was used to select the participants. In the case of heads of schools, each school was randomly selected using the lottery method until the number 67 was arrived at. On the part of teacher participants, schools were used as clusters from which the teachers were selected. From the 78 clusters, 40 schools were selected using the simple random sampling again using the lottery method. All the teachers in each of these schools were selected. This produced a sample size of 203 teachers out of the total population of 342 teachers.

Research Instruments

The main instrument used for the data collection was questionnaire. I decided to use it mainly because the entire sampled population were literate. Moreover, (Leedy, & Ormrod 2010) assert, that questionnaire is one of the best impersonal observation techniques for eliciting data. It does not allow the person conducting the study to influence the respondents, especially so if the instrument was carefully constructed.

I developed the instrument based on the literature review conducted. There were two sets of questionnaire for heads and teachers. Questionnaire for

heads was developed to seek data to answer research question one. The first three questions addressed personal data, while questions four to 17 addressed the research questions. They were mainly made up of close-ended questions.

Questionnaire for teachers had four questions on personal data while question five addresses the research question two. Item number six sought data to address research question three. All the items were closed-ended except question six which required the respondents to write two sentences.

Validity and Reliability of Instrument

I consulted two experts in the subject area on the content of the questionnaires used. They both said they were good. My supervisor also vetted and approved them for their content and face value. I administered the instruments to three schools in Ketu-South Municipality namely: Sepenukope Basic School, Aflao; Avoeme basic school, Avoeme and Aflao R.C. Basic School. I watched the teachers closely as they filled in the questionnaires so that I could identify any difficulties and correct them.

I conducted a reliability test on the instrument using Cronbach's Alph. The test revealed that the instrument had a reliable co-efficient of .796. This means that the right responses could be elicited from the respondents.

Data Collection Procedure

The instruments were administered during the second term of the 2014/2015 academic year to all the schools sampled. Before the instruments were sent to the field, personal contacts were made to the schools where letters of introduction from the College of Distance Education and the Ghana Education Service were given to them. I then booked appointments to come and administer the questionnaires.

The respondents were assured that their participation in the research was not compulsory however, I encouraged them to help voluntarily so that they could be as honest as possible. I also assured them their privacy and anonymity would not be compromised at all. Authors whose contributions I found relevant to my study were used and duly acknowledged.

I gave the instruments to the respondents and waited to collect them. However, a few teachers could not return theirs because either they were busy or not available. For these respondents a second visit was scheduled to collect the remaining questionnaires.

With this plan, I was able to retrieve all the questionnaires, but much time was spent in each school except where the schools were close to each other, I would go to a sister school and come back to collect the completed questionnaires

Data Analysis

The data collected were thoroughly checked to ensure that responses were suitable. The editing also helped to exclude the questionnaires which were not complete. The questionnaires were serially numbered for easy identification. Finally, the questionnaires were coded for easy analysis. All responses were analysed using the IBM SPSS statistics, version 21. The research questions were analysed using frequencies and percentages.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter reports on the presentation and discussion of data collected using the two instruments from teachers and heads of junior high schools. The data were collected from sixty-seven heads and two hundred and three teachers being the samples taken from the population of teachers and head teachers in the junior high schools in the Keta municipality.

The study was to find out:

1. The state of ICT infrastructure in our schools.
2. What teachers believe are the barriers to computer technology use and its integration in classroom integration.
3. Some teacher-suggested strategies to improve the use of computers in classroom instruction.

There was a 100% retrieval of the two sets of questionnaires due to the two follow-ups I made to collect them. In all, 67 heads of schools returned their questionnaires and the 203 teachers also returned theirs successfully.

Table 2 - *Gender of teachers*

Gender	Frequency	Per Cent	Cumulative percent
Female	61	30.0	30.0
Male	142	70.0	100.0
Total	203	100.0	203

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Data from Table 2 reveal that out of the 203 teachers covered in the study, 30% were female while 70% were male representing 61 and 142

teachers respectively. This shows that the sample had more male teachers than their female counterparts.

