UNIVERSITY OF CAPE COAST

THE PERCEPTION OF JUNIOR HIGH SCHOOLS TEACHERS AND PUPILS IN THE AHAFO ANO SOUTH EAST DISTRICT AND NHYIAESO SUB-METROPOLITAN AREAS IN THE ASHANTI REGION ON THE ROLE OF TECHNOLOGY ON TEACHING AND LEARNING

ABOAGYE STEPHEN

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BY

ABOAGYE STEPHEN

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

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DECLARATION

Candidate's Declaration

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

Candidate's Signature…… Date……..

Name: Aboagye Stephen

Supervisors' Declaration

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

Supervisor's Signature…… Date…….

Name: Professor John Nelson Buah

ABSTRACT

The purpose of this study was to examine the outcome on the use of digital technologies to teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas in the Ashanti Region of Ghana and also to integrate Computer Assisted Instruction (CAI) that will facilitate teaching and learning in the classroom. Both quantitative and qualitative research methodology were used. Simple Random sampling technique was used to sample 258 pupils and teachers from both districts (Ahafo Ano South East district and Nhyiaeso sub-metropolis). Self-developed questionnaire was used in data collection. Cross tabulation was used to analyse the data.

The results showed that teachers and pupils in the Nhyiaeso sub-metropolis were much advanced in the use of technology tools as compared to the teachers and pupils in the Ahafo Ano South East district. The use of technology tools had also made teaching and learning easier in the Nhyiaeso sub-metropolis than the Ahafo Ano South East district. This was due to the application of computer assisted instruction during teaching and learning.

Based on the findings, the study recommended that the Ministry of Education should consider integrating computer assisted instruction in teaching and learning in every part of the country.

Teachers are to be given in-service training on the importance of computer assisted instruction and also to improve their knowledge and skill in the use of computers in the classroom, which would improve upon the integration of computer technology in teaching and learning.

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DEDICATION

To my daughter Anna Adutwumwaa Aboagye and son Erwin Frank Aboagye.

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CAI - Computer Assisted Instruction

ITSs - Intelligent Tutoring System

ICT – Information and Communication Technology

LA – Learner Autonomy

MOE - Ministry of Education

PC - Personal Computer

PDA - Personal Digital Assistant

SLA – Second Language Acquisition

SMS - Short Messaging Service

SPSS - Statistical Package for Service Solution

CHAPTER ONE

Background to the Study

The world has embraced the usage of technology as an integral part of education. The effective use of internet service, e-mailing, social media, telecommunication etc. is helping a lot to improve the literacy level in terms of technology in our societies. The documentation of UNESCO (2010) stated that 21st century educational environment has been strengthened by technology. This implies that education cannot do away with technology and carry on smoothly with its objectives in teaching and learning in areas such as arithmetic, reading and writing.

Technology plays a major role in teacher-learner interaction by enhancing teaching and learning. The use of E-learning materials, online, distance learning, self-tutorial learning etc. is paving way for education to move from the traditional classroom to a more advance and acceptable environment for both teachers and pupils. Computer Assisted Instruction is important to the progress of educational development (Ololube, 2009). Therefore, teaching and learning environment is not only determined by one party but rather it depends on the learner as to what platform that he/she wants to associate with.

Technology goes beyond computers and other peripheral devices. Technological tools have been used to solve problems in every aspect of life. We find them in the hospitals, banks, finances, schools, government agencies, industries etc. According to Pelgrum (2003) the term computer technology was replaced by information technology in the late 1980's. Technology has a broader scope and limiting it to computers can raise a lot of issues in its

interpretation and usage in respect of the educational sector and for other policy interventions.

Educational policies on technology are gaining much attention in the world. The use of technology tools helps to improve most of the problems that the education sector is facing. Every policy has a period for completion and targeted area of scope. Availability of new technologies benefits the cooperation with the private sector (UNESCO, 2010). For a better world for today and tomorrow integration of technology is a vital key in educational policies which Africa is also aiming towards.

