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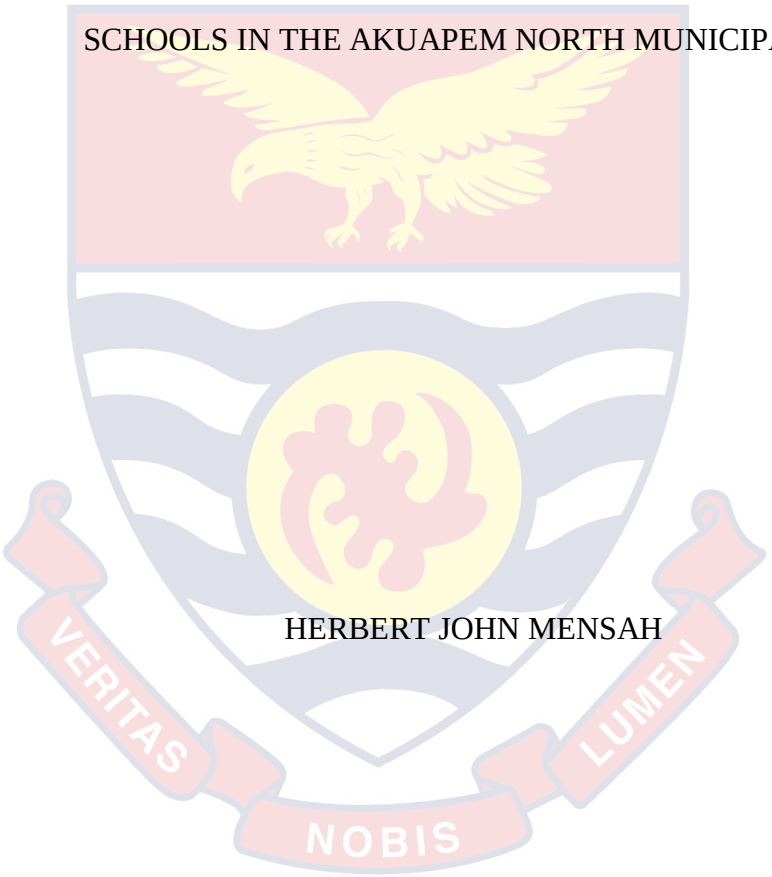
COMPUTER ASSISTED INSTRUCTION (CAI) USAGE IN TEACHING INDIGENOUS GHANAIAN LANGUAGES IN SELECTED SENIOR HIGH SCHOOLS IN THE AKUAPEM NORTH MUNICIPALITY



HERBERT JOHN MENSAH

2020

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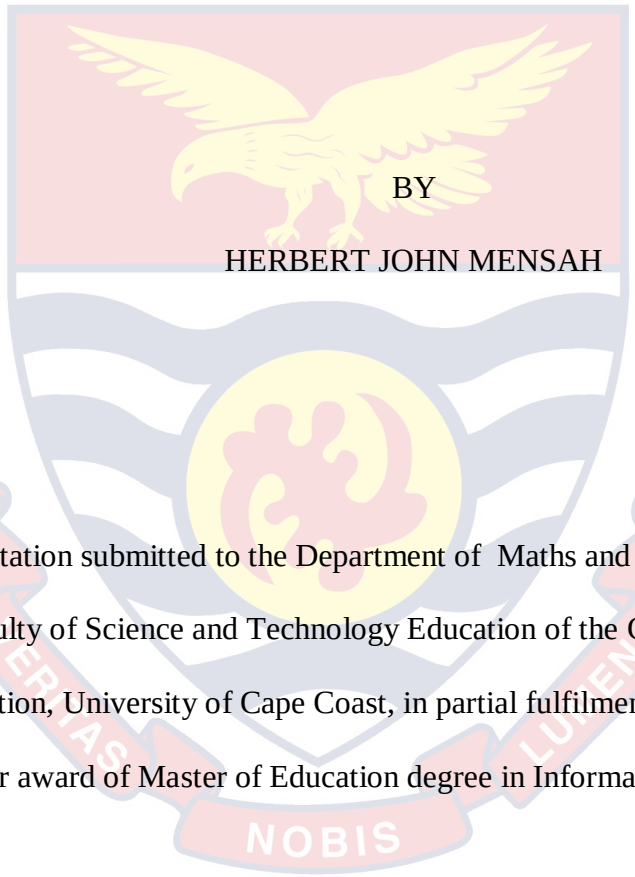

BY

HERBERT JOHN MENSAH

Dissertation submitted to the Department of Maths and ICT Education of the Faculty of Science and Technology Education of the College of Distance Education, University of Cape Coast, in partial fulfilment of the requirements for award of Master of Education degree in Information Technology.

JULY 2020

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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: …….

Supervisor's Declaration

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

Supervisor's Signature: …… Date ……

Name……..…….

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ABSTRACT

The main purpose of the study was to assess the use and effects of Computer Assisted Instruction (CAI) on the teaching of indigenous Ghanaian Languages in the Akuapem North District in the Eastern Region of Ghana. The study adopted descriptive survey design. Questionnaire was the main survey instrument used. The researcher used simple random sampling. A representative sample of 100 students and 29 teachers from six (6) Senior High Schools in the Akuapem North Municipality were involved in the study. It was revealed that most of the respondents had had some form of training in ICT. Furthermore, majority of the respondents have a positive opinion about the use and effect of Computer Assisted Instruction in the teaching and learning of Ghanaian Language. However, the major barriers/obstacles were unavailability of ICT tools and software for CAI in the teaching and learning, and lack of financial support and professional training in the use of CAI in teaching and learning Ghanaian Language. Based on the findings, some recommendations were made. That relevant CAI packages in Ghanaian Language education should be developed; Educational curriculum planners should integrate a practical computer application courses in their curriculum design for pre-service teachers.. Stakeholders should transform the Ghanaian Language curriculum into a multi-media and CAI approaches. Education authorities should frequently

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ACKNOWLEDGEMENTS

It is really an arduous task to embark on an academic exercise such as this. The names of great men they say are not written in books but printed with indelible ink in the heart and minds of people. In this regard, I owe a debt of gratitude to all those who helped in miscellaneous ways in producing this thesis.

For the measure of guidance and inspiration without which no sustained commitment can be rewarding, I express my deep sense of gratitude to my supervisor, Dr. Paul Nyagorme, for his cogent criticism and thought provoking suggestions which have been a great help in the completion of this dissertation.

I also wish to express my profound gratitude to my wife's family, my parents and friends especially George Dwamena Ohenebeng for their unfailing source of inspiration, encouragement, support and prayers. I am highly grateful

I again express my sincere gratitude to my wife who not only kept wake with me in diverse ways throughout the writing of this dissertation but also for her inspiration, encouragement, offered support and prayers.

God richly bless you all.

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DEDICATION

To my beloved wife, Esther Buduwaa Mensah(Mrs.), my lovely children, and my Late mother, Mrs. Agnes Aleenor Mensah-Sowah

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CHARTER ONE

INTRODUCTION

Background to the Study

The role of formal education in the socio-political and economic advancement of any society cannot be over-looked. According to the document published in 1999 by the UNICEF, Education is the single most vital element in combating poverty, empowering women, promoting human right and democracy, protecting the environment, and controlling population growth (Hall & Midgley 2004). Education can influence social development indirectly by contributing to economic growth, which in turn creates resources for social development.

In traditional classroom-based course, much of the learning comes from reading the selected particular textbook, attending lectures and taking notes regularly. Recent technological developments, however, offer instructors an additional method for teaching, introducing content and practice. According to Worthington, Welsh, Archer, Mindes & Forsyth, (1996); Spinelli, (2001); Prvan, Read & Petocz, (2002), Computer-Assisted Instruction (CAI) continues to increase, ultimately offering numerous advantages. Some of the benefits of using CAI include stress on active learning, improvement of collaborative learning, encouragement of greater students' independence and task-based teaching.

The computer is an electronic device used for performing precisely stated instructions with accuracy, rapidity and with real reliability. According to Eriba in Unongo, (2009), computer is capable of making calculation, storing

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information in various fields of study, designing devices, and making graphical representation of engineering parts and providing leisure in form of music.

Studies have shown that computer self-efficacy has a positive effect on information literacy self-efficacy. Tuncer (2013) and Geban, Askar, and Ozkan (1992) found the use of the computer in teaching to improve student's achievement in chemistry and other sciences. However, integration of ICT into education system in Ghana is still relatively poor.

Technology ushers in fundamental structural changes that can be integral to achieving significant improvements in productivity. According to Anderson (2010), ICT affects all spheres of our lives and has become a vital tool to function in modern society. Used to support both teaching and learning, technology infuses classrooms with digital learning tools, such as computers and hand held devices, expands course offerings, experiences, and learning materials, supports learning 24 hours a day, 7 days a week; builds 21st century skills; increases student engagement and motivation; and accelerates learning. Technology also has the power to transform teaching by ushering in a new model of connected teaching. This model links teachers to their students and to professional content, resources, and systems to help them improve their own instruction and personalize learning. (www.ed.gov/oii-news/use-technology-teaching-and-learning).

In addition, they emphasize that testing may be improved if students' complete tests on computer screens and receive immediate feedback about their performance. The educational uses of computers that are considered Computer Assisted Instruction (CAI) or Computer-Based Instruction (CBI) are those cases in which either instruction is presented through a computer program to a passive

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student, or the computer is the platform for an interactive and personalized learning environment.

As a result of the rapid development of the information and communication technology, the use of computers in education has become inevitable. The use of technology in this way plays an important role in the teaching and learning process (İşman, Baytekin, Balkan, Horzum, & Kıyıcı, 2002).

In teaching, computer empowers students to have greater control over the learning process with all the benefits associated with active learning and personal responsibility. The benefits of using CAI include emphasis on active learning, enrichment of collaborative learning, encouragement of greater students' independence and task-based teaching (Worthington et al., 1996; Spinelli, 2001; Prvan et al., 2002). The use of technology in education provides the students with a more suitable environment to learn, serves to create interest and a learning centered-atmosphere, and helps increase the students' motivation.

Computer Assisted Instruction also enables students to work at their own pace with continuous assessment. So teachers and educators should utilize CAI to get the maximum benefit of this emerging technology. Not only will the students decide by using computers on what to learn and how to learn, increasingly they will also decide what to learn and how that learning is to be satisfied.

There have been policies to integrate ICT into the education system. In 2003, the Ghana Government through the Ghana Education Service formulates the policy dubbed "information and Communication Technology for

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Acceleration Development (ICT4AD). The policy among other things is to determine the type and level of ICT needed by school for teaching and administration. This means that there is a conscious effort to inculcate Computer Assisted Instruction (CAI) into Ghana's education system.

Statement of the Problem

The use of Computer Assisted Instruction in the classroom has the potential to help the teacher explain new concepts clearly, resulting in better student understanding of the concepts being taught.

Also, in Ghana, almost all the Senior High Schools now have computer laboratory equipped with computers. Some of the Computer Laboratories have internet access with all the appropriate applications (educational software) such as Microsoft Office suit, browsers and search engines. All this was intended to facilitate the acquisition of knowledge in the schools especially in the Senior High Schools through the use of technology.

Again, the acquisition of computers including smart phones and its peripherals has become common and easy. Almost every individual has at least one form of computer as their personal property. This implies that if everybody, especially teachers and students, decide to use computers in the teaching learning process, there would not be any problem regarding the availability of the device. However, studies of computer usage for educational purposes indicate that computers are often used insufficiently (Kwapong, 2007). Adebi-Caesar (2012), also revealed that regardless of the fact that some teachers had computers at their disposal they are not ready to use and do not have the intention of even using them in their lessons.

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The researcher has observed that the teaching and learning of Ghanaian Language in Senior High Schools in Ghana especially in the Akuapem North Municipality has been with the use of traditional method of instruction. Due to this, the performance of students especially at WASSCE level has consistently remained poor. This may imply that students are not learning from the use of innovative method of teaching and learning (the use of computers).

Purpose of Study

The purpose of this study was to provide a description of the use of Computer Assisted Instruction in teaching Ghanaian Language in Second Cycle Schools and its effect on students' learning outcome in the Akuapem North Municipality of the Eastern Region of Ghana.

Objectives of the Study

Precisely, the study seeks to;

i. Identify the instructional technologies available for teaching and learning in the Senior High Schools in the Akwapem North Municipality.
ii. Find out the extent to which respondents can use CAI in the selected Senior High Schools in the Akuapem North Municipality.
iii. To assess the extent to which students have access to the available instructional technologies
iv. To assess the extent to which teachers have access to the available instructional technologies
v. Evaluate the extent to which the use of Computer Assisted Instruction affects learning outcome.

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vi. Assess the challenges/barriers in the use of CAI in the Senior High Schools in the Akuapem North Municipality?

Research Questions

The study addressed the following research questions:

1. What is the extent to which respondents can use instructional technologies (CAI)?
2. What are the instructional technologies available in the Senior High Schools in the Akwapem North Municipality?
3. How often do students have access to instructional technologies for teaching and learning?
4. How often do teachers have access to instructional technologies for teaching and learning?
5. How does the use of Computer Assisted Instruction in teaching Ghanaian Language affect learning outcome?
6. What are the barriers/challenges in the use of CAI in the Senior High Schools in the Akuapem North Municipality?

Significance of the Study

The results of the research will serve as a basis for recommendations of policies and practices to be put in place to enhance the teachers' use of the technologies in their teaching. The results may also help the Ministry of Education, Science and Technology in planning for further development of modern technologies in the educational sector. The research will again enhance staff development programs and their knowledge and usage levels of technology and instructional materials in the classrooms. It will further help planners

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deliver effective in-service education programs, which can increase the likelihood that technology and materials resources will lead to success.

Delimitations of the Study

A major delimitation of the study was that the topic, Computer Assisted Instruction, is very broad and cannot be fully covered in one study. Therefore, this study concentrated on those technologies that could or should be commonly used in the Ghanaian context. Limiting the study to these technologies does not rule out the importance and impact that other technologies play in the teaching and learning process.

Again the study was restricted to six Senior High Schools in the Akuapem North Municipality of Eastern Region of Ghana due to time constraint, accessibility and other related resources needed to carry out the research. The six Senior High Schools were chosen because they were within the reach of the researcher.

The population for the study is also restricted to the Ghanaian Language teaching staff and students of the Senior High Schools. This is because they are the key element in the teaching and learning process.

Ga and Akuapem Twi were the only Ghanaians Language for the research. The two Ghanaian languages were the only Ghanaian Languages studied in the Senior High Schools in the Akuapem North Municipality.

Limitation of the Study

The Sample size is comparatively small and is likely to limit the generalization of findings to all Senior High Schools in the Eastern Region in particular and Ghana general.

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Also as descriptive survey sometimes delves into peoples' private and emotional lives, it is possible for the respondents not to give accurate and sincere response which would be far from the reality on the ground.

Again, it's possible for a respondent to withhold some information while responding to the questionnaires since the questionnaires were given to them to respond on their own.

However, the finding presents a better overall understanding of the general challenges or otherwise of the use of computers in general and Computer Assisted Instruction in particular in the teaching and learning process.

Definition of Terms

Computer: A device that can be instructed to carry out sequence of arithmetic of logical operation automatically via computer programs. It is an electronic machine that is able to take information (input) and process it to make new information (output)

Software: A collection of data or computer instruction that tell the computer how to work. It enables the computer to perform a specific task

Educational software: A computer software design for the purpose of teaching and learning or for self- learning.

***Computer Peripherals*:** Is an ancillary device we put information into and get information out of the computer

Computer laboratory: Is a space (room) which provides computer services to a defined community (school). It is a central area or room where computing activities are carried out for the purpose of teaching and learning. It can also be accessible to teachers and students after lessons.

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Information and Communication Technology*:* It refers to technologies that provide information through telecommunication.

Technology*:* The application of behavioral and physical sciences concepts and other knowledge to the solution of problems

Educational Technologies: The combination of instructional, developmental, managerial, and other technologies applied specifically to the solution of educational problems

Instructional Technology**:** The application of educational technologies to the solution of specific instructional problems.

Computer Assisted Instruction: Is the interactive instructional use of computer to present instructional material and monitor the learning process.

Organisation of the Study

The research has been organised into five chapters: The chapter one deals with the introduction and background to the study. Chapter two covers the review of the related literature.

Chapter three describes the methodology. It provides a description of the methodology and the plan of analyses employed in this study. It resumes with a brief review of the methodology followed by detailed description of all the methods and steps that were taken in arriving at the conclusions of this study. The chapter also includes the study design and the instruments used. It documents the sample size and sampling procedures and concludes with sources of data, the techniques for data analysis and ethical issues.

Chapter four gives the results of the study and discusses them, while Chapter five summarises the study, draws conclusions and makes recommendations.

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It also suggests future policy initiative that could cause better integration of CAI in the teaching and learning procedures at the Senior High School education level.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter begins with an insight into the traditional method of learning followed by brief historical perspectives of computers and the roles of computers in education and then continues with the theoretical aspects of Computer-Assisted Instruction. Following this, the effects of the computer assisted instruction on student attitudes and retention are considered.

Traditional Instruction

Traditional instruction is teacher-centered and characterized by direct instruction. Direct instruction usually includes the presentation of material, thinking aloud by the teacher, guided practice, correction and feedback, and modeling by the teacher (Kinney & Robertson, 2003). A teaching style inventory administered to 381 faculty members at 200 U.S. public and private colleges and universities revealed that 60% taught using the teacher-centered mode of instruction assuming the role of expert, authority, and model (Grasha, 1994).

In traditional instruction, the teacher plays the role of the expert imparting knowledge. The teacher decides what, when, and how students should learn (Brown, 2003; Kinney & Robertson 2003). All students study the same topic at the same time. The tendency is for teachers to use the same instructional methods with which they were taught and with which they feel comfortable.

In traditional instruction, lecture method of teaching is the sole medium of lesson delivery. In colleges and universities, the predominant mode of instruction has been the presentation of material through lecture and

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demonstration using whiteboard, chalkboard, overhead, PowerPoint, or graphing calculator. This often means that students have been and still are receiving instruction by the traditional lecture (Kinney & Robertson, 2003; Roueche & Kirk, 1974). The teacher talks and learners listen and write; the teacher demonstrates step by step procedures which are reinforced with drill and practice. Interaction is limited to learners responding to the teacher's questions.

Also, in traditional method of teaching, the teacher or the educator is the repository of knowledge and student just have to receive what they are given. According to Brown (2003), the teacher is responsible for thinking and the students memorize and recite. Teachers focused on content, schedules, and standards, not needs of the students. Felder and Brent (1996) described the traditional teaching as stenography with the teacher reciting the course notes, the learners transcribing the notes, and "the information not passing through anyone's brain".