Table 3 - *Gender of heads of schools*

Gender	Frequency	Per cent	Cumulative percent
Female	7	10.4	10.4
Male	60	89.6	100.0
Total	67	100.0	100.0

Source: Field survey, Keta Municipality, Ghana Education Service (2016).

Data from Table 3 show that there were 67 heads of schools covered in the study. There were 60 males and seven females representing 89.6% and 10.4%, respectively. Here again there were more male head teachers than female ones.

Table 4 - *Qualification of teachers*

Qualification	Frequency	Percent	Cumulative Percent
Cert A	38	18.7	18.7
Diploma	118	58.1	76.8
Degree	43	21.2	98.0
Masters	4	2.0	100
Total	203	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 4, shows that majority of the teachers, 118 (58.1%) hold Diploma in Basic Education. The next in terms of population is Bachelor Degree holders, 43 21.2%. Certificate 'A' holders were 38 (18.7%). There were only four Master's Degree holders representing 2% of the sample.

Table 5 - *Qualification of head teachers*

Qualification	Frequency	Percent	Cumulative Percent
Cert A	20	29.9	29.9
Diploma	24	35.8	65.7
Degree	20	29.9	95.5
Masters	3	4.5	100
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

The data from Table 5 show that most of the heads of the schools 24 (35.8%) sampled were Diploma in Basic Education holders. There were 20 (29.9%) Certificate 'A' holders and 20 (29.9%) Bachelor Degree holders with only three (4.5%) Master's Degree holders.

Table 6 - *Teaching experience of Teachers*

Experience	Frequency	Per Cent	Cumulative Percent
1-10	143	70.4	70.4
11-20	50	24.6	95.1
21-30	4	2.0	97.1
31+	6	3.0	100.0
Total	203	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 6 indicates that with regards to teaching experience for teachers, majority of them were new entrants. There were 143 teachers in this category representing 70.4%. Next to this group were teachers who were between 11-20 years of teaching experience. They were 50 representing 24.6%. There were

only four and six teachers in the 21-30 and 31+ categories, respectively, representing 2% and 3% respectively.

Table 7 - *Teaching Experience for Heads of schools*

Experience	Frequency	Per Cent	Cumulative Percent
1-10	28	41.8	41.8
11-20	11	16.4	58.2
21-30	24	35.8	94.0
31+	4	6.0	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service (2016).

Table 7 shows that out of the 67 heads of schools, 28 of them had 1-10 years of teaching experience representing 41.8%. Those in 21-30 brackets were 24 representing 35.8% following them were the 11-20 years group. There were 11 teachers representing 16.4%. The 31+ group had only four teachers, representing 6%.

Table 8 - *Subjects being taught by teachers*

	Frequency	Percent
Social Studies	34	9.2
Maths	71	19.2
French	52	14.1
English Language	52	14.1
Science	55	14.9
ICT	31	8.4
RME	26	7.0
BDT	29	7.9
Ewe	19	5.1
Total	369	100.0%

Source: Field survey, Keta Municipality, Ghana Education Service (2016).

Data from Table 8 indicate that there were more maths teachers, 71 (19.2%) in the sample than other subject teachers. This was followed by French, English and Science teachers with 52 (14.1%), 52 (14.1%) and 55 (14.9), respectively. Others were ICT 31 (8.4%), RME 26 (7.0%). Ewe teachers were the least having only 19 (5.1%). Some teachers taught more than one subject in the table.

Research question one: The state of ICT infrastructure in schools Keta Municipality.

Table 9 - *Headteachers' responses on availability of computers*

Response	Frequency	Percent	Cumulative percent
No	8	11.9	11.9
Yes	59	88.1	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Data from Table 9 indicate that 59 schools sampled out of 67 schools reported that they had computers. Only eight schools did not have computers.