Africa is making every effort to bridge the gap of technology integration in education. Technology integration in Africa is challenging and needs to be given a critical look. The development of technology in schools in Africa started just about two decades ago and therefore is in its early stages. Africa needs to accept the fact that technology has come to stay and every attention should be given to its enhanced usage. ICT stands alone as a subject which should not have been that but rather an integral part of all subjects according to Hepp (2004). Africa is striving high to attain the perfection state of accepting technology in the jurisdiction of Education not leaving Ghana out.

Ghana is one of the countries in the Africa continent which is aiming towards the improvement of Technology in schools. There has not been any concrete policy direction for ICT in education as to what specifically is needed to improve and the strategy for it. Education in Ghana is trying as much as possible to incorporate ICT as a subject but the pace is slow to attain an appreciable level of incorporation and usage.

People have appreciated the use of computers in schools and in their various homes. The use of computers in terms of switching on and off is very common to the Ghanaian rather than using it for other applications. As Jhurree (2004) stated, much have been said and reported about the impact of technology especially computers in education". Technology usage is becoming more persuasive in Ghana and computers need much attention.

The government of Ghana has acknowledged the need for the training in the use of ICT in education in basic Schools, Colleges, and Universities. The improvement of technology in education will help teachers and pupils get new ideas on analysis and information acquisition. Tchombe (2008) stated that it is not just acquiring the knowledge of technology that is important but also teachers need to understand how to use technology pedagogically. The teacher factor is inclusive and the attention on training teachers should be taken care of.

Teachers are always in classroom for easy facilitating of learning for pupils but teaching and learning go beyond the classroom. The teacher is not the only person who can facilitate learning; there are other means through which learning can take place with or without the presence of the teacher. Condie (2007) stated that technology has enabled new or more efficient ways of doing things and provides new tools that facilitate pupil's construction of learning. Technology has finally come to stay but pupils and teachers are not appreciating it. Using technology to help education is very easy and attractive for all people but is not the same as we say. Improving the understanding of technology use in teaching and learning continues to be of interest.

Statement of the Problem

The educational system in Ghana is free and compulsory at the basic level. Pupils must have equal distribution of standard education materials and resources. When this goal is achieved, everyone will be able to read and write. Dankwa (1997) stated that the urban communities have gotten the better share of the national cake in terms of educational facilities and resources. This goal of ensuring equity in education seems to be drifting away since those who can offer to pay higher fees into certain types of schools, get better access to quality facilities and resources.

Basic schools in the urban areas are enjoying technology integration since its inception in the educational curriculum. The government is preaching about integration of technology in education which is the best idea so far but schools which have the mandate to run ICT are mostly the category 'A' schools most of which do not depend on the government for help. Dankwa (1997) claimed that the provision of digital technology in Basic Schools narrowed to the category 'A' schools and other schools in the urban areas. It is noteworthy that the government is supposed to assist in everything that goes on in Basic schools in the country so that all can enjoy the national cake for better future.

Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas are in Ashanti Region. Basic schools here are facing a lot of challenges when it comes to usage of technology. The schools are supposed to have better ICT laboratories and professional or qualified teachers to handle the facilities. Teachers do not seem to be motivated well enough to integrate the usage of technology in lessons that they deliver so that it will arouse the interest of their pupils and also take away the boredom. According to Gregoire (1996) and

Sutherland (2004) the benefits for using new technology is greatly dependent on the technological skills of the teachers and the teacher's attitude to the presence of the technology in teaching and learning. The use of technology has come to stay and the continual usage will help you master it. If the one to teach it is not available, likewise the technology, it will not be possible for a pupil to move on. All stakeholders must get involved in championing the cause for quality education through Technology.

Objectives of the Study

The study was conducted with the following objectives:

1. To examine the outcome on the use of digital technologies to teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas.
2. To integrate Computer Assisted Instruction (CAI) that will facilitate teaching and learning in the classroom.

Research Questions

1. i. What are the available digital technologies in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolis?

   ii. What are the effects of the available digital technologies on teaching and learning in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolis?
2. Which Computer Assisted Instruction will provide easy understanding of instruction?