In traditional instruction (the lecture method of teaching) learners are regarded as empty barrels that need to be filled by the teacher. Learners are viewed as empty pails waiting to be filled and the teacher as the "sage on the stage" (Mahmood, 2006,). According to Brothen and Wambach (2000), faculty, students, and administrators think that teaching means "speaking aloud from the front of the room". Based on their research on a developmental psychology course, they concluded that lectures are an inefficient means of delivering instruction.

Language Policy in Education in Ghana

The language to use as the medium of instruction in Ghanaian schools, especially at the lower basic level dated back to the castle schools and

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missionary era. Before formal education was introduced into Ghana (Spring, 1998), traditional education was conducted in the indigenous languages. With the inception of formal education and the subsequent use of English as the medium of instruction, the indigenous languages were seen as "inadequate" as teaching media (Bamgbose, 2000).

Language Policy During the Colonia Era

A brief overview of the Language policy dated back to the colonial era. According to Anyidoho (2018), the Wesleyan Mission started opening schools in 1838 and emphasized English in the curriculum. A few years later, the Basel (1843) and the Bremen (1847) missions also set up schools in the south-eastern part (Akuapim, Ga and Ewe areas), and used the indigenous languages as media of instruction at the primary level (P1 – P6).

In 1874 when the British declared the southern part of Ghana a British colony and began establishing public schools, they forced the Christian missions that used mainly the local language in teaching to include English in their curriculum in order to receive funding from the colonial administration (Anyidoho 2018).

The colonial policy of instruction through English was upheld until 1922, when the PhelpsStoke Commission was set up to make recommendations towards the improvement of education in British West Africa. One of the recommendations of the commission was the use of the indigenous language as medium of instruction in the lower primary classes (P1 – P3) and English at the upper levels. In 1951, another committee endorsed the use of the local language medium at the lower primary classes. (Anyidoho 2018).

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The use of a Ghanaian Language during the period from 1529 to 1925 had gained root to the extent that when the British colonial government took over the administration of education in the country in 1925, it could not reverse the trend (Bamgbose, 2000). During this period, a systematic pattern began to emerge with regard to both education and language use.

The first legislation on the use of a Ghanaian Language in education was promulgated (MacWilliam, 1969; Graham, 1971;. Ghanaian Language was to be used as the medium of instruction only at the lower primary level, with English used thereafter.

The local language was to be taught as a subject from P4 onwards, at which point English became the language of instruction.

Language Policy After the Colonia Era

An important milestone in the history of language-in-education policy in Ghana occurred in 1957 when the government declared English as the medium of instruction at all levels including the very early stages, P1– P3. The choice of English in 1957 seems puzzling since it coincided with the year of Ghana's independence from British colonial domination when the indigenous language option would have been expected. (Anyidoho 2018).

After 1966, there was a returned to the local language policy. However, the policy allowed urban and private schools to provide instruction in English at the lower primary. The local Language was retained as a medium of instruction from 1969 – 1971 in the lower primary. In 1972, the indigenous language was used as the medium of instruction in P1 only. From 1982-2000, the Language policy was retained. In 1987 the study of the local language compulsory and examinable at the Basic and SHS levels. In 1994 the local

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language was made an optional subject of study at the SHS level. (Anyidoho, 2018

The policy was reversed and became unstable when the administration of the country came under the jurisdiction of indigenous Ghanaians in 1957. Since then, the use of a Ghanaian Language as the medium of instruction at the lower primary level has had a checkered history. From 1925 to 1951, a Ghanaian Language was used as medium of instruction for the first three years. Between 1951 and 1956, it was used only for the first year. From 1957 to 1966 a Ghanaian Language was not used at all, from 1967 to 1969 it was used only for the first year, and between 1970 and 1974 a Ghanaian Language was used for the first three years and where possible beyond (to the sixth year). From 1974 to 2002 a Ghanaian Language was used for the first three years. A Ghanaian Language in this case is the language of the locality which includes one of the following: Akan (Fante and Twi), Nzema, Ga, Ga-Adangbe, Ewe, Gonja, Kasem, Dagbani, and Dagaare (Owu-Ewie, 2006).

Brief History of Computers in Education

The 1960s marks the beginning of modern computers. The Punch card system was large but slow. The International Business Machine Corporation (IBM) initially developed one of the first computer systems in the 1960s that utilized the minicomputers (Carter, 2003).

Computer was introduced into the education system as early as 1950s. In 1959, P.L.A.T.O, the first large-scale project for the use of computers in education was implemented by Donald Bitier at the University of Illinois (Carter, 2003). Atkinson and Suppes' (1959) work led to some earliest applications of computers at both the public school and university levels during

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the 1960s. By the early 1980s many educators were attracted to microcomputers because they were relatively inexpensive, compact enough for desktop use, and could perform many of the functions performed by the large computers that had preceded them.

The dominant use of computer-based instruction in the 1980s was typified by the development of "behavioral-based branching" software that was based greatly on drill-and practice to teach programmed content and/or skills. The educational software that ran on the computers of the early 1980s were at first based on Skinner's "methods of branching": first separating into small sections, rewarding combined responses, and teaching disconnected facts. Although the learning is passive where learners do not work together with problems and content, research studies indicate that learner gain advantage from the technology when the learning objectives were behavioral.

During the 1990s, computers eventually started to have a major impact on instructional practices in schools. With the help of advances in technology and learning, science researchers consider learning with technology as means for construction problem-solving skills and for achieving learner independence. The cognitive approach to instructional technology emphasized "looking at how we know rather than how we respond, and analyzing how we plan and strategize our thinking, remembering, understanding, and communicating" (Saettler, 1990, cited in http://www.ncrel.org/ tplan/cbtl/toc.htm, 2003).

Swiftly there was a volume of information obtainable to students with a network of people all over the world that improved communication and the exchange of thoughts. Since 1995, rapid advances in computer and other digital technology, as well as the Internet, have led to a rapidly increasing interest in

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and use of these media for instructional purposes (Reiser, 2001). Additionally, distance education courses are offered and in this way students in geographically isolated schools have extended learning opportunities in a diversity of subject areas. For example, in United Nations, Kalu (2006) stated "the proportion of instructional rooms with internet access increased from 51 percent in 1998 to 93 percent in 2003".

Much of the early work which computers introduced in education was done in the 1950s by researchers at IBM, who developed the first Computer Assisted Instruction (CAI) author language and designed one of the first CAI programs to be used in public schools. Students followed the commands on the computer screen receiving rewards for correct answers within the framework of behaviorist approaches. In 1959, PLATO, the first large-scale project for the use of computers in education was implemented by Donald Bitier at the University of Illinois (Carter, 2003). Atkinson and Suppes' (1959) work led to some earliest applications of computers at both the public school and university levels during the 1960s.

By the early 1980s many educators were attracted to microcomputers because they were relatively inexpensive, compact enough for desktop use, and could perform many of the functions performed by the large computers that had preceded them.

Besides, students would also learn through playing games and simple simulations with the help of cognitive thought. Other subject matter teachers perceived the importance of the computer in creating a rich learning environment by using databases, spreadsheets, presentation, and research tools. Since 1995, rapid advances in computer and other digital technology, as well as

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the Internet, have led to a rapidly increasing interest in and use of these media for instructional purposes (Reiser, 2001).

Theoretical explanations could now be demonstrated and manipulated with the help of technology innovations. A complete innovative learning environment became possible. Since the advent of the personal computers in the mid-1980s, computers have rapidly become one of the key instructional technologies used in both formal and informal education. Papert (1993) concluded that the computer should be an "object to think with" not a dispenser of information.

The computer's role has changed because of two factors: first, it can provide rich learning experiences for students and secondly, computer giving students the power to manipulate depth and way of their learning. Furthermore, teachers can use the computer as an aid to manage classroom activities; it has a multitude of roles to play in the curriculum which can range from tutor to student tools.

Computer Assisted Instruction (CAI)

Computer Assisted Instruction (CAI) has been defined in several ways by several authors. According to Rushby (1989), and Uşun (2000), Computer Assisted Instruction is concerned with the use of computers not only as a choice but to mediate the flow of information in the instruction process and the complementary means. Also, Freedman (1999) explained that Computer Assisted instruction refers to a specially designed application for teaching a variety of subject area to learners. According to Fouris (1999), CAI is an interactive instructional technique whereby a computer is used to preset the instructional materials and monitor the learning that takes place. Furthermore,

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Stennet (1985) explained that CAI is an instructional technique based on the principle of programmed instruction and makes use of a combination of tutorial, computer simulation activities and drill and practice programs. In conclusion, CAI approach refers to the use of computer to give course content instruction in the form of drills and practice, tutorials stimulations. According to Sharp (1996), CAI programs use tutorials, drills and practice, simulation and problem solving approach to present topics, and they test the student's understanding.

Computer use in Education

CAI was utilized in education as an educational medium which deliverd instructional activities in the late 1950s. Papert (1993) stated that programming the computer to administer the 23 kinds of exercises traditionally given by a teacher at blackboard, a textbook, or a worksheet.

Another type of computer application in education is simulating experimentations. In the simulation environment, students investigate simulations on the computer screen as a replacement for observing and doing something real, either in a laboratory or in the field. For instance, one program popular in the early '90s was simulated a natural ecosystem. In this ecosystem simulation software, the students could change a number of characteristics of the habitat, the consequences of which were then played out for them to observe and from which they were to draw conclusions (Setzer & Monke, 2001).

In the tutorial mode, computers act as the teacher by presenting information in small units to the students and then reinforcing it with questions or tasks. Then computer analyzes the student's responses and gives feedback or remedial instruction based on his or her response. For example, *Mavis Beacon*

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Teaches Typing as a tutorial program which guides students to learn touch-typing skills (Smaldino, Russell, Heinich, & Molenda, 2005)

The final mode is games. Smaldino et al. (2005) defined game as "…an activity in which participants follow prescribed rules that differ from those of real life as they strive to attain a challenging" (p. 121). Therefore, a game may or may not be instructional. If it contains academic skill practice, then it is defined as an educational 24 game. Game software provides elements of competition into learning activities. With computer games, students are competing against their own previous scores or against the designer of the game as they indicate their understanding of educational content. Game assumes that students have already gained the knowledge of the content and generally it is designed based on the time-limitation to encourage students to respond quickly (Ugwu, 2005). As an example, *King Arthur's Magic Castle* educational game was designed based on the problem solving strategies to emphasize entertainment (Smaldino et al. 2005).

The above modes of CAI are the ones that are widely used in the educational practices. However, there are other utilization methods of CAI: such as Discovery and Problems solving programs. The goal of quality education seems to have the computers as new learning/teaching resource rather than a teacher's aid in the future. With the usefulness of Internet since 1990s, Distance Education, Virtual Reality (VR), Electronic-Books (e-Books), and Electronic Learning (e-Learning) have become the future of learning (Robertson, 2004).

There has been a massive use of computer recently since it's now more affordable. Niemic and Walberg (1987) stated that when computers first appeared as a means of instruction almost three decades ago, they created great

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excitement among educational psychologists. However, their effectiveness did not meet the expectations of educators and the high cost of the technology made them impracticable. With the emergence of the microcomputer in the 1970s, there was greater use of the computer in education.

Computer use in Computer Assisted Instruction

Computer use in Computer Assisted Instruction serves as a tutor, tool and tutee. Taylor classified the instructional use of the computer as tutor, tool and tutee. Computer programs that teach new skills or concepts or remediate tutor the student. When the student programs the computer, the computer becomes the tutee. A program that is used to perform a task such as word processing or The Geometric Supposer is a tool. Fey and Heid (1984) stated that initially, the role of tutee was predominant as it was felt that the students would have a deeper understanding of Mathematics through programming.

The Role of Computer Software

With the advent of educational software, the role of tutor became more prevalent. More recent developments focus on the role as a tool, which allows the student to take on more of a discovery role. Cuban (1989) indicated that computer instruction accounts for only 5% of all instruction. Niemic and Walberg's (1987) statement that 90% of American schools use computers for instruction is misleading. While 90% of the schools may do some CAI, this researcher's feeling in reading the literature is that the extent of that type of instructs ion is minor. Certainly Papert's (1980) goal of a computer for every student has not been reached.

For the past two decades, educators have been concerned with having the curriculum respond to the influence of computer technology. The National

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Council of Teachers of Mathematics ' 1984-year book dealt exclusively with computers and Mathematics instruction. At the 1984 NCTM conference, with the Impact of Computing on School Mathematics , it was suggested that content priorities in all Mathematics courses be adjusted in light of computer graphics and technology. Furthermore, it was suggested technology would offer enriched curriculum for students with limited abilities or interest in Mathematics (Corbitt, 1985). The NCTM^'s Curriculum and Evaluation Standards for School Mathematics (NCTM, 1989) for grades K-12 calls for computers to be integrated into Mathematics instruction and the use of computers for investigations by individuals and groups of students.

The use of Computer Assisted Instruction grounds students to gains more positive attitudes toward the use of the computer, enjoyed their courses more, and spent less time in the learning process. Kulik, Bangert and Williams (1983) used a meta-analysis to integrate 51 studies about computer-based instruction in grades 5-12 that used treatment and control groups of similar aptitudes. According to the analysis, computer-based instruction raised scores from the 50th to the 63rd percentile on final examinations and in follow-up tests there was a measurable gain. In addition, students who had used the computer had more positive attitudes toward the computer, enjoyed their Mathematics courses more, and spent less time in the learning process.

CAI and learners

With the use of Computer Assisted Instruction, learners at the lower level of education benefit more than those at the high level of education. In a more recent review of the literature, Niemiec and Walberg (1987) concluded that CAI used in Mathematics instruction moderately raised the achievement

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levels of the students. They also concluded that secondary and college students did not benefit as much from CAI as did elementary students. However, when CAI was used at upper levels, it decreased the learning time and achieved a higher rate for course completion.

Benefits of Computer Assisted Instruction CAI

Although the research studies on the effectiveness of computers in the field of education reveals contradictory results, majority of the research studies indicates that CAI brings several possible advantages as a teaching/learning tool. The main strength of the computer as a learning medium is its ability to process information quickly. This makes it possible for the computer to accept and act upon a variety of different kinds of response from the learner and to provide information in textual, graphical, and animated form (Rushby, 1989).

According to Kaput (1992), there are three advantages of the usage of technology in teaching and learning Mathematics ; interactivity, connectivity and controlling of learning environments. Furthermore, computer suggest opportunities for learner-control, improved enthusiasm, associations to the real world, and enhance student achievement as measured in variety of ways, including, but not exclusively limited to, "standardized achievement tests". Ertmer (1999) (as cited in Day, 2006) stated that "CAI benefits most students when compared with traditional Instruction because it increases student interest, reduces anxiety, provides more time on task, and provides instant feedback for the student".

The fact that the computer can exercise various senses and present information in a variety of media can enhance the learning process. According to Fletcher, Hawley and Piele (1990), people remember 20% of what they hear,

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40% of what they see and hear and 75% of what they see, hear and do. Therefore, the more senses are used through which we obtain information, the easier to keep in mind. As a result, students can retain knowledge.

Further, CAI is visually attractive, when it presents concepts using demonstrations that are made attractive by animation, color, and sound. Besides this, computer assisted instruction captures and holds the students' attention by providing opportunities for competition where the opponent is the student's previous performance (Mahmood, 2006). CAI also eliminates the misconceptions by providing immediate feedback, since immediate feedback prevents learning concepts incorrectly.

Benefits of CAI to the Teacher

The use of CAI is not only beneficial to the learner but to the teacher also. As Cotton (2001) indicated, teachers can benefit from CAI since it can be programmed with concept, level and ability specificity; that is, the students are not challenged outside his or her demonstrated ability range, nor are they allowed moving to a higher level until they have mastered the level on which they are working.

The use of CIA as proof beneficial in all subject areas in all level of education. The study by Clinkscales (2002) examined the effectiveness if CAI on Mathematics . Also the study by SERIN (2011) on the effectiveness of Computer Based Instruction on Science and technology students revealed that there was a significant increase in the achievement of students who receive computer Assisted Instruction.

Many different career areas use CAI to teach and train. The study by Lowe (2004) on the effective CAI for adults investigated the need for using

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computer as a means of instruction delivery based on the growth of adult students in the workforce. She found that the Computer as some advantages such as providing consistency of content delivery, delivering training to the remote location, providing opportunity for practice through stimulation and afforded greater retention (Lowe 2004). CAI was also being used to assist today's workforce at higher learning institution.

Computer Assisted Instruction allows for flexibility in structuring learning environments that are challenging to students. Battista and Clements (1988) stated that the Geometric Supposer and Logo software encourage students to explore significant problems. Papert (1980), the developer of Logo, maintained that through active participation in the programming approach of Logo, students could learn powerful Mathematics in an informal manner. He claimed by using Logo students would think about thinking, be given experiences to close the gap between the Piagetian stages of concrete and formal operations, and become better problem solvers.

Although Logo was originally developed for younger children, and Battista and Clements (1988) supported its use at the Secondary level. Battista and Clements believed Logo would help high school geometry students' progress in van Hiele"s hierarchy of geometric thinking from visual, to descriptive, to theoretical. They claimed that the theoretical level is a necessary requirement for proof-oriented geometry classes.

Computer Assisted Instruction sometime is more beneficial for average and above average students than the below average students. Trueman (1981) reported in a study involving a lesson on transformational geometry compared the achievement levels between a group taught using a traditional Socratic

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method and a group that used CAI. The results showed that the guided inquiry method using CAI was more beneficial for average and above average students. The below average students showed little enthusiasm for either approach.

Benefits of computer software

Computer Software aid in learners understanding of abstract concept. A study by Zehavi (1988) suggested that students are not ready for the abstract concepts involved in graphing linear equations and can be helped in their understanding by a more informal approach using computer software. The experimental group used the software for four days prior to graphing instruction. When tested after the topic was completed, the experimental group showed significant achievement over the control group. It was implied that the software activity filled a cognitive gap and aided the students' intuitive ideas about graphing (Zehavi, 1988). Lynch, Fischer, and Green (1989) reported that the students developed an understanding of the algebraic concepts and at the same time increased their problem solving skills. Through the shared use of computers, they learned to communicate mathematically and to take on a greater responsibility for their own learning.

The use of computer in the teaching and learning process helps present real problems and solve them readily. Waits and Demana (1989) stated that the use of computers will eliminate contrived problems and replace them with realistic and more difficult problems. The speed of the computer might allow for the solution of many problems in a short time.

Computer Assisted instruction develops positive attitude towards instruction and subject matter in learners. In searching the 1iterature, studies involving university students were more avai1able. In a study using CAI as a

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supplement to the traditional approach of teaching statistics, Varnhagen and Zumbo (1990) found there was no direct positive effect on student achievement. However, there was a significant positive effect on students' attitudes toward the instruction and subject matter.