Table 10 - *Headteachers' responses on number of computers in the school*

Response	Frequency	Percent	Cumulative percent
1-10	39	58.2	58.2
11-20	7	10.4	68.7
31-50	3	4.5	73.1
Nil	18	26.9	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Data from Table 10 indicate that 39 (58.2%) schools had between 1-10 desktop computers. Seven (10.4%) schools had between 11-20 desktop computers, while only three (4.5%) schools had between 31-50. The schools that did not have desktop computers were 18 (26.9%). Included in this number were the eight schools that did not have computers at all.

Table 11 - *Headteachers' responses on number of laptop computers*

Response	Frequency	Percent	Cumulative percent
1-10	28	41.8	41.8
11-20	12	17.9	59.7
31-50	11	16.4	76.1
Nil	16	23.9	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 11 illustrates the fact that there were 28 (41.8%) schools that had between 1-10 laptop computers. Twelve (17.9%) schools owned between 11-20 laptop computers while 11 (16.4%) owned between 21-30 laptop computers. Sixteen (23.9%) schools did not have any laptop computers. Among these schools were the eight that did not have any computers.

Table 12 - *Headteachers' responses on number of Ipads/tablets*

No. of Ipads/Tables	Frequency	Percent	Cumulative percent
1-10	12	17.9	17.9
Nil	55	82.1	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 12 shows that only 12 (17.9%) schools reported having I pads or tablets in their schools.

Table 13 - *Headteachers' responses on availability of wireless network in the school*

Response	Frequency	Percent	Cumulative percent
No	60	89.6	89.6
Yes	7	10.4	100
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 13 shows that only seven schools representing 10.4% had wireless network in their school.

Table 14 - *Headteachers' responses on availability of cable network in the school*

Response	Frequency	Percent	Cumulative percent
No	62	92.5	92.5
Yes	5	7.5	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 14 shows the availability of cable network in five (7.5%) schools out of the number sampled.

Table 15 - *Headteachers' responses on schools with internet connectivity*

Response	Frequency	Percent	Cumulative percent
No	63	94.0	94.0
Yes	4	6.0	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 15 shows that there were only four schools (60%) with internet connectivity among the 67 schools covered.

Table 16 - *Headteachers' responses on availability of Electricity in the school*

Response	Frequency	Percent	Cumulative percent
No	4	6.0	6.0
Yes	63	94.0	100.0
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 16 shows that only four schools (60%) were not having electricity in their schools. As many as 63 schools representing 94% were connected to electricity.

Table 17 - *Headteachers' responses on availability of Projectors in the school*

Response	Frequency	Percent	Cumulative percent
No	67	100.0	100.0
Yes	-	-	-
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 17 indicates that there was no projector in any of the schools sampled.

Table 18 - *Headteachers' responses on availability of Digital Cameras in the school*

Response	Frequency	Percent	Cumulative percent
No	67	100.0	100.0
Yes	-	-	-
Total	67	100.0	

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 18 indicates that none of the schools had digital cameras in their schools for video production and collection of photographs.

Table 19 - *Headteachers' responses on location of computers in the schools*

Computer location	Frequency	Percent	Percent of cases
Computer lab	31	52.5	53.04
Classroom for instruction	27	45.8	46.6
Office for clerical work	1	1.7	1.7
Total	59	100.0	101.7

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Data from Table 19 show that 31 (52.5%) schools where computers were, had their computers in the computer lab. There were 27 (45.8%) schools where computers were located in the classroom for instruction. There was only one school (1.7%) where there was a computer in the office for clerical work.

Table 20 - *Headteachers' responses on sources of funding for technology in the school*

Sources of Funding	Frequency	Percent
Government Donations	39	43.3
NGOs	12	13.3
Philanthropists	13	14.4
PTA/SMC	21	23.3
Other sources	5	5.6
Total	90	100

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 20 shows that 39 (43.3%) of the schools had their computers supplied by government. This was followed by PTA/SMC having 21 (23.3%).

The rest were philanthropists and NGOs having 13 (14.4%) and 12 (13.3%), respectively.

Table 21 - *Headteachers' responses on availability of software in the school*

Type of software	Frequency	Percent
Learning management system	24	27.3
Quiz software	10	11.4
Student management system	8	9.1
Educational Games	31	35.2
Films	15	17.0
Total	88	100.0

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 21 indicates that 31 (35.2%) of the sampled schools had educational games on their devices for pupils to use. This was followed by Learning Management system having 24 (27.3%). Films were found in some schools with 15 (17.0%). Quiz software had 10 (11.4%) while Student Management System had eight 9.1% being the least popular software in the sampled schools.

Table 22 - *Headteachers' responses on who repaired computers in the school*

Who repairs	Frequency	Percent
ICT teachers	21	34.4
Experts	40	65.6
Total	61	100.0

Source: Field survey, Keta Municipality, Ghana Education Service, (2016).

Table 22 shows that 40 (65.6%) of responses came from schools that invited experts to repair their devices while 21 (34.4%) of them allowed teachers to repair them.

The Southwest Asian Ministers of Education Organisation (SEAMEO) report (2010), describes the status of ICT integration in education as emerging, applying, infusing and transforming.

The data from the respondents on ICT infrastructure and resources in the schools revealed that when the SEAMEO measure is used, the Keta Municipality has not even qualified to be placed under the lowest level; emerging. This group listed the following: stand-alone workstations for administration, individual classrooms computers and printers, word processing, spread sheets, database, presentation software, school administration software, among others.

Under applying, there should be computers in the computer lab or individual classrooms for ICT specific outcomes, with the basic software and internet access. None of the schools had internet connectivity so they cannot be placed under this category.

Under infusing, there should be computers in the lab and classrooms, with intranet and internet connectivity, resource-rich learning centres, digital cameras, scanners and a range of subject specific software. Our schools came nowhere near this category.

The last group, transforming, is beyond the reach of the municipality. As noted earlier in the review of literature, for a successful implementation of ICT in classroom instruction, certain physical infrastructure should be available. Among them are rooms for servers, computer rooms, placing of cables and network points, electricity supply points, among others. Lim, et al (2010), propose a guide for teacher education institutions to set up infrastructure and hardware that is also appropriate to primary schools. Their

guide includes description of some key components of schools' computer and hardware including networks, internet access, computer rooms, open access rooms, staff computers, computer for students, and digital media production facilities.

From the data analysed above, one can say that the infrastructure in the schools surveyed was inadequate. There was electricity supply in most of the schools. Many schools also had computers in the labs, but their numbers were woefully inadequate when compared to the enrolment in the schools. There were a few schools with networking facilities. None of the schools had a projector. Digital cameras were also unavailable in the schools.

According to the report, 31 (52.5%) of computers were in the lab, while 27 (45.8%) were in the classroom for instruction. This should be welcome news. The research did not include interview and observation to ascertain this.

Research question two: What do teachers in Keta Municipality believe are the barriers to computer use in classroom instruction?

Table 23 - Teachers' responses barriers to computer technology use in the

Barrier	SA		A		D		SD	
	Freq	%	Freq	%	Freq	%	Freq	%
Lack of access to hardware	57	28.1	97	47.8	24	11.8	25	12.3
Lack of relevant computer skills	62	30.5	93	45.8	32	15.8	16	7.9
Lack of support from school authorities	82	40.4	75	36.9	38	18.7	8	3.9
Lack of access to software	30	14.8	110	54.2	27	13.3	36	17.7
Negative attitude of teachers	17	8.4	56	27.6	55	27.1	75	36.9
Lack of internet connectivity	82	40.4	79	38.9	29	14.2	13	6.4
Lack of computers at home	106	52.2	72	35.5	17	8.4	8	3.9
Lack of technical assistance	92	45.3	84	41.4	20	9.9	7	3.4
Insufficient time for teachers	88	43.3	68	33.5	40	19.7	7	3.4
Lack of personal laptop for teachers	112	55.2	61	30.0	15	7.4	15	7.4

classroom

Source: Field survey, Keta Municipality, Ghana Education Service, (2016)