Educational software for CAI

There are many educational softwares for the use of Computer Assisted Instruction in education. The Maths Blaster and the NovaNET are good examples of software for CAI. Maths Blaster is a good example of the type of instructional software that allowed for skills to be reviewed and practiced or more time can be spent learning and understanding new concept for those more skilled in basic Mathematics . (Clinkscale 2002). The NovaNET system is a computer based online learning system linking educators with progressive technology and proven teaching methods.

Educational software and the use of Computer Assisted Instruction grooms the learners to become creative in the learning process. According to Yerushalmy (1986), Schwartz (1989) and Yerushalmy (1990), the developers of The Geometric Supposer, promoted its use as a means for students to create Mathematics rather than passively learn geometry in a teacher centered environment. They suggested that creativity takes place when the students use the geometric Supposer to explore shapes and their geometrical relationships and to make conjectures through inductive processes. They envisioned a classroom where students communicate their findings in a seminar-like environment. The Geometric Supposer provides visual and numerical data without interpretation, allowing the student to form his own conjectures and arrive at generalizations through inductive reasoning.

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Educational software and Computer Assisted Instruction enable learners to use a process similar to that of scientific method in the learning process. Schwartz and Yerushalmy (1989) stated that the pedagogy used in the development of the Geometric Supposer is similar to that in a science lab. Turner (1988) encouraged teachers to have students use the computer to discover geometric concepts and supported the use of the Geometric Supposer for this purpose. Chazan and Houde (1989) and Chazan (1990) explained how to use the Geometric Supposer for conjecturing. They stated that the speed of the program, its ability to make any Euclidian construction and its repeat feature provide the many examples needed to arrive at a conjecture.

CAI and Students'Performance

Some studies show that Computers (CAI) provides for improving students' performance. A number of studies have suggested that the computer provides an effective vehicle for improving students' achievements (Bahr & Rieth, 1989). Fletcher, Hawley and Piele (1990) observed that the overall Mathematics performance of the third and fifth grade students who used CAI was higher than their peers who did not use it to practice. Also Bahr & Rieth, (1989) identified CAI as a factor for improved Mathematics achievement of the disabled Junior and Senior High School students.

The meta-analyses of the 1980s produced the conclusion that programs of computer based instruction have positive evidence in the evaluation literature (Kulik, 1994). Similarly, Burns and Bozeman (1981) provided the results of a meta-analysis of 40 studies that compared the effectiveness of traditional instruction alone with a combination of traditional instruction and computer-

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assisted instruction on students' Mathematics achievement. Results showed that the combined traditional-CAI approach was significantly more effective.

Computer Assisted instruction aid learners to become independent thinkers and discoverers. Bruner (1961) stated that learning that has come about by active participation and discovery is of a most personal nature and indeed the most useful and powerful in subsequent problem solving situations. He placed on teachers the responsibility to assist students to become independent thinkers and to enable them to become discoverers. Brown (1982) advocated students' active participation in the learning process by means of discovery. He claimed that educated guesses or conjectures can be formulated through inductive reasoning, a procedure requiring numerous examples. Fitting (1983) indicated that computers can bring a variety of experiences to the classroom including discovery.

Computer Assisted Instruction enables learners to be active rather than passive in the learning process. Polya (1981) stated that learners should be active rather than passive, and that the most beneficial learning is attained when the learner discovers a large portion of it. He believed that guessing based on observation, inductive reasoning, and conjecturing, which he called plausible reasoning, play a large part in mathematical discovery.

Theoretical Review on the Effects of CAI

The teaching – learning process is basically about the acquisition of knowledge and skills. In the past, a conscious effort has been made by individuals concern with education to define learning. These efforts have led to the evolution of teaching and learning theories. Learning theories provides us

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with conceptual framework of interpreting the act of learning and also show us where to look for solutions to practical problems (Skinner 1953).

This research focused on the behaviorism and constructivism. These theories have different viewpoint on learning, different perception on teaching style and different approaches to pedagogy and evolution (Skinner 1953) Both approaches play a vital role in facilitating the use of CAI in the teaching and learning process.

Learning theories have been developed over the past 150 years. The development of these learning theories over many decades is a fascinating story. Some theories developed as a negative reaction to earlier ones. The other learning theories built foundational theories, looking at a specific context for learning, or taking them to more sophisticated level. Positive features from many theories influence teaching/learning process in schools to this day.

Behaviorism

Behaviorism (or behaviorism) is a systematic approach to the understanding of human and animal behavior. It assumes that the behavior of a human or an animal is a consequence of that individual's history, including especially reinforcement and punishment, together with the individual's current motivational state and controlling stimuli in the environment, (https://en.wikipedia.org/wiki/Behaviorism) Behaviorism is a worldview that assumes a learner is essentially passive, responding to environmental stimuli. The learner starts off as a clean slate (i.e. tabula rasa) and behavior is shaped through positive or negative reinforcement. Both positive reinforcement and negative reinforcement increase the probability that the antecedent behavior will happen again (Skinner, 1953).

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Behaviorism is more concerned with observable behavior rather than the cognitive or mental activity (thinking, feeling, or knowing) that cannot be observed. It focuses on the objective and observable components of behavior. This theory considers learning to be nothing more than the acquisition of new observable behavior. Burton, Moore, Magliaro (2004), considered behaviourism as relevant and vital philosophy that gives foundation and support for widely understand concept of "educational technology".

Behaviourism in CAI

The application of Behaviourism in education has transformed quite a bit though some aspects remain parallel despite the changing times. Sutton (2003) discussed the current trends in instructional technology that incorporate Behaviourism and Constructivism. He stated that there are many aspects of Behaviourism that are positive and have led to the development of important instructional technologies. Examples of Behaviourism in current trends are instructional software and Computer-Assisted Instruction.

Shields (2000) also discussed the use of drill and practice tutorials, with individual instructions and feedback. Shields argued that student's understanding of basic technological terms and descriptions of components can be achieved through structured programs delivered through media. Therefore, ICT in technology education, can be seen as a source of information and if were structured effectively a context or structure for learning simple skills and concepts. Behaviourism is said to have a number of views, this view of learning drives a lot of current educational practice where competencies and standards have become established indicators of achievement.

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Shields (2000) concluded on much of what current Behaviourists focus on, stating that it is sometimes necessary to memorise bits of information before higher-level, problem-based learning can take place. He also brings up the interesting point that much of today's curriculum focuses on these memorized bits of information and we can clearly conclude that this is a strong reason why so many Behaviourist practices are still relevant in today's educational tactics.

Constructivism

Constructivism is a meta-concept. It is not just another way of knowing, but a way of thinking about knowing. It is a theory of communication and suggests that each listener or reader will potentially use the content and process of the communication in different ways. (Machlova & Malcik 2012). Constructivism holds the view that learning is an active process, unique to the individual, and consists of constructing conceptual relationships and meaning from information and experiences already in the learner's repertoire. (Machlova & Malcik 2012).

According to Machlova & Malcik, (2012), Constructivism claims that each learner constructs knowledge individually and socially. The "glue" that holds the constructs together is meaning. Knowledge is not "out there", as the realist philosophers such as Plato claimed. Knowledge is always an interpretation of reality, not a "true" representation of it.

The main contributors to constructivism as Machlova & Malcik, (2012), spelled out are: David Ausubel – subsumption theory, Jerome S. Bruner – constructivism, Jean Piaget – genetic epistemology, Lave – situated cognition, C. Argyris – double loop learning, R. J. Spiro – cognitive flexibility, D. A. Kolb – learning styles, J. H. Flavell – metacognition, Schank – script theory.

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According to Machlova & Malcik, (2012), there are certain Principles of constructivist learning. They outline these principles as:

i. The learner uses sensory input and does something with it, ultimately making meaning of it.

ii. Learning consists of both constructing meaning and constructing systems of meaning. Learning is layered.

iii. Learning occurs in the mind. Physical activity may be necessary, but is not sufficient alone.

iv. Learning involves language. Vygotsky (1978), believed that language and learning are inextricably intermeshed.

v. Learning is a social activity.

vi. Learning is contextual. We do not isolate facts from the situations and environment in which they are relevant.

vii. Knowledge is necessary for learning. It is the basis of structure and meaning making. The more we know, the more we can learn.

viii. Learning takes time; it is not spontaneous. Learners go over information, ponder over them, use them, practice and experiment.

ix. Motivation is a necessary component, because it causes the learner's sensory apparatus to be activated. Relevance, curiosity, fun, accomplishment, achievement, external rewards and other motivators facilitate ease of learning.

Again Machlova & Malcik, (2012), pointed out some suggestions of constructivism for course design (presuppositions from J. S. Bruner). They enumerate them as follows:

i. Students come with a world view.

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ii. Their world view acts as a filter to all their experiences and incoming observations.

iii. Changing a world view takes work - Students learn from other students and the teacher

iv. Students learn by doing

v. When all participants have a voice, construction of new ideas is promoted

vi. Constructivism works best when the learner prepares something for others to see or hear. When the learner prepares visuals such as text, graphics, web sites, or activities in which another can participate, or endeavors to explain material to other students, or works in a group context, leaning is especially powerful.

Machlova & Malcik, (2012), advocated nine characteristics of a constructivist teacher. To them, these characteristics of a constructivist teacher are:

i. Teacher serves as one of many resources for students, not necessarily the primary source of information.

ii. The teacher engages students in experiences that challenge previous conceptions of their existing knowledge.

iii. The teacher uses student responses in the planning of next lessons and seeks elaboration of students' initial responses.

iv. The teacher encourages questions and discussion among students by asking open-ended questions.

v. The teacher assists students to understand their own cognitive processes (meta cognition) by using cognitive terminology such as classify, analyze, create, organize, hierarchy, etc. when framing tasks.

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vi. The teacher encourages and accepts student autonomy and initiative by being willing to let go of classroom control

vii. The teacher makes available raw data and primary resources, along with manipulative and interactive physical materials.

viii. The teacher does not separate knowing from the process of finding out. Nouns and verbs.

ix. The teacher facilitates clear communication from students in writing and verbal responses, from the point of view that communication comes from one's deep structural understanding of the concepts being communicated. When they can communicate clearly and meaningfully, they have truly integrated the new learning.

There are several principles of constructivist course design. Machlova & Malcik, (2012), identified these principles of constructivist course design as:

i. Maintain a buffer between the learner and potentially damaging effects of instructional practices. Emphasize the affective domain, make instruction relevant to the learner, help learners develop attitudes and beliefs that ill support both present learning and lifelong learning, and balance teacher-control with personal autonomy in the learning environment.

ii. Provide contexts for both autonomous learning and learning within relationships to other students. Group discussion, projects, collaboration as well as independent.

iii. Provide reasons for learning within the learning activities themselves. Have students identify relevance and purpose.

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iv. Promote and make conscious the skills and attitudes that enable a learner to assume responsibility for his/her cognitive and developmental processes.

Constructivism in CAI

The study was also based on constructivism theory. The theory views learning as an active process of knowledge construction by learners. Computer Assisted Instruction and constructivism have a common link in CAI classroom, students are at the center of the learning process and they actively engage in constructing knowledge rather than receiving instruction passively. The research assumed that for students learning outcome to be improved, the instructional method used by the teacher, have to succeed positively in enhancing the learning of Ghanaian Language. In Ghanaian Language lesson, the method of instruction plays a major role in determining the students' success in learning outcome. According to Abdous & Yoshimura (2010), the content delivered in a computer Assisted instruction is more effective than that of the conventional Classroom.

Constructivism lay foundation for the design of curricula. Hypermedia and multimedia are examples of instructional technologies that are more Constructivists in nature. Along with the increased use of such educational technologies originated the emphasis on problem solving. This is particularly Constructivist in theory, and though positive aspects of Behaviourism in learning have been identified, there has been a major shift toward more Constructivist learning situations involving problem solving (Sutton, 2003).

The learners actively construct their own knowledge based on their own experiences in the environment. When implementing instructional technologies,

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there is an enormous drive toward more of a Constructivist approach in the learning process. There are many supporters of this and they provide a convincing argument. One way forward, is to switch our attention from the design of software packages to an interactive problem-based environment in which the student assumes the key. The creation of these rich learning environments will also have to ensure that texts, reference sources, multimedia and communication facilities are fully integrated (Shields, 2000). We can clearly see the relevance that Constructivist have in recent educational practices, as real-world Constructivist learning conditions are more motivating to students through practical application of knowledge.

From above discussions it is clear that both theories will have emerce benefit to teachers for designing their classroom very well to suit learners. These will help the learners have full benefit from the use of ICT in the classroom.

Traditional Educational Paradigm

The first foundation of traditional paradigm is the general system theory that affects instructional design. The second foundation is with learning behaviourism machines and programmed learning in fifties the last century. The programmed learning emphasizes the active role of subject in learning, role of feedback and control of learning process. Behaviourism is considered as simple, elegant and consistent by Burton, Moore, Magliaro (2004). Behaviourism is considered by them as relevant and vital philosophy that gives foundation and support for widely understand concept of "educational technology"

Application of key elements or principles of traditional paradigm onto using of technology and learning programs has several forms. Subject matter is presented in small parts or in modules. Pupil has to master basic or the first level

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for continuing learning. Learning program gives opportunity to repeat subject matter, gives supplementary information or gives example. Program can test pupil's knowledge and skills and gives his or her progress in learning. Technology can supplement teacher in certain cases. (Burton, Moore, Magliaro 2004).

ICT are compatible with the traditional paradigm. Sophisticated ways of using ICT in traditional paradigm is ADDIE model for creation and planning education. Other applications of technology are CAI (Computer Assisted Instruction) and CML (Computer-Managed Learning). (Burton, Moore, Magliaro 2004).

Modern Educational Paradigm

Modern paradigm was developed as reaction on traditional paradigm. The foundation of modern paradigm was constructivism and newly connectivism. Constructivism is considered as prevailing present paradigm. Pupil's learning is personal, reflective and transformative process. Teacher has to find way to diagnose pupil's momentum level of knowledge and skills to help pupil's learning. New demands on the teacher by Jonassen (2004) are not accepted by all teachers. Many teachers are resistant to this approach or refuse it.

ICT in Modern Paradigm

ICT in modern paradigm are significant entrepreneur. Technology can help modern teaching/learning process in the following ways [26]: - ICT as tool for construction of science - presentation of ideas, conceptions, and opinions of pupil; creation of multimedia knowledge databases by pupils - ICT as information tool for discovering science that supports learning through

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construction – acquisition needed information; comparison perspectives, opinions, and look on world - ICT as creator context supporting learning by doing – presentation and simulation problems of real world, situations and contexts; presentation of opinions, perspectives, arguments and stories of the others; definition safety and controllable environment that has problems or project for students' thought - ICT as social medium supporting learning by conversation or communication – cooperation with the others; discussion, argumentation, formation consensus among members of community; support of discourse in communities based on knowledge - ICT as intellectual partner of pupils that support learning by reflection – helps students express and present knowledge; reflects knowledge of pupils and the way of obtaining knowledge; supports pupils inner dialogue and creation of meaning; constructs personal presentation of meaning; supports thinking. Principles of modern paradigm reflects in concept Resource-based Learning (RBL) and Web-based Learning (WBL)

ICT Policy in Ghana

Ghana as a country has made a conscious effort to harness the benefits of ICT to the development of the country. The Government of Ghana has placed a solid weight on the role of ICT in contributing to the country's economy (Mangesi, 2007). According to Acquah (2012), "the country's medium-term development plan captured in the Ghana Poverty Reduction Strategy Paper (GPRS I&II) and the Education Strategic Plan 2003-2015 all suggest the use of ICT as a means of reaching out to the poor in the country". Mangesi reported, in 2007, that the Parliament of Ghana passed into law Ghana's ICT4AD policy. This policy is presently at various phases of operation. Out of this policy the

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Ministry of Education produced an ICT in education framework document to integrate ICTs in schools.

An effort to policy development for the sector precedes the national ICT policy. A team set up by the Ministry of Education, Science and Sports drew an ICT in education policy framework and created a document that remained untouched for a long time (Mangesi, 2007). The goals of the policy were to:

i. Determine the type and level of ICT needed by schools for teaching and administrative purposes.
ii. Ensure that students have ICT literacy skills before coming out at each level of education,
iii. Facilitate training of teachers and students in ICT,
iv. Provide guidelines for integrating ICT tools at all levels of education,
v. Provide means of standardising ICT resources for all schools,
vi. Promote ICT as a learning tool in the school curriculum at all levels (Mangesi, 2007). On these ICT policy goals, the government of Ghana promised to provide computers to all Senior High Schools in the country in order to promote equitable access to ICT in the school system that is useful to students regardless of their geographical location.

Government of Ghana has also introduced an intervention programme called "One Laptop Per Child Policy" (OLPCP) to sustain the interest of pupils in ICT as well as enhance teaching and learning in basic schools. According to Owusu–Ansah (2015) the investigation that he did on this programme has shown that the use of user-friendly laptops and skilled instructors has considerably improved students' knowledge and skills in ICT.

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However, lack of infrastructure, electricity supply and qualified teachers were prominent encounters that stalled the attainment of the goals of the policy. To ensure equity and quality ICT education, recommendations were given in the study. That the students should be given regular training on the use of laptops to enhance their skills and also ICT teachers should be engaged in more training activities in order to support the students in the use of the laptops. When students are able to get the necessary skills and knowledge at the basic level it will aid them to excel when they get to the second-cycle level (Owusu–Ansah, 2015).

Barriers and Challenges in Using CAI

There are many barriers and challenges in integrating CAI in the teaching and learning process. These barriers include inadequate computers, lack of maintenance and technical assistance and lack of computer skills and/or knowledge among teachers (OECD, 2009). Jenson, Lewis and Smith (2002) classified these barriers as: limited equipment, inadequate skills, minimal support, time constraints, and lack of interest or knowledge by teachers. In a research conducted by British Educational Communications and Technology Agency (BECTA) in 2004, vital barriers were identified. These were: lack of confidence, accessibility, lack of time, fear of change, poor appreciation of the benefits of ICT and age. Ertmer (2009) agreed with Schoepp (2005), that if teachers are aware of and understand such barriers, they can initiate strategies to overcome them.

In Ghana, ICT is a subject of study in the curriculum but does not link to its use in the various specific subject areas especially Ghanaian Language. According to Iddrisu (2009), although valuable lessons may be learned from

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best practices around the world, there is no one formula for determining the optimal level of ICT integration in the educational system. Significant challenges that policy makers and planners, educators, education administrators, and other stakeholders need to consider include: Educational policy and planning, infrastructure, language and content, capacity building and financing.