KEY: SA=Strongly Agree; A=Agree; D=Disagree; SD=Strongly Disagree

With regards to lack of access to hardware as a barrier to computer integration into classroom instruction, data from Table 23 indicate that 97 (47.8%) of the respondents strongly agreed and 57 (28.1%) agreed. However, 24 (11.8%) and 25 (12.3%) disagreed and strongly disagreed, respectively. This shows clearly that computers and their components needed to do the integration were not adequate.

With regards to lack of relevant computer skills on the part of teachers, data from Table 23 show that 62 (30.5%) of the respondents strongly agreed while 93 (45.8%) agreed that their current computer skills leaves much to be desired if technology integration is to be implemented appropriately. However, 32 (15.8%) disagreed and 16 (7.9%) strongly disagreed.

With regards to lack of support from school authorities, Table 23 reveals that 82 (40.4%) of the respondents strongly agreed while 75 (36.9%) of the teachers surveyed agreed with the barrier. The study did not find out the actual or specific support they required which were not given. However, it is obvious that schedules would have to be affected if integration were given serious thought. Supply of the appropriate information technology infrastructure as well as skills upgrade might have been mentioned. However, 38 (18.7%) disagreed and 8 (3.9%) strongly disagreed.

With regards to access to software, Table 23 indicates that 30 (14.8%) of the respondents strongly agreed and 110 (54.2%) of them agreed with it being a barrier to integration. This will surely affect the work of the teacher even if the hardware were supplied adequately. The hardware alone without the appropriate software cannot make any difference as far as integration is concerned. However, 27 (13.3) disagreed and 36 (17.7%) strongly disagreed.

Regarding negative attitude of teachers towards the integration of technology into classroom instruction, Table 23 shows that 55 (27.1%) of the respondents disagreed while 75 (36.9%) of them strongly disagreed that it was a barrier. However, 17 (8.4%) strongly agreed and 56 (27.6%) agreed.

Pertaining to lack of internet connectivity, Table 23 shows that 82 (40.4%) of the teachers surveyed strongly agreed that it was a barrier to

computer integration into classroom instruction while 79 (38.9%) of them agreed with it. However, 29 (14.25) disagreed and 13 (6.4%) strongly disagreed.

With regards to lack of computers at home for students, data from Table 23 reveal that a 106 (52.2%) of the respondents strongly agreed that it was a barrier and 72 (35.5%) of them also agreed with this. However, 17 (8.4%) disagreed and 8 (3.9%) strongly disagreed.

Data from Table 23 show that as many as 92 (45.3%) of the respondents strongly agreed and 84 (41.4%) agreed that lack of technical assistance in the use of technology in the schools for teachers is a barrier to technology integration. However, 20 (9.9%) disagreed and 7 (3.4%) strongly disagreed.

Data from Table 23 show that many respondents 88 (43.3%) strongly agreed and 68 (33.5%) also agreed that insufficient time for teachers is a barrier to technology integration. However, 40 (19.7%) disagreed and 7 (3.4%) strongly disagreed.

Data from Table 23 show that 112 (55.2%) of the respondents strongly agreed and 61 (30%) agreed that lack of personal laptop computers for teachers is a barrier to computer integration in the classroom. However, 15 (7.4%) disagreed and 15 (7.4%) strongly disagreed.

The findings have confirmed what Yildirim (2007), found out in his study that appropriate hardware and software and materials were barriers to integration of technology into instruction. When schools do not have appropriate amounts and suitable types of technology in locations where teachers and students can use them in appropriate ways, then the technology is

meaningless. For example, Zhao et al (2002), found that although schools often have computer labs, teachers might not have easy access to them if they needed to compete with other teachers for laboratory time. The number of computers in the schools surveyed suggests teachers might not have easy access to the use of these few computers because they have to compete with other teachers.

Sometimes proper resources may be present, but teachers often struggle with them due to inadequate knowledge of specific technology-supported pedagogy and technology-supported classroom management. Hutchison and Reinking (2011), put it as lack of specific knowledge about technology and how to combine it with the existing pedagogical content knowledge to support learning. As large as 155 (76.3%) of the respondents agreed with this barrier.

Research question three: What are some teacher suggested strategies to improve the use of computers in classroom instruction in Keta Municipality?

Table 24 - *How to remove the barriers to integration*

Remove Barriers	Frequency	Percent
Well-stocked computer labs	95	23.6
In-service training and fresh training	76	18.9
Computer for pupils at home	67	16.6
Parents should help pupils at home	52	12.9
Assistance from NGOs	12	3.0
Opportunity for student's practice	28	6.9

Table 24 continued

Supervision of teachers and Tech asst.	20	5.0
Personal laptop for teachers	20	5.0
Assistance from school authorities	18	4.5
Internet connectivity for schools	15	3.7
Total	403	100.0

Source: Ghana Education Service, Keta Municipality, (2016).

Data from Table 24 indicate that the respondents to the survey gave suggestions to help remove the barriers to technology integration. The suggestions they gave to an open-ended response type of question were categorised into ten responses. The most popular response is well-stocked computer lab for pupils. It had 95 (23.6%). The next suggested remedy had 76 (18.9%). It is in-service training and training of teachers to handle the integration. The third in order of popularity is computer for pupils at home. It had 67 (16.6%). Others suggested that parents should help pupils at home to use technology to do assignments and other things. It had 52 (12.9%). Opportunity for pupils to practice had 28 (6.9%), while supervision of teachers and giving teachers technical assistance had 20 (5.0%). A few people, 20 (5.0%) also suggested that laptop computers should be supplied to help them to do their work effectively. The rest are assistance from school authorities 18 (4.5%), internet connectivity had 15 (3.7%) and assistance from NGOs had 12 (3.0%).

In their study, Hutchison and Reinking (2011), suggested that effective, timely and continuous training should be provided to teachers to improve ICT skills and manage a technology-rich classroom. Resta et al (2002) argued that if teachers are not trained to acquire the necessary skills,

have easy access to the technical and moral support they need to effectively integrate technology into classroom instruction in their everyday teaching, then the scarce resources invested in computer technology by the government in the public schools will be wasted. It is the case here in the Keta Municipality.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter talks about the summary of the study and the methodology used. It gives a summary of the key findings of the study. It further talks about the conclusions drawn from the key findings. Also included in this chapter are recommendations for policy and practice based on the findings of the study.

Summary

The study was conducted to investigate the state of ICT infrastructure in our schools, the barriers that affect effective integration of computer technology in classroom instruction and find out how these barriers could be removed for our children to benefit from the supply of computers to our schools by the government of the republic of Ghana.

The research questions were formulated based on the review of literature on the topic. They were directed at the state of ICT infrastructure in our schools, barriers to computer integration in classroom instruction and how to overcome these barriers.

Descriptive survey design was used to collect data to answer the research questions. Both quantitative and qualitative research methodologies were employed in the process of data gathering, analysis and presentation.

A total sample of 270 respondents took part in the survey. This was made up of 67 heads of junior high schools and 203 teachers. The samples were selected from all the ten circuits in the Keta Municipality. There were 61 female teachers and 142 male teachers. The female heads of schools were seven while their male counterparts were 60.

The instruments used for the study were two sets of questionnaires that I designed myself based on review of related literature. There was one questionnaire for teachers and another one for heads of schools. Analysis of the data was done using IBM SPSS version 21. Percentages, frequencies and cross-tabulations were used to get the analysis.