There has been several different classification of the barriers in integrating ICT into the learning process. Several studies have divided the barriers into two categories. These are extrinsic and intrinsic. However, what was meant by extrinsic and intrinsic, differed among studies (Mikre, 2011; Yousef & Dahmani, 2008). Ertmer (2009) referred to extrinsic barriers as first order barriers citing as examples: lack of time, support, resources and training. She itemized intrinsic barriers as second order barriers, citing as examples: attitudes, beliefs, practices and resistance to change. Balanskat, Blamire and Kefala (2006), classified barriers as 'micro level' (teacher attitude) and 'meso level' (institutional). He added a third category called 'macro level, which account for the wider educational system. Pelgrum (2001) also identified material barriers as a lack of real or physical equipment and non-material barriers as intangible entities such as lack of knowledge, confidence or time.

Conceptual Review

This study was based on constructivist theory, which view learning as an active process of knowledge construction by learners. CAI is linked to constructivist theory based on the fact that students learn through the use of CAI and are at the center of the leering process. They are actively involved in constructing knowledge rather than being passive recipients of instruction. This

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study perceives that for learning outcome to be improved, the instructional method used in teaching the students have to be interactive. In teaching especially, Ghanaian Language, the instructional method plays a center role in determining the learning outcome of students. According to Abdous & Yoshimura, 2010, the content delivered in a computer based instruction is more effective than the conventional instructional method. In the research, the independent variable, types of instructional technologies available for teaching and learning, the competence level of teachers and students in using CAI, access to the available instructional technologies and challenges/ barriers in the use of CAI in Senior High Schools affect the use of CAI which intend affects the learning outcome which is the dependent variable. The interaction between the dependent variable and the independent variable that were used for the research are illustrated in Figure 1:

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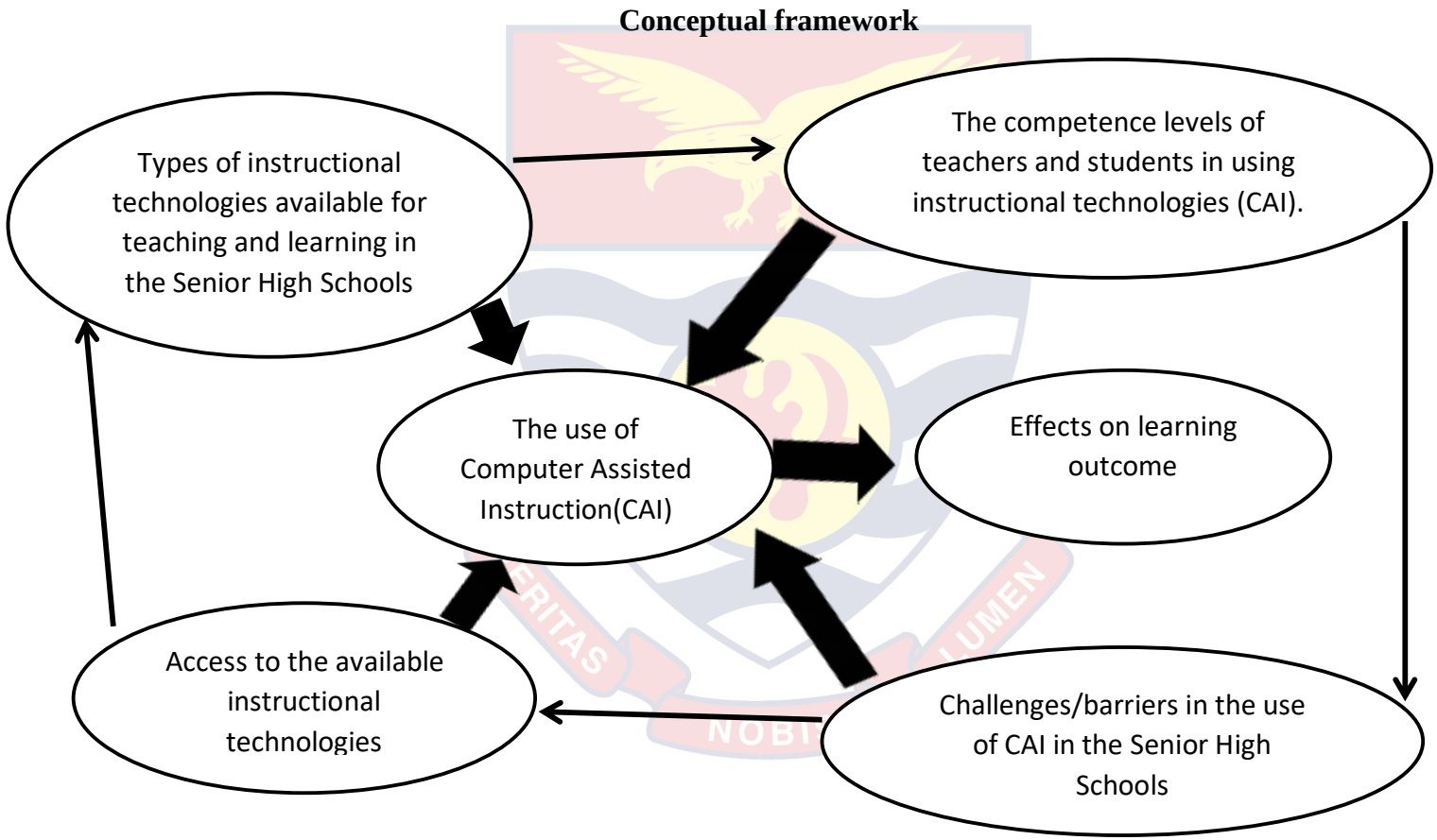

Figure 1. Conceptual framework on the use of CAI in learning

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Empirical Review

Computer Assisted instruction refers to a specially designed application for teaching a variety of subject area to learners. According to Freedman, (1999) CAI allows students to receive feedback from the computer which controls the flow of the subject matter. Many researches have showed that the use of CAI to supplement the traditional instruction is better than the use of the instructional program itself. Goode (1988) also found that students who used CAI scored Significantly higher marks in Mathematics concepts and computing than a control group of students who used the traditional approach. Again Harrison (1993) discovered that students who received computer instruction showed greater increase in their achievement scores in multiplication and subtraction than students who received Mathematics instruction through the traditional approach.

The study of effectiveness of the lecture approach and CAI on College students learning and how to use the program by Tsai and Pohl (1977), revealed a significant difference in students' scores when their achievement was measured by quizzes or final examination. Linn (1986) conducted an experiment, which he used computer as Lab partner for a semester. The students used the computer to collect and display data. They saved and printed out their reports. It was established that the students who were instructed in the micro-based lab performed better than the students who took the standard test on scientific knowledge. To add to that the students who were taught using the computer demonstrate a very positive attitude toward the experimentation.

Computer stimulation enhances higher students' achievement. Moore, Smith and Auner (1980), Summerville (1984) and Fortner, Schar and Mayer

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(1986) established higher student's achievement with computer simulations when students had to interpret the results of the experiments to make decision. According to Thomas and Hooper (1991), the results of the science simulation studies showed no significant difference between students who use the traditional approach and those that use the computer.

Computer Assisted Instruction tutorials supplement aids students' performance. Tsai and Pohl (1977) experiment with CAI for two different groups of students studying introductory statistics received instruction for a two-week segment of the following methods: 1. Lecture/ discussion (regular classroom); 2. Programmed instruction (students were told to read material in a programmed textbook): 3. CAI tutorials; 4. Programmed instruction with periodic discussion with faculty and 5. CAI tutorials with periodic discussion with faculty. The results of the achievement test at the end of the initial two-week period clearly favoured the CAI tutorials supplemented by the faculty session. Furthermore, Aberson, Berger, Healy and Romero (2002) used CAI for students enrolled in introductory and intermediate statistics courses. The students enormously rated the tutorial as clear, useful and easy to use. In the final examination, the students who used the tutorial performed better than those students who did not.

With the use of drill-and-practice, tutorial or simulation activities in CAI to supplement traditional approach of instruction learning becomes more meaningful to the learner. Andeson-Cook, Dorai-Raj and Sundar (2003) found that on the use of applets in statistics courses, students in introductory statistics classes react very positively to the applets, both in terms of enjoying being able to experiment with them as well as being better able to discuss the concept

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relating to statistical power. Cotton (2001) conducted a research and used drill-and-practice, tutorial or simulation activities in CAI to supplement traditional approach of instruction. During the study, students often work independently or in pairs at computer around to series of interrelated activities and instruction to address a variety of learning styles. Funkhouser (1993) and Rochowicz (1996) found that students of Mathematics courses were more motivated, self-confident, and joyful and the subject became more meaningful with CAI

The study of the effectiveness of CAI where the effectiveness was measured through heightened affective response, or better attitudes, reduced learning time, and higher course completion rate. It was found out that CAI was more effective than traditional classroom instruction. Szabo's (2001)

Summary of Literature Review

From the review of the literature, it is of much importance to bear in mind that the use of ICT in general and CAI in particular has positive impact on academic performance. However, the integration of CAI into the teaching and learning process with particular reference to Senior High School education has some set-backs. These set-back ranges from inadequate computers, lack of maintenance, technical assistance, and lack of computer skills and/or knowledge among teachers. Thus, limited equipment, minimal support, time constraints and lack of interest by teachers.

It can be concluded from the above that when most of the barriers to the use of ICTs in education is removed, most of the problems that is associated with the integration of ICT in the teaching and learning process will be eliminated.

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CHAPTER THREE

METHODOLOGY

Introduction

This chapter is concerned with the description of the appropriate measures, various procedures and techniques that were used in collecting the data for the study. This includes the population and setting of the study, sample and sampling procedure, research instrument, research design, data collection, and data analysis procedures.

Research Design

The most critical challenge that confronts any researcher in the attempt to study and give in-depth interpretation of the problem is the methodology to employ. According to Kombo and Tromp (2006), a research design is the organisation of conditions for gathering and analysis of data in a way that aims at reducing expenditure of efforts, time and money. The researcher decides on what research design, the type of data to collect and analytical tools or procedures to employ (Borg & Gall, 1993). The research design used for a study usually depends on what the researcher is trying to study (Orodho, 2005).

Descriptive survey was employed in this research. Descriptive survey designs are used in preliminary and exploratory studies to gather information, summarize, present and interpret for purpose of clarification (Orodho, 2005). According to Salaria (2012), descriptive survey research is dedicated to the collecting of information about prevailing situations for the purpose of explanation and clarification.

This type of research method includes proper analyses, explanation, assessments, identification of trends and relationships.

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Descriptive survey was used because readily obtainable statistics from the issues in their natural settings, in line with attitudes or view point are available.

Population

Population entails all entities or items, being human or objects that the researcher has interest to study to form generalization. The population as used in this research was the target group on which the experiment was conducted and finding generalized. Teachers and students of six (6) Senior High School in the Akuapem North municipality in the Eastern Region form the population for this research. In all, there were twenty-nine (29) teachers and two thousand five hundred and fifty-five (2,555) students totaling two thousand five hundred and eighty-four (2,584) respondents in the categories of the schools: Benkum Senior High School, Methodist Girls Senior High School, Nifa Senior High School, Okwapeman Senior High School and Aburi Senior High School. Table 1 shows the distribution of the population in the schools studied.

Table 1. Distribution of the Population

School	Teachers	Students
Benkum Senior High School	5	625
Nifa Senior High School	4	230
Okwapeman Senior High School	6	450
Methodist Girls Senior High School	5	485
Aburi Senior High School	4	250
Aburi Technical - Senior High School	5	520
Total	29	2,555

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Sampling Procedure

The sampling techniques adopted were cluster random sampling, random sampling and purposive sampling. Cluster random sampling is the process of selecting certain group and use as the sample for the study. Also purposive sampling is where the sample is taken from a group of individuals who are specially qualified and will provide the needed information for the study based on the researcher's judgment.

A particular sampling technique is adopted at a particular time for a particular reason. Purposive sampling was used to select the second circle schools in the Akuapem North Municipality. Also purposive sampling was used to select teachers of all year groups of each school. This is due to the fact that the teachers of the year groups have taught the students long enough (the three years' duration for each student to complete a course) to give the needed information. Random sampling technique was employed in the selection of the students in the six Senior High Schools in the municipality. This is to ensure that everybody within a category stands equal chance of being selected.

The sample size consists of twenty-nine (29) teachers and one hundred (100) students, totaling one hundred and twenty-nine (129) respondents. The one hundred sample size of students was chosen because I could not use all the 2,555 student population for the research. I employed the formula that was developed by Daniel (1999).

The said formula is as follows:

$n = N*X / (X + N - 1)$,

Where,

$X = Z\alpha/22 *p*(1-p) / MOE2$,

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and Zα/2 is the critical value of the Normal distribution at α/2 (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size. Note that a Finite Population Correction has been applied to the sample size formula. The following details was use in the calculation:

Margin of error 5%

Confidence level 80%

Population Size 2,555

Sample proportion 20%

The scale down was due to the fact that I cannot use all the students' population of two thousand five hundred and fifty-five in the research.

I used the formula that was developed by Miller and Brewer (2003) for calculating the sample size for each school. This is to allow for proportional distribution of the population to each school. The formula is produced below:

$$n_h = \frac{N_h}{N} \times n$$

From the formula:

n_h = sample size of stratum h (Thus, the sampled size for each school)

N = total size of population

n = total sample size

N_h = population size of stratum h (population size of each school

The table below shows the sample size distribution of teachers and students in each school.

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Table 2: Distribution of Sampled School

School	Teachers	Students
Benkum Senior High School	5(17.2%)	24(24%)
Aburi Girls Senior High School	4(13.8%)	10(10%)
Okwapeman Senior High School	6(20.7%)	17(17%)
Methodist Girls Senior High School	5(17.2%)	19(19%)
Nifa Senior High School	4(13.8%)	10(10%)
Aburi Technical- Senior High School	5(17.2%)	20(20%)
Total	**29(100%)**	**100(100%)**

Research Instrument

The main research instrument used for this study was Questionnaire. Questionnaire was chosen by the researcher because it is very effective and efficient for data collection and also does not allow the researcher to influence the respondent. According to Kerlinger (1973), it is very effective for seeing realistic information about practices and conditions for enquiring into opinions and attitudes of the subjects.

The researcher also considered the geographical distribution of the respondents and the time within which the research need to be completed. Nwana (1981) pointed out that the questionnaire is suitable, if the population is widely distributed geographically and not enough time and personnel and other resources are available for data collection. Sidhu (1984) also upheld that the questionnaire is helpful in the field of attitudes, opinions, and judgment.

There are two different set of questionnaires. One for teachers and other for students. (Appendix A and B). The development of the questionnaire was

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influenced by the review of relevant and related literature and issues raised in the background of the study. As a result of this, a self- constructed questionnaire was developed comprising of seven (7) sections (A – G) each. Both questionnaires consist of close – ended questions.

With regards to the questionnaire for the teacher, each section collected data on specific issues. Section A elicited personal and professional information or data from the respondent while Section B collected data on respondent's training and qualification in the use of ICT. Section C and D found out the availability of CAI tools (ICT facilities and equipment) and access to CAI tools (facilities and equipment) in the school respectively. Section E on the other hand elicited data on types of software application used in the teaching learning process whereas Section F found out perception and benefits of the use of CAI in the learning process

The last section (G) sought to collect data on the Barriers/ Challenges in the use of CAI in lesson delivery. With the exception of Section A, the responses to items were designed on a five-point likert-type scale ranging from Strongly Agree (SA), Agree (A), indecisive (ID), Disagree (D) and Strongly Disagree (SD) developed by McLeod (2008). The researcher choosed a five point likert-scale because it allowed the respondents to respond to a series of statements about the topic, in terms of the extent to which they agree or disagree with them, and so tapping into the cognitive and affective components of attitudes. Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions (Bowling, 1997; Burns, & Grove, 1997). These ordinal scales measure levels of agreement/disagreement.

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However, like all surveys, the validity of Likert Scale attitude measurement can be compromised due the social desirability. This means that individuals may like to put themselves in a positive light. For example, if a likert scale was measuring discrimination, who would admit to being racist? Offering anonymity on self-administered questionnaires should further reduce social pressure, and thus may likewise reduce social desirability bias

Paulhus (1984) found that more desirable personality characteristics were reported when people were asked to write their names, addresses and telephone numbers on their questionnaire than when they were told not to put identifying information on the questionnaire.

With regards to the questionnaire for the students, again, each section collected data on the specific issues demanded in the questionnaire for the teachers'. For the sake of analysis, strongly agree and agree was considered as agree and strongly disagree and agree was considered as disagree

Pilot-Testing of Instrument

According to Leedy (1989), all questionnaires should be pre-tested on a small population because it helps to unveil poorly worded questions, ambiguities and whether there will be an understanding problem with any of the items by the respondents.

A pilot-test of the instrument was conducted in Mt. Sanai Senior High School in the Akuapem North Municipality in the Eastern Region. The researcher choose this school because both teachers and students in this school had similar characteristics and offers the same course with the population of the study. Two sets of questionnaire were given to 4 teachers and 20 students. Simple random sampling was used to select the sample population. The

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feedback helped in rewording some of the items which were found to be ambiguous. It also assisted in reducing the number of items on the two sets of questionnaires.

The return rate was 100% for both teachers and students. The final was tested for reliability using test-retest method of two weeks' interval. The average Cronbach's alpha reliability coefficient obtained for the seven sections of the instruments were 0.74 for teachers and 0.73 for the students. According to Fraenkel and Wallen (2000), a good instrument was one whose reliability coefficient index was closer to one. These meant that the reliability of the instruments was high.

Data Collection Procedure

The researcher administered the questionnaires in the selected schools and on the selected students and teachers personally with the assistance of some of the teachers around after the requisition of authorisation from the school head. There was so much order and cooperation from respondents due to the help given by the teachers in the schools.

In each school, respondents were given briefing. Briefing was given to each teacher when and as they are available since not all the teachers were not available at the same time. With regards to the students, all of them (school base) were gathered into the hall and they were briefed on how to respond to the questionnaire. Both the teachers and the students were assured of the confidentiality of information provided. They were also informed of their right to take part or otherwise.

Averagely, the researcher spent about a week in each school to administer the questionnaires. The researcher gave the questionnaires out and

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gave respondents ample time to respond. This is to ensure that the respondents do not feel pressured in responding to the questionnaire. The total number of questionnaires that were given were retrieved.

Data Analysis

After the collection of the questionnaires from the respondents, they were carefully checked to ensure that all had been filled appropriately. Each questionnaire was coded appropriately and analysed using the Statistical Package for Service Solution (SPSS) v. 21.0. This software package was used because it is appropriate and has the ability to present the data in frequencies, percentages and tables. It also has the ability to analyse multi-response questions, cross section and time series analysis. In addition, it can be used alongside Microsoft Excel and Word.

For the purpose of this research, data was analysed with descriptive statistical tools. The descriptive statistical tools used were tables, percentages, charts, graphs and frequency counts. This is to discern meaning from the data more clearly.