Key Findings

1. With regards to ICT infrastructure, eight schools out of the 67 did not have any computers. Four of these sampled schools did not have electricity. Networking of computers was not popular among the schools sampled. Only five and seven schools had cable and wireless networks, respectively. Only four out of the 67 schools had internet connectivity in their schools. Projectors and digital cameras were completely absent.

2. With regards to barriers to computer technology integration in classroom instruction, teachers responded to the factors presented to them from the review of relevant literature as they perceived them. The respondents agreed with all the barriers except “negative attitude of teachers” as a barrier. The one that most teachers embraced was “lack of computers at home for pupils to use”.

3. About question three which sought from teachers, suggestions to overcome the barriers, very useful ones were given. The most popular one was “well stocked computer labs for schools. The least popular was assistance from NGOs.

Conclusions

Conclusions drawn from the study conducted are as follows: With regards to ICT infrastructure, there are schools, few though they are, that had no computers to learn ICT as a subject so the teachers in those schools could not think of integrating ICT into classroom instruction. The schools that had computers reported very few with most of them having between one and ten computers. This picture is bleak since technology is the very essential in the 21st century. Majority of the schools surveyed did not have their computers networked. No digital cameras were found in any of the schools surveyed. None of the schools had a projector. Only four out of the 67 schools had access to the internet. These notwithstanding, most schools had electricity in their premises. Only four did not have it at all.

Another conclusion is the absence of software for learning. The responses given by respondents showed that no effective integration is being done because the educational software are sine qua non to effective integration of computer technology into classroom instruction.

With regards to barriers to integration of computer technology into classroom instruction, it is clear from the result from the field that there are several of them as respondents did not reject any barrier suggested to them completely. At least, half of the respondents accepted every one of them.

Respondents made very good suggestions as to how the barriers could be removed to make integration very successful in our schools. It is worth mentioning that a large number of respondents also requested for in-service training which will make them ready.

The findings indicate that computer technology integration into classroom instruction which is being practised greatly in advanced countries has major barriers here in the Keta Municipality which needs immediate attention by stakeholders if we want our children to rub shoulders with pupils from the other countries especially the Western ones.

Recommendations

Based on the findings and the conclusion, the following recommendations are made:

- 1. Provision of ICT infrastructure:** If the plans of the government to equip the pupils of our institutions with up-to-date ICT skills and also integrate computer technology into classroom instruction are to be successful, then government should intensify the supply of ICT tools to schools. Computers alone without other vital things such as internet connectivity, projectors, and computer labs, among others cannot help us. This is not to say that computers are sufficient in the schools.
- 2. Training of teachers:** Training of teachers should in all intents and purposes include vigorous preparation of the new teachers to be functionally literate in the use and application of computer technology in their day-to-day work as teachers. They should be trained to use computer technology in classroom instruction.
- 3. Provision of Home Computers:** Parents should be encouraged to buy and install computers at home so that pupils can have uninterrupted access to computers.

4. **In-service training programmes:** In-service training programmes should be organised for the teachers in the field so that they can also function effectively.

Suggestions for Future Research

I suggest that this study is done across the whole country so that the stakeholders in education can have a first-hand information of how we can overcome the barriers to make technology integration in classroom instruction effective.

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APPENDICES

APPENDIX A
UNIVERSITY OF CAPE COAST
COLLEGE OF DISTANCE EDUCATION

Questionnaire for Heads of Schools

Thank you for your acceptance to complete this questionnaire. Its purpose is to investigate the barriers to effective integration of computer technology into classroom instruction in junior high schools in the Keta Municipality. No answer will be wrong.

Your anonymity is very much assured because it is an academic exercise.

(For each of the following items, please put your responses in the spaces provided).

1. Your gender (**tick one**) Male Female

2. What is your highest level of education? (Tick one that best applies to you)
Teachers Cert 'A' Diploma in Basic Education Bachelor's Degree
 Master's Degree

3. How long have you been teaching? 1-10 years, 11-20 years 21-30 years
31+ years (**Circle one**) .

4. What is the enrolment for your JHS?

5. Do you have computer technology devices in your school? Yes No
If your answer is "yes", then move to the next item. If your answer is "no",
then you cannot proceed.

6. How many desktop computers do you have in your school?
1-10 11-20 21-30 31-50 51+

7. How many laptop computers do you have in your school?
1-10 11-20 21-30 31-50 51+

8. How many Ipads or tablets do you have in your school?

1-10 11-20 21-30 31-50 51+

9. Which computer network do you have? (Tick all that apply.)

Wireless network Cable network

10. Do you have internet connectivity in your school for the computer lab?

Yes No

11. Do you have electricity supply in your school? Yes No

12. Do you have a projector in your school? Yes No

13. Do you have digital production facilities (digital cameras)?

Yes No

14. Where are the computers located? (**Tick all that apply.**)

Computer lab

Classroom for instruction

Office for clerical work

15. Which software do you have on the machines apart from the regular office software? (**Tick all that apply.**)

Virtual experiments

Learning Management Systems

Quiz software

Student Management Systems

Educational games

Films

16. What is/are the source(s) of funding for these technologies and the software? (**Tick all that apply.**)

Government donations

NGOs

Philanthropists

PTA/SMC

Any other sources. (Please specify.)

.....

.....

17. How do you maintain these devices? (**Tick all that apply.**)

ICT teachers repair them. They are taken to experts

Thank you very much for your time. I could not have done this research without your help.

APPENDIX B

UNIVERSITY OF CAPE COAST

COLLEGE OF DISTANCE EDUCATION

Questionnaire for teachers.

Thank you for your acceptance to complete this questionnaire. Its purpose is to investigate the barriers to effective integration of computer technology into classroom instruction in junior high schools in the Keta Municipality. No answer will be wrong.

Your anonymity is very much assured because it is an academic exercise.

(For each of the following items, please write your responses in the spaces provided).

1. Your gender (tick one) Male Female

2. What is your highest level of education? (Tick one that best applies to you)

Diploma in Education Bachelors Masters

3. How long have you been teaching? 1-10 11-20 21-30 31+

(Circle one)

4. Which subjects do you teach? (Tick as appropriate.)

Social Studies English Language RME

Mathematics Science BDT

French ICT Ewe

4. The following statements relate to barriers to computer technology use in classroom instruction. For each statement, indicate whether you strongly disagree (**SD**), disagree (**D**) agree (**A**), strongly agree (**SA**) with the statement by ticking the appropriate column.

Statement		SD	D	A	SA
1.	Access to hardware (computers and accessories)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	Lack of relevant computer skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	Lack of support from school authorities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	Access to software.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	Attitudes of teachers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	Lack of internet connectivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	Lack of computers at home for students.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	Lack of technical assistance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9.	Insufficient time due to heavy workload.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10.	Lack of personal laptops.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. What do you think can be done to remove some of these barriers to using computer technology for classroom instruction? (Suggest two ways).

- a)
-
- b)
-

Thank you very much for your time. I could not have done this research without your help.

APPENDIX C

UNIVERSITY OF CAPE COAST
College of Distance Education

Tel No: 03321 - 36947
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University Post Office
Cape Coast

Our Ref. No: CCE/MED/17/Vol.1/068

10th September, 2014

Your Ref. No:

TO WHOM IT MAY CONCERN

This is to certify that **Mr. David Kweku Besah** with registration number **ED/MIT/12/0004** 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 **“Barriers to Effective Integration of Computer Technology into Classroom Instruction in Public JHS in the Keta Municipality”**.

We will strongly appreciate any courtesy extended to him.

Thank you.

A handwritten signature in black ink, appearing to read 'Emmanuel Arthur-Nyarko'.

Emmanuel Arthur-Nyarko
for: Provost, CoDE