Conclusion

This chapter described the methodology used to collect data for this study. The researcher began by presenting the research design, a description of the sample and the research instruments. This was followed by an explanation of the data collection procedures and data analysis. The Chapter ended with a conclusion.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

In this chapter, the data that was collected, is presented. The data is also analysed and discussed. In all, there are 129 respondents to the questionnaires (100 students and 29 teachers). This chapter has seven (7) sections. The first section deals with the personal and academic/professional data.. This is followed by the first research question: the respondents training and qualification in ICT. Then the availability of CAI tools (facilities and equipment) which examined the second research question. Access to CAI tools was next and it answered the third research question. This is followed by the type of software applications used in the teaching and learning process. This again answered research question five. The last two sections deal with effects and benefits of the use of CAI in lessons as well as the Barriers and challenges in the use of CAI in lessons. This answers research question six.

Demographic Characteristics of Respondents

The Demographic Characteristics of Respondents of this section has nine (9) questions for respondents (both teachers and students) to respond to. This will help to know whether the respondents could be relied on. All the 129 questionnaires were repossessed from respondents. The following are the presentation of the responses:

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Table 3. School distribution of respondents (Teachers and Students)

School	Teachers	Students
Benkum Senior High School	5(17.2%)	24(24%)
Aburi Girls Senior High School	4(13.8%)	10(10%)
Okwapeman Senior High School	6(20.7%)	17(17%)
Methodist Girls Senior High School	5(17.2%)	19(19%)
Nifa Senior High School	4(13.8%)	10(10%)
Aburi Technical- Senior High School	5(17.2%)	20(20%)
Total	**29(100%)**	**100(100%)**

Table 3 shows that 5(17.2%) teachers were from Benkum Senior High School, 4(13.8%) were from Nifa Senior High School, 5(17.5%) were from Methodist Girls Senior High School, 4(13.8%) were from Aburi Girls Senior High School, 6(20.7%) were from Okwapeman Senior High School, and 5(17.5%) were from Aburi Technical - Senior High School. The table also shows that 24(24.0%) students were from Benkum Senior High School, 10(10.0%) were from Nifa Senior High School, 19(19.0%) were from Methodist Girls Senior High School, 10(10.0%) were from Aburi Girls Senior High School, 17(17.0%) were from Okwapeman Senior High School, and 20(20.0%) were from Aburi Technical - Senior High School.

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Table 4. Gender distribution of respondents

Respondents	Male	Females
Teachers	17(58.6%)	12(41.4%)
Students	18(18.0%)	82(82.0%)
Total	35(27.13%)	94(72.87%)

From Table 4, 17(58.6%) of teachers were male and 12(41.4%) were female. Again the table shows that 18(18.0%) of students were males and 82(82.0%) were females. To sum up, the total male respondents (teachers and students) were 35(27.13%) and the total female respondents (teachers and students) were 94(72.87%). this shows that female respondents were more than the male respondents.

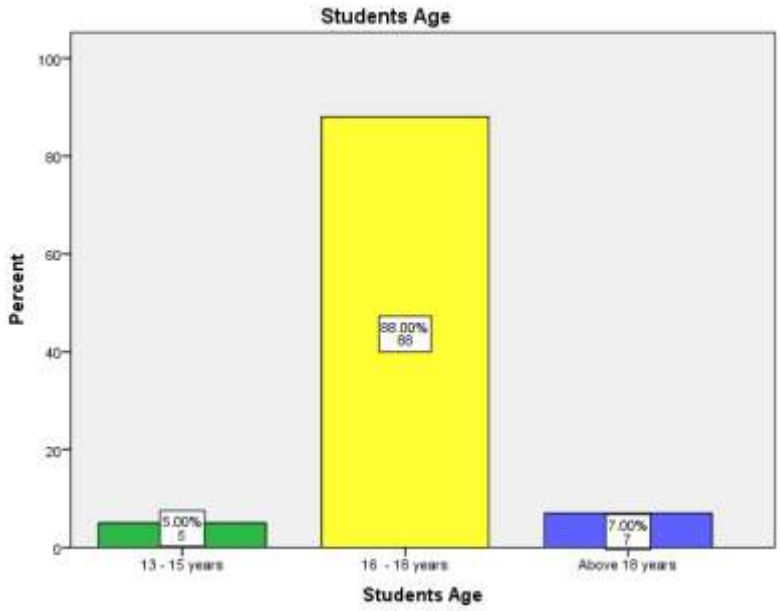

Figure 2. Age distribution of Students.

Figure 1 shows that out of the total number of 100 students who responded to the questionnaire, none (0%) was below the age of 12 years, 5(5.0%) of them were between the age of 13 – 15 years, 88(88.0%) of them

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were between the age of 16 – 18 years and 7(7.0%) of them were above 18 years.

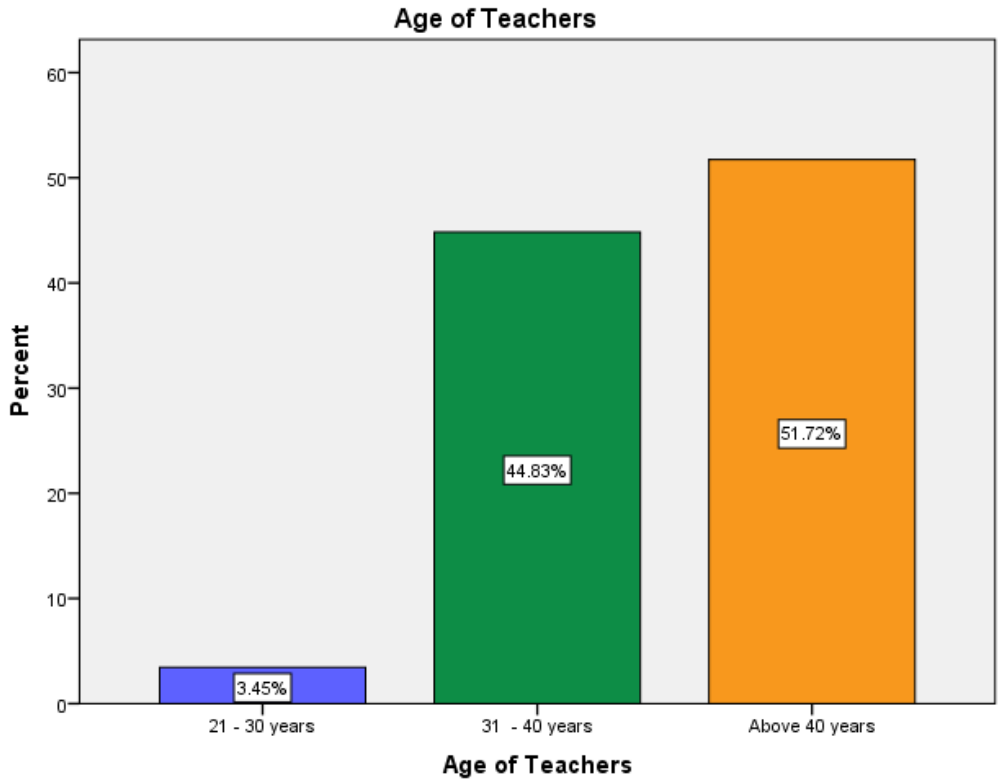

Figure 3. Age distribution of teachers

Figure 3 shows that out of the total number of 29 teachers who responded to the questionnaire, none (0%) was below the age of 20 years, 1(3.45%) of them was between the age of 21 – 30 years,13(44.83%) of them were between the age of 31 – 40 years and 15(51.72%) of them were above 40 years.

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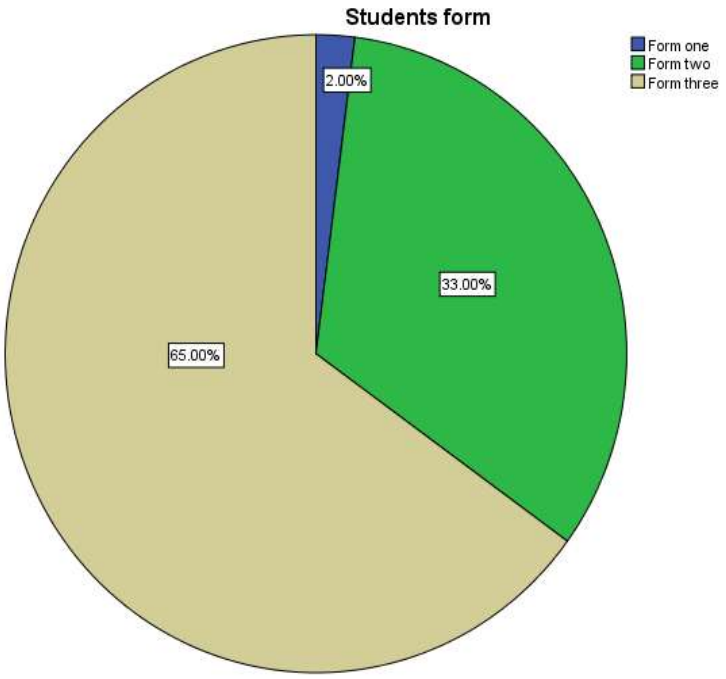

Figure 4. Form distribution of Students.

Figure 4 shows that 2(2.0%) students were in form 1, 33(33.0%) students were in form 2 and 55(55.0%) students were in form 3.

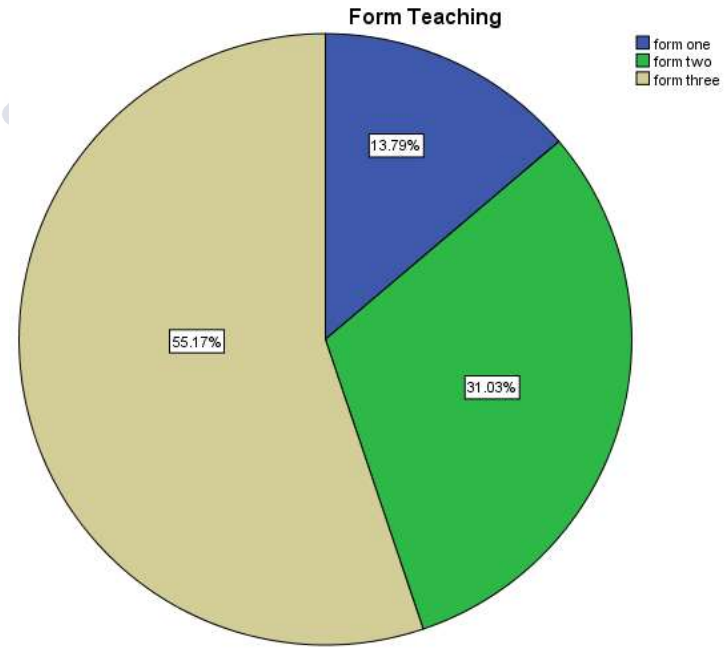

Figure 5. Form distribution of Teachers.

Also, Figure 5 shows that 4(13.79%) teachers teach in form 1, 9(31.03%) teachers teach form 2 and 15(55.17%) teachers teach form 3

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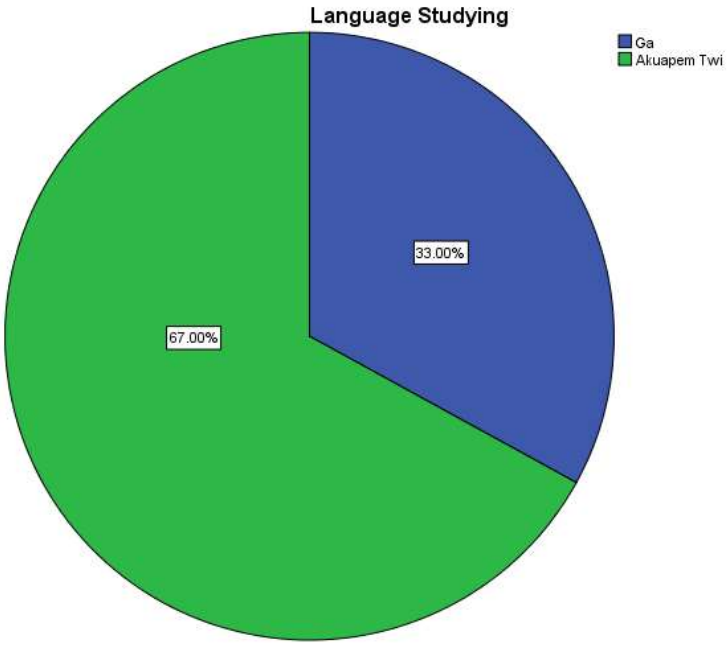

Figure 6. Subject distribution of Students

The Figure 6 shows that 33(33.0%) of students studies Ga Language while 67(67.0%) of students studies Twi Language.

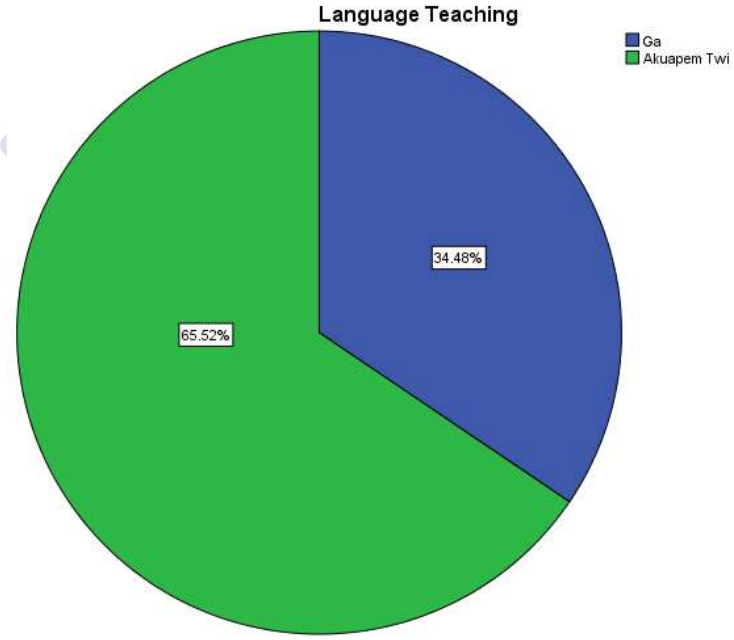

Figure 7. Subject distribution of Teachers

Also, Figure 7 shows that 10(34.5%) teachers teach Ga Language and 19(65.5%) teachers teach Twi Language.

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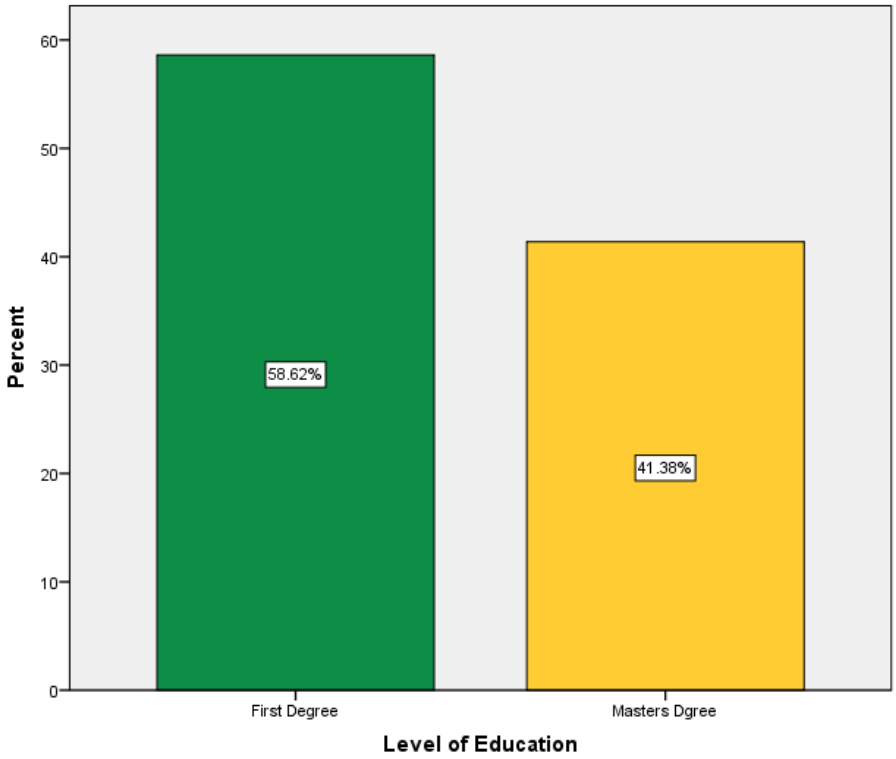

Figure 8. Educational Qualification of teachers

From Figure 8, 17(58.62%) had First Degree as their highest qualification, 12(41.38%) had Master Degree as their highest qualification but none (0%) had PHD or above as their highest qualification.

Analyses of the Main Research Questions

Research Question 1. What is the extent to which respondents can use instructional technologies (CAI)?

In an attempt to answer research question 1, the researcher posed a number of questions to the respondents in section B of the questionnaire. Their responses are presented in Figures and tables below.

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Can you use the computer?

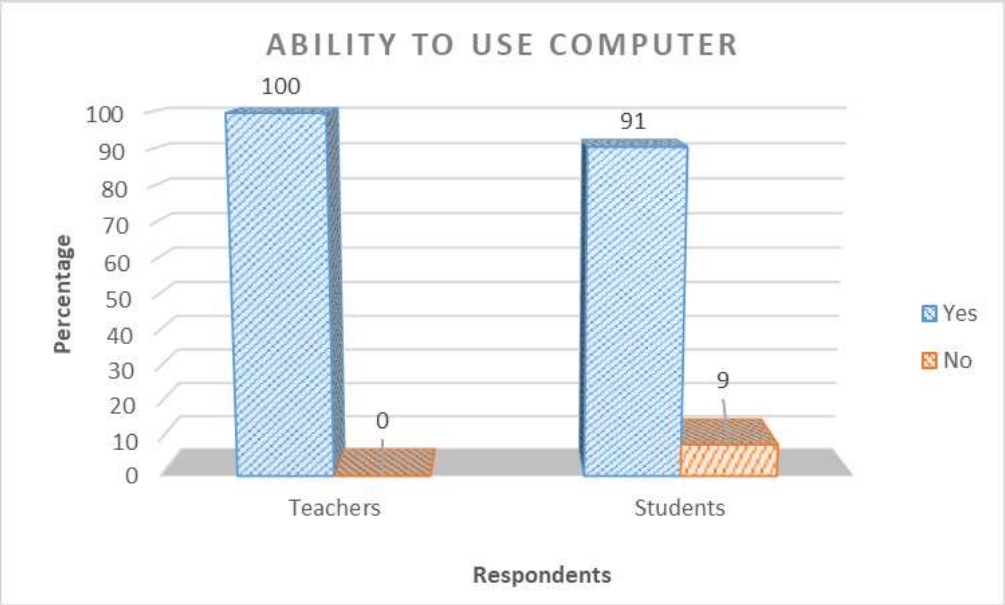

Figure 9. Distribution of respondents' ability to use the computer

Figure 9 shows that 91(91.0%) of students can use the computer and 9(9.0%) of them cannot use the computer. Also the figure shows that 29(100%) of teachers' can use the computer and none (0%) of them cannot use the computer. In all, 120(93.02%) of respondents can use the computer and 9(6.98%) of them cannot use the computer. The statistics shows that almost all the respondents can use the computers. The finding supports Owusu-Ansah's (2015) study that revealed that the use of user-friendly laptops and qualified instructors has significantly improved students' knowledge in ICT.

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Have you received any ICT training before joining the teaching profession?

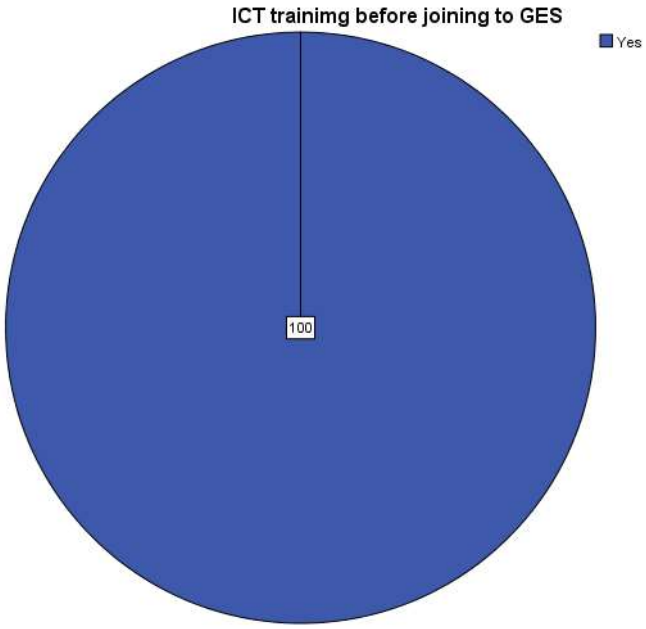

Figure 10. Distribution of ICT training received by the teacher before joining the teaching profession.

Figure 10 shows 29(100%) of teacher have received ICT training before joining the teaching profession while none (0%) of them had not

Have you received any training before coming to Senior High School?

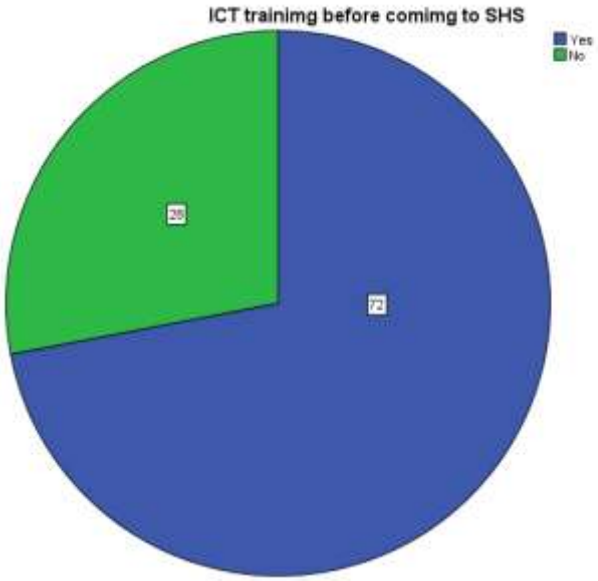

Figure 11. Distribution of ICT training received by the students before coming to Senior High School.

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Figure 11 shows 72(72.00%) of students have received ICT training after coming to Senior High School while 28(28.00%) of them have not. From the statistics, all the teachers have received ICT training before joining the teaching profession at the SHS level and almost all the Students have received ICT training before coming to SHS. This implies that almost all the respondents have received training in the use of computer.

Have you received any training after coming to Senior High School?

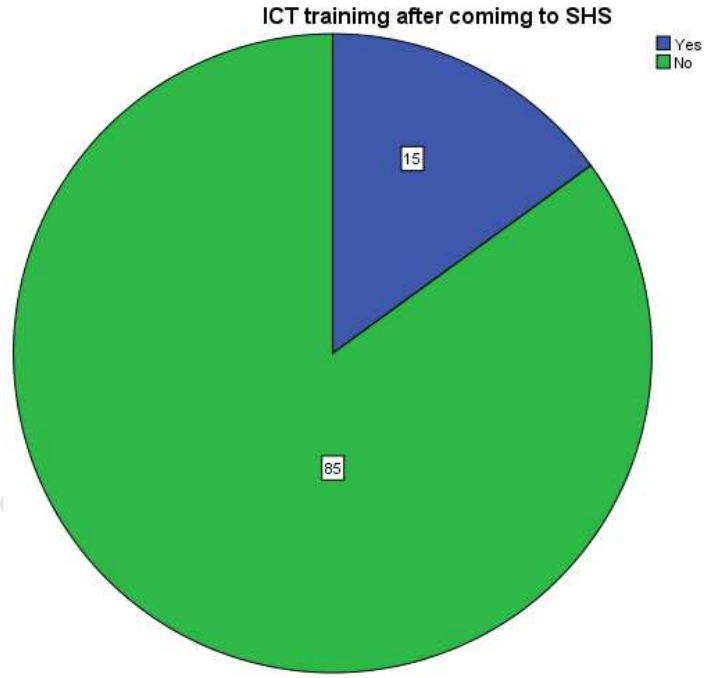

Figure 12. ICT training received by the students after coming to Senior High School.

The Figure 12 shows 15(15.00%) of students have received ICT training after coming to Senior High School while 85(85.00%) of them have not.

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Have you received any training after joining the teaching profession?

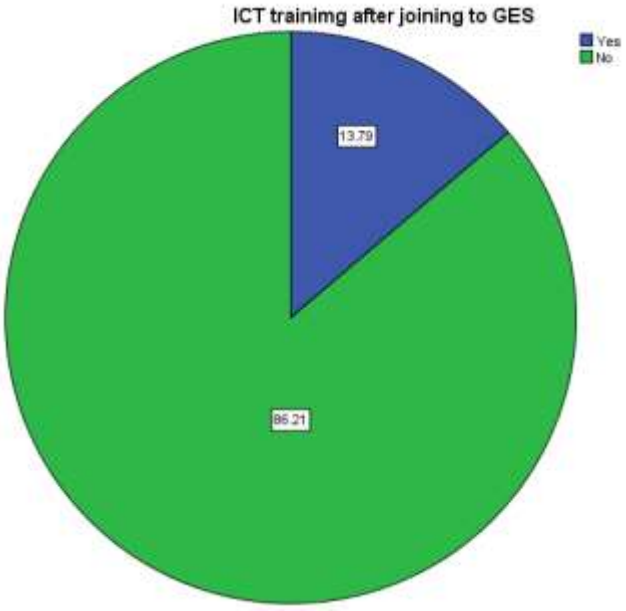

Figure 13. ICT training received by the teachers after joining the teaching profession.

The Figure 13 shows 4(13.8%) of teachers have received ICT training after joining the teaching profession while 25(86.2%) of them have not. Also the statistics shows that most of the respondents have not received any training in ICT after joining SHS.

Do you have any professional training in ICT?

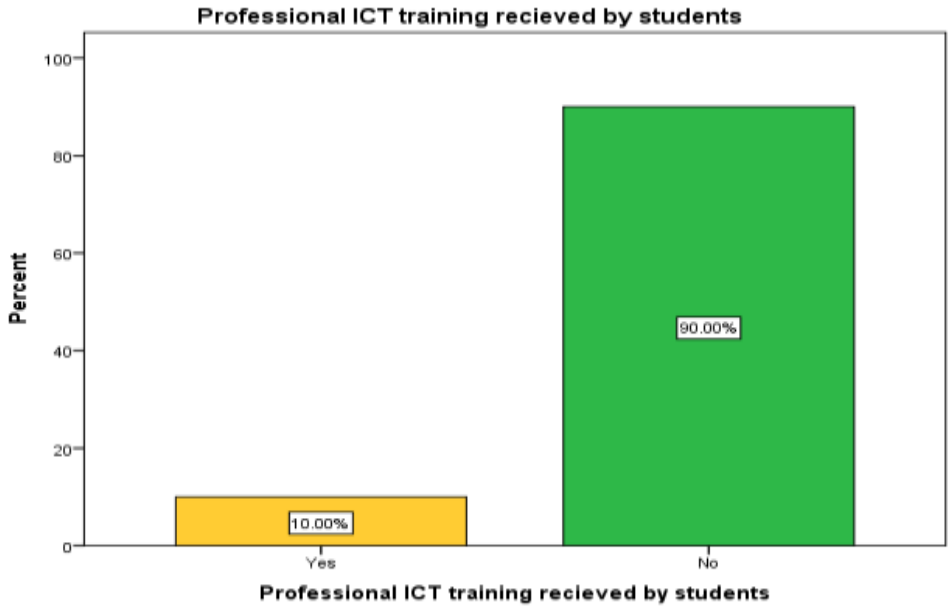

Figure 14: Distribution of students' professional training in ICT.

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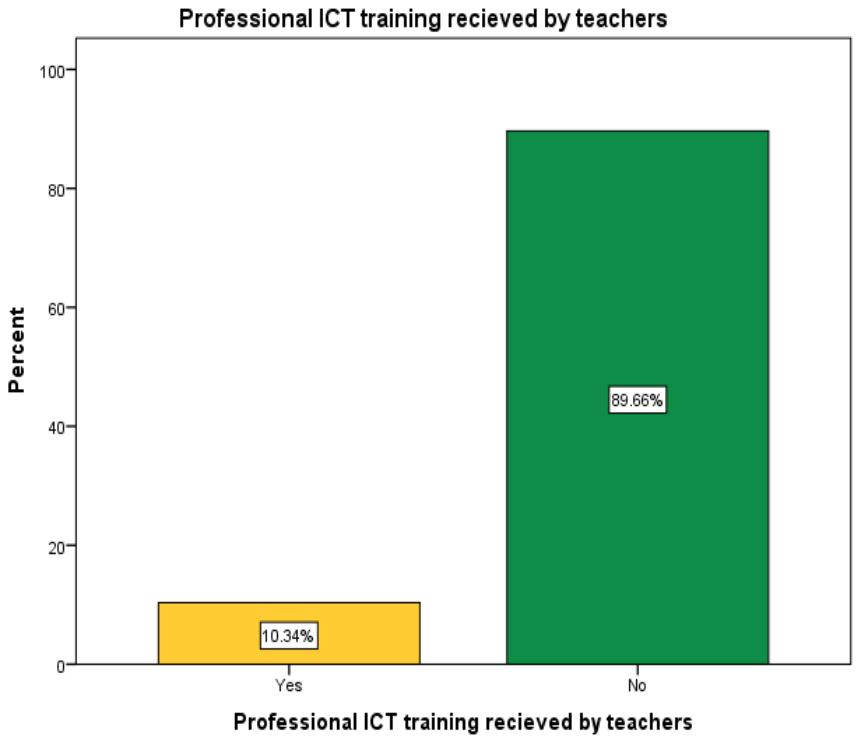

Figure 15 Distribution of teachers' professional training in ICT.

The Figure 14 shows that 10(10.0%) of students had attained profession training in ICT and 90(90.0%) of them had not attained profession training in ICT. Also the figure shows that 3(10.3%) of teacher had attained profession training in ICT and 26(89.7%) of them had not attained profession training in ICT. In all, 13(10.08%) of respondents had attained profession training in ICT and 116(89.92%) of them had not. Again the statistics shows that almost all the respondents have not received any professional training in ICT.

From the statistics, it is conclusive that even though most of the respondents have not received any professional training in ICT, almost all of them can use the computer. Pelgrum (2001) revealed that the success of educational modernization depends largely on the skills and knowledge of teachers.

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Research Question 2. What are the instructional technologies available in the Senior High Schools in the Akwapem North Municipality?

In order to find an answer to this question, respondents were asked to state the extent to which they agree or disagree to the statements given. The following is the details of their responds.

Availability of CAI tools (facilities and equipment) in the school

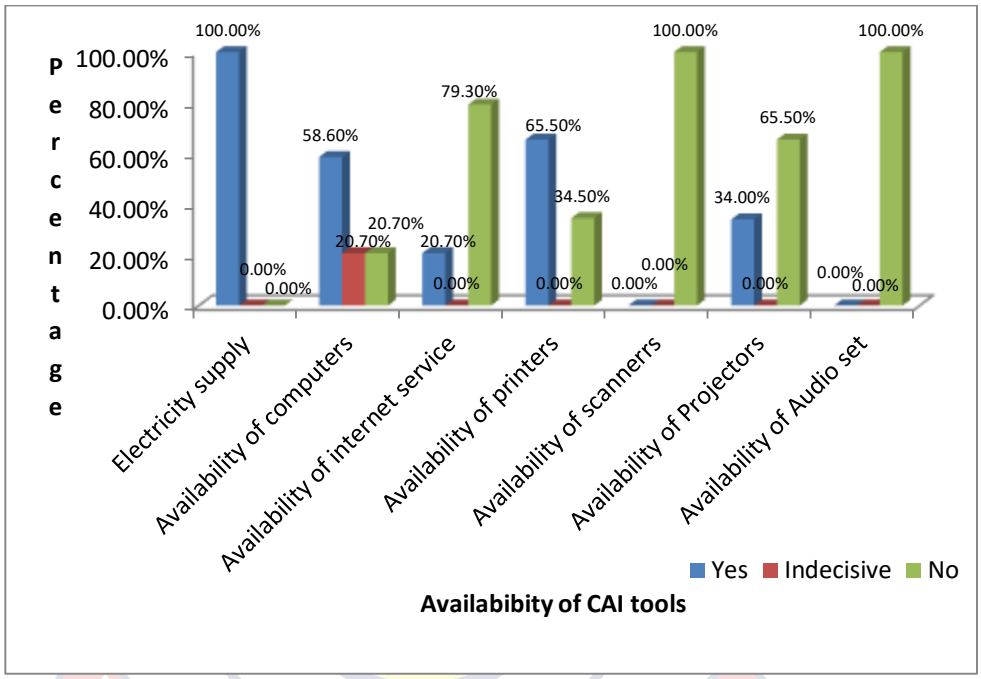

Figure 16 Students responds on the availability of CAI tools (facilities and equipment) in the school.

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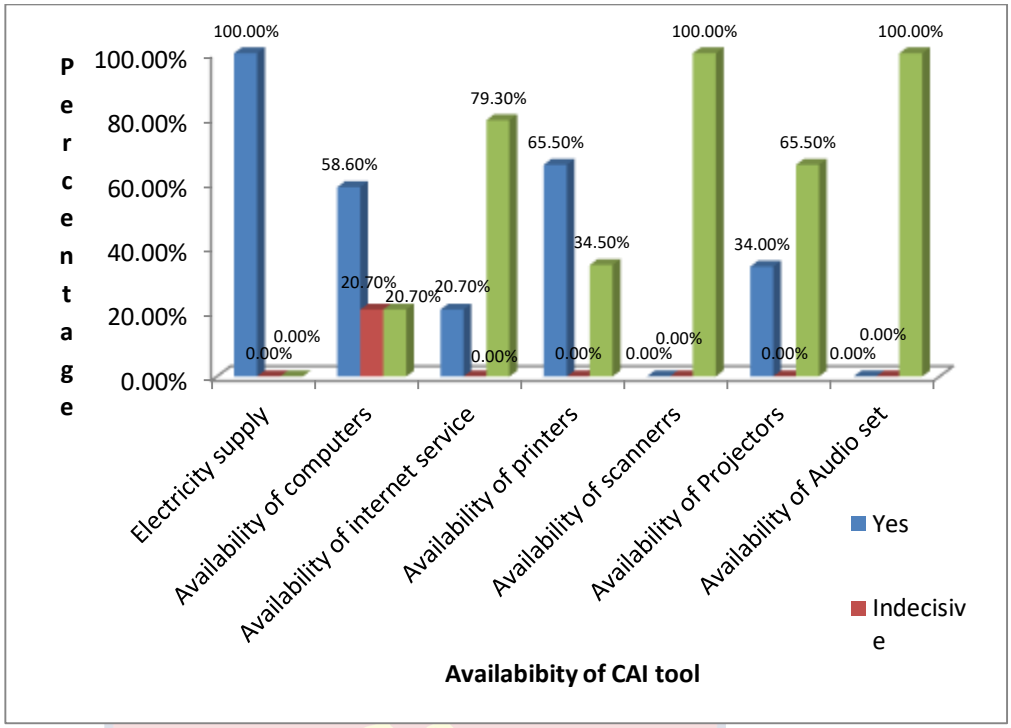

Figure17: Teachers responds on the availability of CAI tools (facilities and equipment) in the school

Figure 16 reveal that 89(89.0%) of students attest to the fact that there is electricity supply in the school, 2(2.0%) where indecisive while 9(9.0%) of them debunked that attestation. Also, 29(100%) of teachers agreed to the fact that there is electricity supply in the school, none (0%) was indecisive and 0(0%) of them disagreed. In all, 118(91.47%) of the respondents agreed that there is electricity supply in the school, 2(1.55%) where indecisive while 9(6.98%) of them disagreed.

Also, 22(22.0%) of students agreed to the fact that there is availability of computers in their school, 7(7.0%) where indecisive while 71(71.0%) of them disagreed. Seventeen (58.6%) teachers agreed that there is availability of computers in their school, 6(20.7%) where indecisive while 6(20.7%) of them disagreed. In all 39(30.23%) of respondents (both students and teachers) agreed

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that there is availability of computers in their school, 13(10.07%) where indecisive while 77(59.69%) of them disagreed.

Again, 29(29.0%) of students agreed to the fact that there is internet service in their school 9(9.0%) where indecisive while 62(62.0%) of them disagreed. Six (20.7%) teachers agreed that there is internet service in their school, none (0%) was indecisive while 23(79.3%) of them disagreed. In all 35(27.13%) of respondents (both students and teachers) agreed to the fact that there is internet service in their school 9(6.98%) where indecisive while 85(65.89%) of them disagreed.

Furthermore, 66(66.0%) students agreed to the fact that there is availability of printers in their school, 9(9.0%) where indecisive while 25(25.0%) of them disagreed. Nineteen (65.5%) of the teachers agreed to the fact that there is availability of printers in their school, none (0%) was indecisive while 10(34.5%) of them disagreed. In all 85(65.89%) of respondents (both students and teachers) agreed to the fact that there is availability of printers in their school, 9(6.98%) where indecisive while 35(27.13%) of them disagreed.

In addition, 23(23.0%) of the students agreed to the fact that there is availability of scanners in their school, 16(16.0%) where indecisive while 61(61.0%) of them disagreed. None (0%) of the teachers agreed to the fact that there is availability of scanners in their school, none (0%) was indecisive while 29(100%) of them disagreed. In all, 23(17.83%) of respondents (both students and teachers) agreed to the fact that there is availability of scanners in their school, 16(12.40%) where indecisive while 90(69.77%) of them disagreed. Thirty one (31.0%) of the students agreed to the fact that there is availability of projectors in their school, 8(8.0%) where indecisive while 61(61.0%) of them

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disagreed. Ten (34.5.0%) of the teachers agreed to the fact that there is availability of projectors in their school, none (0%) was indecisive while 19(65.5%) of them disagreed. In all, 41(31.78%) of respondents (both students and teachers) agreed to the fact that there is availability of projectors in their school, 8(6.0%) where indecisive while 80(62.02%) of them disagreed.

Also, 19(19.0%) of the students agreed to the fact that there is availability of audio system (headset) in their school, 19(19.0%) where indecisive while 62(62.0%) of them disagreed. None (0%) of the teachers agreed to the fact that there is availability of audio system (headset) in their school, none (0%) was indecisive while 29(100%) of them disagreed. In all, 19(14.73%) of respondents (both students and teachers) agreed to the fact that there is availability of audio system (headset) in their school, 19(14.73%) where indecisive while 91(70.54%) of them disagreed.

From the statistics, almost all the schools have electricity supply. There is also some level of availability of all the ICT tools in the schools. Computer is the most available ICT tool whist Audio set is the less available tool in the schools. This confirms Chiafie (2011)'s view that different ICT devices are used in diverse ways by several teachers depending on their lessons, skills and accessibility. According to Chiafie, Laptop and computers are used for demonstration lessons when classes are divided into groups and also mobile phones are used by both teachers and students to connect to the internet for information.

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Types of software application use in the teaching learning process

Table 5: Students response on the types of software application use in the teaching learning process.

CAI Tools	Yes	Indecisive	No
Frequently use word processor (MS Word) application in lesson	18 (18.0%)	5 (5.0%)	77 (77.0%)
Frequently use spreadsheet (MS Excel) application in lesson	17 (17.0%)	0 (0%)	83 (83.0%)
Frequently use database management (MS Access) application in lesson	11 (11.0%)	0 (0%)	89 (89.0%)
Frequently use presentation software (MS PowerPoint) application in lesson	8 8.0(%)	0 (0%)	92 (92.0%)
Frequently use desktop publisher (MS Publisher) application in lesson	10 (10.0%)	0 (0%)	90 (90.0%)
Frequently use computer telecommunication (E-Mail) application in lesson	17 (17.0%)	5 (5.0%)	78 (78.0%)
Frequently use browser (internet) Applications in lesson	14 (14.0%)	2 (2.0%)	84 (84.0%)

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Table 6: Teachers responds on the types of software application use in the teaching learning process.

CAI Tools	Yes	Indecisive	No
Frequently use word processor (MS Word) application in my lesson	9 (31.0%)	0 (0%)	20 (69.0%)
Frequently use spreadsheet (MS Excel) application in my lesson	0 (0%)	0 (0%)	29 (100%)
Frequently use database management (MS Access) application in my lesson	0 (0%)	0 (0%)	29 (100%)
Frequently use presentation software (MS PowerPoint) application in my lesson	16 (55.2%)	0 (0%)	13 (44.8%)
Frequently use desktop publisher (MS Publisher) application in my lesson	0 (0%)	0 (0%)	29 (100%)
Frequently use computer telecommunication (E-Mail) application in my lesson	0 (0%)	0 (0%)	29 (100%)
Frequently use browsers (internet) application in my lesson	0 (0%)	0 (0%)	29 (100%)

Table 5 reveals that 18(18.0%) of students attest to the fact that Word processor (MS Word) is used frequently in lesson, 5(5.0%) where indecisive while 77(77.0%) of them debunked that attestation. Also, 9(31.0%) of teachers agreed to the fact that they frequently use Word processor (MS Word) in their lessons, 0(0%) where indecisive while 20(69.0%) of them disagreed. In all,

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27(20.93%) of the respondents agreed to the fact that Word processor (MS Word) is use frequently in lesson, 5(3.88%) where indecisive while 97(75.19%) of them disagreed.

Again, 17(17.0%) of students attest to the fact that Spreadsheet (MS Excel) is used frequently in lesson, 0(0%) where indecisive while 83(83.0%) of them debunked that attestation. Also, none (0%) of teachers agreed to the fact that they frequently use spreadsheet (MS Excel) in their lessons, 0(0%) where indecisive while 29(100%) of them disagreed. In all, 17(13.17%) of the respondents agreed to the fact that spreadsheet (MS Excel) is used frequently in lesson, none (0%) where indecisive while 112(86.82%) of them disagreed.

Again, 11(11.0%) of students attest to the fact that Data Management application (MS Access) is used frequently in lesson, 0(0%) where indecisive while 89(89.0%) of them debunked that attestation. Also, 0(0%) of teachers agreed to the fact that they frequently use Data Management application (MS Access) in their lessons, 0(0%) where indecisive while 29(29.0%) of them disagreed. In all, 11(8.53%) of the respondents agreed to the fact that Data Management application (MS Access) is used frequently in lessons, none (0%) where indecisive while 118(91.47%) of them disagreed.

Furthermore, 8(8.0%) of students attest to the fact that Presentation application (MS PowerPoint) is used frequently in lessons, 0(0%) where indecisive while 92(92.0%) of them debunked that attestation. Also, 16(55.2%) of teachers agreed to the fact that they frequently use Presentation application (MS PowerPoint) in their lessons, 0(0%) where indecisive while 13(13.0%) of them disagreed. In all, 24(18.60%) of the respondents agreed to the fact that

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Presentation application (MS PowerPoint) is used frequently use in lesson, none (0%) where indecisive while 105(81.40%) of them disagreed.

In addition, 10(10.0%) of students attest to the fact that Desktop publisher (MS Publisher) is used frequently in lessons, 0(0%) where indecisive while 90(90.0%) of them debunked that attestation. Also, none (0%) of teachers agreed to the fact that they frequently use Desktop publisher (MS Publisher) in their lessons, 0(0%) where indecisive while 29(100%) of them disagreed. In all, 10(7.75%) of the respondents agreed to the fact that Desktop publisher (MS Publisher) is used frequently in lessons, none (0%) where indecisive while 119(92.25%) of them disagreed.

Seventeen (17.0%) of students attest to the fact that Computer telecommunication (E-Mail) is used frequently in the learning process, 5(5.0%) where indecisive while 78(78.0%) of them debunked that attestation. Also, none (0%) of teachers agreed to the fact that they frequently use Computer telecommunication (E-Mail) for their lessons, 0(0%) where indecisive while 29(100%) of them disagreed. In all, 17(13.18%) of the respondents agreed to the fact that Computer telecommunication (E-Mail) is used frequently in the lesson process, 5(3.88%) where indecisive while 107(82.94%) of them disagreed.

Also, 14(14.0%) of students attest to the fact that Browsers (internet) is used frequently in the lesson process, 2(2.0%) where indecisive while 84(84.0%) of them debunked that attestation. Also, none (0%) of teachers agreed to the fact that they frequently use Browsers (internet) for their lessons, 0(0%) where indecisive while 29(100%) of them disagreed. In all, 14(10.85%) of the respondents agreed to the fact that Browsers (internet) is used frequently

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in the lesson process, 2(1.55%) where indecisive while 107(82.95%) of them disagreed.

From the statistics, even though all the schools have some level of application software use, all the schools do not use Software application frequently during lessons. The least used software application is data management system whilst Word and presentation software is used to some extent. This application software given by the respondents were similar to the ICT tool used by teachers in the work of Lever- Duffy et al. (2003).

Research Question 3: How often do Students have access to instructional technologies for teaching and learning?

Table 7: Students response on access to CAI tools in the school.

CAI Tools	Yes	Indecisive	No
Regular supply of electricity in the school	85 (85.0%)	0 (0%)	15 (15%)
Regular access to the computers in the school	11 (11.0%)	3 (3.0%)	96 (96.0%)
Regular access to the internet service in the school	6 (6.0%)	3 (3.0%)	91 (91.0%)
Regular access to the printers in the school	29 (29.0%)	4 (4.0%)	67 (67.0%)
Regular access to the scanner in the school	14 (14.0%)	4 (4.0%)	82 (82.0%)
Regular access to the projectors in the school	10 (10.0%)	10 (10.0%)	80 (80.0%)
Regular access to the audio system(head set) in the school	8 (8.0%)	0 (0%)	92 (92.0%)

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Research Question 4: How often do Teachers have access to instructional technologies for teaching and learning?

Table 8: Teachers responds on access to CAI tools in the school

CAI Tools	Yes	Indecisive	No
Regular supply of electricity in the school	29 (100%)	0 (0%)	0 (0%)
Regular access to the computers in the school	6 (20.7%)	0 (0%)	23 (79.3%)
Regular access to the internet service in the school	0 (0%)	0 (0%)	29 (100%)
Regular access to the printers in the school	6 (20.7%)	3 (10.3%)	20 (69.0%)
Regular access to the scanner in the school	0 (0%)	0 (0%)	29 (100%)
Regular access to the projectors in the school	9 (31.0%)	0 (0%)	20 (69.0%)
Regular access to the audio system(head set) in the school	0 (0%)	0 (0%)	29 (100%)

Table 7 reveals that 85(85.0%) of students attest to the fact that they have access to electricity supply in the school, none was indecisive while 15(15.0%) of them debunked that attestation. Also, 29(100%) of teachers agreed to the fact that they have access to electricity supply in the school, none was indecisive while 0(0%) of them disagreed. In all, 114(88.37%) of the respondents agreed

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to the fact that they have access to electricity supply in the school, none was indecisive while 15(11.63%) of them disagreed.

Also, 17(13.19%) respondents (both students and teachers) agreed to the fact that they have access to the computers in their school, 3(2.32%) where indecisive while 96(92.25%) of them disagreed.

Again, 6(4.64%) respondents (both students and teachers) agreed to the fact that they have access to internet service in their school, 3(2.33%) where indecisive while 120(93.08%) of them disagreed.

Furthermore, 35(27.13%) respondents (both students and teachers) agreed to the fact that they have access to the printers in their school, 7(5.43%) while 87(67.44%) of them disagreed.

In addition, 14(10.85%) respondents (both students and teachers) agreed to the fact that they have access to the scanners in their school, 4(3.10%) where indecisive while 111(86.05%) of them disagreed.

Nineteen (14.73%) respondents (both students and teachers) agreed to the fact that they have access to the projectors in their school, 10(7.75%) where indecisive while 100(72.52%) of them disagreed.

Also, 8(6.20%) respondents (both students and teachers) agreed to the fact that they have access to the audio system (headset) in their school, none was indecisive while 112(86.82%) of them disagreed. From the statistics, almost all the schools have access to the supply of electricity do not have full access to other ICT devices. This is in contrast with Chiafie (2011) who viewed that different ICT devices are used in diverse ways by several teachers depending on their lessons, skills and accessibility.

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According to Chiafie, Laptop and computers are used for demonstration lessons when classes are divided into groups and also mobile phones are used by both teachers and students to connect to the internet for information. Also the obstacles/barriers were limited computers and peripherals, scarce software, poor quality software, no access to the internet and insufficient hardware (Empirica, 2006; Pelgrum, 2001). Butcher (2003) stated that access to ICT resources is a major problem in some developing countries. Haddad and Draxler (2002) revealed that inadequate number of ICT resources hinder schools from using them in their lessons. In support of this, a study conducted by Afful-Dadzie (2010) in Ghana revealed that almost all the senior high schools in the Sekondi Takoradi Metropolis had computer laboratories but the number of computers in the laboratories compared with the school population was far less. This affected the number of hours and the number of days that both teachers and students spend in using the computer laboratories.

From the statistics, almost all the schools have access to the supply of electricity. Again, the statistics shows that most of the school do not have full access to other ICT devices hence they do not use them regularly in the teaching and learning process.

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Research Question 5: How does the use of Computer Assisted Instruction affect learning outcome?

Table 9: Students response on the effect of the use of Computer Assisted Instruction on learning outcome.

CAI Tools	Yes	Indecisive	No
The use of ICT makes lesson more interesting	96 (96.0%)	4 (4.0%)	0 (0%)
The use of ICT makes lesson presentation easier	98 (98.0%)	2 (2.0%)	0 (0%)
The use of ICT makes lesson increase students participation	93 (93.0%)	7 (7.0%)	0 (0%)
The use of ICT makes pupils understand lesson.	93 (93.0%)	3 (3.0%)	4 (4.0%)
The use of ICT makes lesson a waste of time.	4 (4.0%)	2 (2.0%)	94 (94.0%)
The use of ICT in lesson aids retention	48 (48.0%)	16 (16.0%)	36 (36.0%)
The use of ICT makes lesson efficient and effective	92 (92.0%)	2 (2.0%)	6 (6.0%)
The use of ICT sustains students attention throughout the lesson	69 (96.0%)	12 (12.0%)	19 (19.0%)

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Table 10: Teachers responds on the effect of the use of Computer Assisted Instruction on learning outcome.

CAI Tools	Yes	Indecisive	No
The use of ICT makes my lesson more interesting	25 (86.2%)	0 (0%)	4 (13.8%)
The use of ICT makes my lesson presentation easier	25 (86.2%)	0(%)	4 (13.8%)
The use of ICT makes my lesson increase students participation	25 (86.2%)	0 (0%)	4 (13.8%)
The use of ICT makes pupils understand my lesson.	22 (75.9%)	0 (0%)	7 (24.1%)
The use of ICT makes my lesson a waste of time.	29 (100%)	0 (0%)	0 (0%)
The use of ICT in my lesson aids retention	13 (44.8%)	6 (20.7%)	10 (34.5%)
The use of ICT makes my lesson efficient and effective	19 (65.5%)	0 (0%)	10 (34.5%)
The use of ICT sustains students attention throughout the lesson	19 (65.5%)	0 (0%)	10 (34.5%)

The data represented in Table 9 shows that 96(96.0%) of students attest to the fact that the use of CAI in lesson make the lesson more interesting, 4(4.0%) where indecisive while none (0%) of them debunked that attestation. Also, 25(86.2%) teachers agreed to the fact that the use of CAI in lesson make the lesson more interesting, none (0%) where indecisive while 4(13.8%) of them

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disagreed. In all, 121(93.80%) of the respondents agreed to the fact that the use of CAI in lesson make the lesson more interesting, 4(3.10%) where indecisive while 29(22.48%) of them disagreed.

Also, 98(98.0%) of the students attest to the fact that the use of CAI in lesson make the lesson presentation easier, 2(2.0%) where indecisive while none (0%) of them debunked that attestation. Also, 25(86.2%) teachers agreed to the fact that the use of CAI in lesson make the lesson presentation easier, none (0%) where indecisive while 4(13.8%) of them disagreed. In all, 123(95.35%) of the respondents agreed to the fact that the use of CAI in lesson make the lesson presentation easier, 2(1.55%) where indecisive while 4(3.10%) of them disagreed.

Again, 93(93.0%) students attest to the fact that the use of CAI in lesson increases students' participation in the lesson, 7(7.0%) where indecisive while none (0%) of them debunked that attestation. Also, 25(86.2%) of teachers agreed to the fact that the use of CAI in lesson increases students' participation in the lesson, none (0%) where indecisive while 4(13.8%) of them disagreed. In all, 118(91.47%) of the respondents agreed to the fact that the use of CAI in lesson increases students' participation in the lesson, 7(5.43%) where indecisive while 4(3.10%) of them disagreed.

Again, 93(93.0%) students attest to the fact that the use of CAI aids students understanding in lesson, 3(3.0%) where indecisive while none 4(4.00%) of them debunked that attestation. again, 22(75.9%) teachers agreed to the fact that the use of CAI aids students understanding in lesson, none (0%) where indecisive while 7(24.1%) of them disagreed. In all, 115(89.15%) of the

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respondents agreed to the fact that the use of CAI aids students understanding in lesson, 3(2.33%) where indecisive while 11(8.53%) of them disagreed.

Furthermore, 4(4.0%) of students attest to the fact that the use of CAI in lesson waste time, 2(2.0%) where indecisive while 94(94.0%) of them debunked that attestation. Again, none (0%) of teachers agreed to the fact that the use of CAI in lesson wastes time, none (0%) where indecisive while 29(100%) of them disagreed. In all, 4(3.10%) of the respondents agreed to the fact that the use of CAI in lesson waste time, 2(1.55%) where indecisive while 123(95.35%) of them disagreed.

Seventy one (71.0%) of students attest to the fact that the use of CAI in lesson aids retention of the knowledge acquired in the lesson, 16(16.0%) where indecisive while 13(13.0%) of them debunked that attestation. Also 17(58.6%) teachers agreed to the fact that the use of CAI in lesson aids retention of the knowledge acquired in the lesson, 6(20.7%) where indecisive and 6(20.7%) of them disagreed. In all, 68(52%) of the respondents agreed to the fact that the use of CAI in lesson aids retention of the knowledge acquired in the lesson, 22(17.05%) where indecisive while 23(17.83%) of them disagreed.

Furthermore, 92(92.0%) students attest to the fact that the use of CAI in lesson make the lesson more efficient and effective, 2(2.0%) where indecisive while 6(6.0%) of them debunked that attestation. Again, 19(35.5%) of teachers agreed to the fact that the use of CAI in lesson make the lesson more efficient and effective, none (0%) where indecisive and 10(34.5%) of them disagreed. In all, 111(86.05%) of the respondents agreed to the fact that the use of CAI in lesson make the lesson more efficient and effective, 2(1.55%) where indecisive while 12(9.30%) of them disagreed.

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Sixty nine (69.0%) students attest to the fact that the use of CAI in lesson aids sustains students' attention throughout the lesson, 12(12.0%) where indecisive while 19(19.0%) of them debunked that attestation. Also 19(65.5%) teachers agreed to the fact that the use of CAI in lesson sustains students' attention throughout the lesson, none (0%) where indecisive and 10(34.5%) of them disagreed. In all, 88(68.22%) of the respondents agreed to the fact that the use of CAI in lesson sustains students' attention throughout the lesson, 12(9.30%) where indecisive while 29(22.42%) of them disagreed.

From the statistics, the use of CAI in lessons makes lesson more efficient, effective, more interesting and easy presentation. It also aids understanding, retain knowledge, acquire and facilitate learner's participation in the lesson Farooq, (1997) concluded that during CAI lesson, it is rather the device that provides students with interactive involvement with instructional material. Therefore, the students might be given varying degree of control over their own learning, instruction could be designed according to individual students needs and feedback on students' performance could be stored for further reference. This finding is also in line with Harrison (1993)'s earlier findings that students who receive computer instruction showed greater increase in their achievement score in multiplication and subtraction than who received traditional instruction in Mathematics. It is also in coherence with Burns and Bozemen's (1981) findings that a curriculum supplemented with CAI led to gains in achievement in some areas of the curriculum.

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Research Question 6: What are the barriers/Challenges in the use of CAI in the Senior High Schools in the Akuapem North Municipality?

Table 11: Students response on Barriers/Challenges in the use of CAI in the Senior High Schools in the Akuapem North Municipality

CAI Tools	Yes	Indecisive	No
I feel more comfortable using CAI for my lesson	77 (77.0%)	9 (9.0%)	14 (14.0%)
I have enough skills and competence to use ICT resources in my lesson	69 (69.0%)	0 (0%)	31 (31.0%)
It is easier to access ICTs for my lessons	25 (25.0%)	8 (8.0%)	67 (67.0%)
It is easier to use ICTs in the traditional classroom	10 (10.0%)	17 (17.0%)	73 (73.0%)
The timetable schedule makes it easier to use ICTs in my lesson	44 (44.0%)	7 (7.0%)	49 (49.0%)
Lack of professional training support in ICT	39 (39.0%)	5 (5.0%)	56 (56.0%)

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Table 12: Teachers responds on Barriers/Challenges in the use of CAI in the Senior High Schools in the Akuapem North Municipality

CAI Tools	Yes	Indecisive	No
I feel more comfortable using CAI for my lesson	22 (75.5%)	0 (0%)	7 (24.1%)
I have enough skills and competence to use ICT resources in my lesson	6 (20.7%)	0 (0%)	23 (79.3%)
It is easier to access ICTs for my lessons	9 (31.0%)	0 (0%)	20 (69.0%)
It is easier to use ICTs in the traditional classroom	13 (44.8%)	0 (0%)	16 (55.2%)
The timetable schedule makes it easier to use ICTs in my lesson	9 (31.0%)	3 (10.3%)	17 (58.6%)
Lack of professional training support in ICT	26 (89.7%)	0 (0%)	3 (10.3%)
Lack of Financial support in developing instructional materials	20 (68.97%)	6 (20.67%)	3 (10.3%)

Table 11 shows that 77(77.0%) of students attest to the fact that they feel comfortable to use ICTs during lesson, 9(9.0%) were indecisive while 14(14.0%) of them debunked that attestation. Also, 22(75.9%) of teachers agreed to the fact that they feel comfortable to use ICTs in lesson, none (0%) was indecisive while 7(24.1%) of them disagreed. In all, 99(76.74%) of the respondents agreed to the fact that they feel comfortable to use ICTs during lesson, 9(6.98%) was indecisive while 21(16.28%) of them disagreed.

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Also, 69(69.0%) students attest to the fact that they have enough skills and competence to use ICT resources during lesson, none (0%) was indecisive while 31(31.0%) of them debunked that attestation. Also, 18(62.1%) teachers agreed to the fact that they have enough skills and competence to use ICT resources during lesson, none (0%) was indecisive while 11(37.9%) of them disagreed. In all, 87(67.44%) of the respondents agreed to the fact that they have enough skills and competence to use ICT resources during lesson, none (0%) were indecisive while 38(29.46%) of them disagreed.

Also, 25(25.0%) students attest to the fact that it is easy to access ICTs during lessons, 8(8.0%) were indecisive while 67(67.0%) of them debunked that attestation. Again, 9(31.03%) teachers agreed to the fact that it is easy to access ICTs during lessons, none (0%) was indecisive while 20(68.97%) of them disagreed. In all, 34(26.36%) of the respondents agreed to the fact that it is easy to access ICTs during lessons, 8(6.20%) while 87(67.44%) of them disagreed.

Again, 10(10.0%) students attest to the fact that it is easy to use ICTs in the traditional classroom, 17(17.0%) where indecisive while 73(73.0%) of them debunked that attestation. Again, 13(44.8%) teachers agreed to the fact that it is easy to use ICTs in the traditional classroom, none (0%) was indecisive while 16(55.2%) of them disagreed. In all, 28(17.83%) of the respondents agreed to the fact that it is easy to use ICTs in the traditional classroom, 17(18.18%) were indecisive while 89(68.99%) of them disagreed.

Furthermore, 44(44.0%) students attest to the fact that the timetable schedules make it easy to use ICTs during lesson, 7(7.0%) where indecisive while 49(49.0%) of them debunked that attestation. Again, 9(31.03%) teachers agreed to the fact that the timetable schedules make it easy to use ICTs during

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lesson, 3(10.34%) were indecisive while 17(58.62%) of them disagreed. In all, 53(41.09%) of the respondents agreed to the fact that the timetable schedules make it easy to use ICTs during lesson, 10(7.75%) were indecisive while 66(51.17%) of them disagreed.

Thirty nine (39.0%) students attest to the fact that there is lack of professional training support in ICT, 5(5.0%) where indecisive while 56 (56.0%) of them debunked that attestation. Also 26(89.7%) of teachers agreed to the fact that there is lack of professional training support in ICT, none (0%) was indecisive while 3(10.3%) of them disagreed. In all, 65(50.39%) of the respondents agreed to the fact that is lack of professional training support in ICT, 5(3.88%) while 59(45.74%) of them disagreed.

From Table 12, 20(68.97%) of teachers agreed to the fact that is lack of financial support in ICT, 6 (20.67%) was indecisive while 3(10.3%) of them disagreed.

The statistics shows that there are some barriers in the use of CAI in schools. The most prevailing barrier is the lack of financial support from school authority for the use of CAI. There is also the barrier of lack of professional training and support on the use of CAI for both teachers and students. The finding from this study is coherence with the barriers/ challenges given by Ahiatrogah and Barfi (2015) as the major barriers teachers face when it comes to the use of ICT in teaching. The result is also in line with the results of OECD (2009) which gave some reasons why teachers do not use ICT in their teaching. Ironically, results were different from what Ertmer (2009) referred to as intrinsic barriers. She referred to intrinsic barriers as attitudes, beliefs, practices and resistance to change as their major barriers.

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Also the finding agrees with Butcher (2003) who stated that access to ICT resources is the core problem in some developing countries. Haddad and Draxler (2002) revealed that inadequate number of ICT resources hinder schools from using them in their lessons. In support of this, a study conducted by Afful-Dadzie (2010) in Ghana discovered that almost all the senior high schools in the Sekondi Takoradi Metropolis had computer laboratories but the number of computers in the laboratories comparing with the school population was far less. This affected the number of hours and the number of days that both teachers and students spend in using the computer laboratories.

Conclusions

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

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CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

In this chapter, summary and conclusions of findings from the study are presented. This chapter, also has recommendations and area for further research

Summary of the Study

The main aim of this research is to assess the use and effect of CAI on performance in Ghanaian Language education with specific reference to Senior High Schools in the Akuapem North Municipality in the Eastern Region. Specifically, the study examined;

i. the extent to which respondents can use instructional technologies (CAI)
ii. the instructional technologies available for teaching and learning in the Senior High Schools
iii. access to instructional technologies for teaching and learning
iv. the effect of the use of Computer Assisted Instruction on learning outcome
v. the barriers/Challenges in the use of CAI in the Senior High Schools

The research is a descriptive survey. A sample size of 100 Ghanaian Language students and 29 Ghanaian Language teachers totaling 129 respondents were selected from six (6) Senior High Schools in the Akuapem North Municipality in the Eastern Region of Ghana. In selecting the respondents, simple random technique was employed.

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Key Findings

1. Even though most of the respondents had not had any professional training in ICT and had had any training in ICT neither after coming to Senior High School or joining the SHS Staff, almost all the respondents had received some form of ICT training and can use the computers.
2. Even though most Senior High Schools have electricity and printers, there are no other ICT devices such as scanners, internet service, projectors and audio sets that will aid the use of CAI in the teaching and learning process.
3. Software applications such as word processor, spreadsheet, database management application, presentation application, are not used at all in the teaching and learning process of Ghanaian Language in the Senior High Schools.
4. Both the teachers and students in Senior High Schools do not have access to instructional technologies for teaching and learning Ghanaian Language.
5. There are many benefits derived from the use of CAI in the teaching and learning process in Ghanaian Language. The major benefits are; It makes lesson interesting, increase students participation in the lesson and sustain learners interest throughout the lesson as well as increase students understanding. It also makes the lesson effective and efficient, makes presentation easy and aid retention of knowledge learnt.
6. There are certain barriers/challenges such as lack of easy access to ICT devices in the schools, difficulty in using CAI in the traditional

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classroom, the time table is not flexible for the use of CAI in lesson, no financial and professional training support.

Conclusions

The use of the CAI in teaching and learning Ghanaian Language concepts facilitated the achievement of students better than the use of conventional teaching strategy. However, the use of CAI in the Teaching and learning process in Ghanaian Language has some challenges.

Recommendations

It is recommended therefore that:

1. Computer literacy and operation in the Senior High Schools should be encouraged while relevant CAI packages in Ghanaian Language education should be accorded attention and developed for use within the Senior High School system. This can be done by bringing experts in Ghanaian Language education and computer together to design something in line with the Senior High School curriculum.
2. Educational curriculum planners should endeavor to integrate a practical computer application courses especially CAI courses in their curriculum design for pre-service teachers in Ghanaian language education. This will enable them to use computer to teach Ghanaian language subjects effectively.
3. The government in collaboration with the Ministry of Education and other stakeholders should try and transform the Ghanaian Language curriculum into a multi-media and CAI approaches which uses tutorials, drills and practice, simulation and problem solving

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approaches since it offers students to more opportunity to explore, discuss, challenge and test their pre-existing ideas about concept.

4. The Ghana Education Service in close collaboration with Senior High Schools authorities should frequently organize in-service training for Ghanaian Language teachers in CAI approaches since it exposes both teachers and students to new ways of teaching and learning Ghanaian Language concepts.

Suggestions for Further Research

i. The study should be replicated by other researchers to know the use and effect of CAI in teaching and learning in other districts in the Eastern region and other Regions in the country. This will help to give a general picture of the situation.

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APPENDICES

APPENDIX A: Questionnaire for Students

University of Cape Coast

College of Distance Education

Master of Education (Information Technology)

Questionnaire for the Student

Dear respondent

This study aimed at evaluating the use and effects of Computer Assisted Instruction (CIA) in Ghanaian Language Education in Senior High Schools in the Akuapem North Municipality.

I would be most grateful if you could sincerely provide the most accurate answers. Any information you provide would be very confidential. This is guaranteed with your anonymity.

I count on your sincerity.

Instructions

This questionnaire consists of five sections. At the beginning of each section, the instruction for that section would be given.

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Section A: Personal/ Academic Data

Provide the needed information by either ticking (√) at the appropriate answer or provide in writing the answer as the question demand.

1. Name of school; Benkum Senior High School [ ]
   Methodist Girls Senior High School[ ]
   Aburi Girls Senior High School [ ]
   Nifa Senior High School [ ]
   Okwapeman Senior High School [ ]
   Aburi Technical- Senior High School [ ]
2. Gender: Male [ ] Female [ ]
3. Age: Below 12years [ ] 13 – 15years [ ] 16 – 18years [ ] Above 18years [ ]
4. Education level: Form one [ ] Form two [ ] Form three [ ]

6.a. What Ghanaian Language do you study? Ga [ ] Akuapem Twi [ ]

Section B: Training and Qualification in ICT

Please answer the following questions by ticking (√) the appropriate answer.

7. Can you use the computer? Yes [ ] No [ ]
8. Have you receive any training before coming to Senior High School?
   Yes [ ] No [ ]
9. Have you attended any ICT training after coming to Senior High School?
   Yes [ ] No [ ]
10. Do you have any professional training in ICT? Yes [ ] No [ ]

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Section C: Availability of CAI tools (facilities and equipment) in the school.

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
11	We have supply of electricity in the school					
12	We have computers in the school					
13	We have internet service in the school					
14	We have printers in the school					
15	We have scanner in the school					
16	We have projectors in the school					
17	We have audio system(head set) in the school					

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Section D: Access of CAI tools (facilities and equipment) in the school.

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
18	We have regular supply of electricity in the school					
19	We have regular access to the computers in the school					
20	We have regular access to the internet service in the school					
21	We have regular access to the printers in the school					
22	We have regular access to the scanner in the school					
23	We have regular access to the projectors in the school					
24	We have regular access to the audio system(head set) in the school					

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Section E: Types of software application use in the teaching learning process.

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

D – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
25	Word processor (MS Word) is used frequently in my lesson					
26	Spreadsheet (MS Excel) is used frequently in my lesson					
27	Database management (MS Access) is used frequently in lesson					
28	Presentation software (MS PowerPoint) is used frequently in lesson					
29	Desktop publisher (MS Publisher) is used frequently during lesson					
30	Computer telecommunication (E-Mail) is used frequently in lesson					
31	Browsers (internet) is used frequently during lesson					

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Section F: Perception and benefits of the use of CAI in lesson

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
32	The use of ICT makes lesson more interesting					
33	The use of ICT makes lesson presentation easier					
34	The use of ICT makes lesson increase my participation in the lesson					
35	The use of ICT during lesson aid my understanding					
36	The use of ICT during lesson is a waste of time.					
37	The use of ICT during lesson aids retention					
38	The use of ICT makes lesson efficient and effective					
39	The use of ICT sustains my attention throughout the lesson					

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Section G: Barriers/Challenges **the use of CAI in lesson**

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
40	I feel more comfortable using ICTs during lesson					
41	I have enough skills and competence to use ICT resources during lesson					
42	It is easier to access ICTs during lessons					
43	It is easier to use ICTs in the traditional classroom					
44	The timetable schedules makes it easier to use ICTs during lesson					
45	Lack of professional training support in ICT					

What possible recommendations would you make towards increasing the use of ICTs in enhancing teaching and learning in senior high schools?

……..

……

Thank you for sparing your precious time to respond to this questionnaire.

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APPENDIX B: QUESTIONNAIRE FOR TEACHERS

University of Cape Coast

College of Distance Education

Master of Education (Information Technology)

Questionnaire for the teacher

Dear respondent

This study is aimed at evaluating the use and effects of Computer Assisted Instruction (CIA) in Ghanaian Language Education in Senior High Schools in the Akuapem North Municipality.

I would be most grateful if you could sincerely provide the most accurate answers. Any information you provide would be very confidential. This is guaranteed with your anonymity.

I count on your sincerity.

Instructions

This questionnaire consists of five sections. At the beginning of each section, the instruction for that section would be given.

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Section A: Personal/ Professional Data

Provide the needed information by either ticking (√) at the appropriate answer or provide in writing the answer as the question demand.

1. Name of school; Benkum Senior High School [ ]
   Methodist Girls Senior High School [ ]
   Aburi Girls Senior High School [ ]
   Nifa Senior High School [ ]
   Akwapeman Senior High School [ ]
   Aburi Technical- Senior High School [ ]
2. Gender: Male [ ] Female [ ]
3. Age: Below 20years [ ] 21 – 30years [ ] 31 – 40years [ ]
   41 – 50years [ ] Above 50years [ ]
4. Highest education level: First Degree [ ] Master's degree [ ]
   PHD or higher [ ]
5. How long have you been teaching? 0 – 5 [ ] 6 – 10 [ ] 11 – 15 [ ]
   16 – 20 [ ] 20+ [ ]
6. Which form do you teach? Form one [ ] Form two [ ] Form Three [ ]

6.a. What Ghanaian Language do you teach? Ga [ ] Akuapem Twi [ ]

Section B: Training and Qualification in ICT

Please answer the following questions by ticking (√) the appropriate answer.

7. Can you use the computer? Yes [ ] No [ ]

8. Have you received any ICT training before joining the teaching profession

Yes [ ] No [ ]

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

Yes [ ] No [ ]

10. Do you have any professional training in ICT? Yes [ ] No [ ]

Section C: Availability of CAI tools (facilities and equipments) in the school.

Please use the scale by ticking (√) in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
11	We have supply of electricity in the school					
12	We have computers in the school					
13	We have internet service in the school					
14	We have printers in the school					
15	We have scanner in the school					
16	We have projectors in the school					
17	We have audio system(head set) in the school					

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Section D: Access to CAI tools (facilities and equipments) in the school.

Please use the scale by ticking in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
18	We have regular supply of electricity in the school					
19	We have regular access to the computers in the school					
20	We have regular access to the internet service in the school					
21	We have regular access to the printers in the school					
22	We have regular access to the scanner in the school					
23	We have regular access to the projectors in the school					
24	We have regular access to the audio system(head set) in the school					

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Section E: Types of software application use in the teaching learning process.

Please use the scale by ticking in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
25	I frequently use word processor (MS Word) application in my lesson					
26	I frequently use spreadsheet (MS Excel) application in my lesson					
27	I frequently use database management (MS Access) application in my lesson					
28	I frequently use presentation software (MS PowerPoint) application in my lesson					
29	I frequently use desktop publisher (MS Publisher) application in my lesson					
30	I frequently use computer telecommunication (E-Mail) application in my lesson					
31	I frequently use browsers (internet) application in my lesson					

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Section F: Perception and benefits of the use of CAI in lesson

Please use the scale by ticking in the appropriate box to indicate the level to which you agree or disagree with the statements below:

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

Q/N	Statement	SD	D	ID	A	SA
32	The use of ICT makes my lesson more interesting					
33	The use of ICT makes my lesson presentation easier					
34	The use of ICT makes my lesson increase students participation					
35	The use of ICT makes pupils understand my lesson aid.					
36	The use of ICT makes my lesson a waste of time.					
37	The use of ICT in my lesson aids retention					
38	The use of ICT makes my lesson efficient and effective					
39	The use of ICT sustains students attention throughout the lesson					

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Section G: Barriers/Challenges **the use of CAI in lesson**

Please use the scale by ticking in the appropriate box to indicate the level to which you agree or disagree with the statements below:

Q/N	Statement	SD	D	ID	A	SA
40	I feel more comfortable using ICTs in my lesson					
41	I have enough skills and competence to use ICT resources in my lesson					
42	It is easier to access ICTs for my lessons					
43	It is easier to use ICTs in the traditional classroom					
44	The timetable schedule makes it easier to use ICTs in my lesson					
45	Lack of professional training support in ICT					
46	Lack of Financial support in developing instructional materials					

SD – Strongly Disagree D – Disagree ID - Indecisive A – Agree SA – Strongly Agree

46. What possible recommendations would you make towards increasing the use of ICTs in enhancing teaching and learning in senior high schools?

…….

……

……

Thank you for sparing your precious time to respond to this questionnaire.

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