Significance of the Study

Teachers, puplis, parents and the community will benefit from this study. This study will promote the idea of inclusive teaching and learning. Pupils will actually be enthusiastic and try as much as possible to ask and answer questions with the help of technology tools. The ability of teachers and pupils knowing much about technology tools will greatly assist them in their daily activities. The gap created between abstract and concrete learning will be minimized.

Limitations of the Study

The study faced some constraints which were not favourable. These constraints could be as a result of resources in terms of logistics and time. This prevented the researcher from extending the study to other districts in Ashanti Region and throughout the entire nation.

Some respondents also did not return the questionnaires given to them. Some gave a lot of excuses and others even refused to collect the questionnaires.

The study encountered some difficulty in terms of meeting with some of the respondents. The administrators of the various schools in Ahafo Ano South East district and Nhyiaeso sub-metropolis frustrated the researcher until finally giving him limited time to meet the staff and pupils.

The researcher assured the respondents about their responses been considered confidential. This enabled their cooperation and wiliness to provide needed information.

Delimitation of the Study

The scope of the study is limited to only teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas in the Ashanti Region. The study was expected to run smoothly in these areas due to the targeted population which were solely for these districts. The respondents in these two areas will help to achieve the purpose of the study. Although the research might work in other places, the targeted population understudy will not be the same. The Ahafo Ano South-East district gets much of its income from farm produce while Nhyiaeso sub-metropolis people are business minded.

Organisation of the Study

The study was basically divided into five sections. Chapter one is on the background to the study, statement of the problem, research objectives and research questions, significance of the study, limitation and delimitation of the study. Chapter two is a review of literature on other studies which might be similar and help in getting what others have worked on. The third chapter is on the methodology that was used to carry out the study while chapter four dealt with its results and discussions. Summary, conclusion and recommendations are in the final chapter.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

The use of digital technology tools in the daily activities of pupils, especially, in the classroom, have given them the opportunity to play and learn unconsciously without knowing the future benefits. In fact, the use of digital technology tools forms an integral part of education but many obstacles encountered do not facilitate their integration. The infusion of digital technology in education is vital because of the future benefits of using digital technology. Akbaba-Altun (2004) concluded that successful integration of digital technology is not simple, because it depends on such interlinking variables. It is not simple but with determination and gradual process, integration of digital technology will bring smiles to everyone who happens to be part of this transformation.

The literature review below seeks to analyse some of the views that other people have written about and aims to identify the gap being created as they try to bridge it.

Digital technologies are radically transforming the curriculum in a number of ways. They demand that teachers should reflect on new teaching methods but not the old traditional methodologies. Teachers should discard the old teaching methods and use the computer, projector and printer to make delivery of lesson, which in the traditional classroom would have been impossible to use. Educators believe that integrating digital technology in education will greatly enhance learning experience (Sutherland, 2004).

The growth of digital technology itself dictates that in order for pupils to adjust to modern society and the global economy, the way in which they are taught and what they are taught, requires adjustments to and around technology (Watson, 2006). Balanskat (2006) however, argued that although educators appear to acknowledge the value of digital technology, difficulties continue to be encountered in adopting and integrating such digital technologies. Mueller (2008) concludes that although many teachers are comfortable with technology in general, they still may not be ready or capable to integrate such technologies, in their classrooms. The following section will provide a brief overview of what digital technology integration means:

Meaning of Digital Technology Integration in Education

Digital technology integration in education is not something which has just emerged to take over the educational system. The use of digital technology became popular in the 1980's when personal computers became available to consumers. Global competition has also influenced government policies all over the world in ensuring that they keep pace with technological advancements. These policies caused the mass production of computers for schools. Digital technology will be an important part of the educational process for the next generation. According to Pelgrum (2003), towards the end of the 1980's, the term 'digital technology' will be a household name that is common to every consumer. The term digital technology, therefore, referred to computer's processing ability, indicating a shift from computing technology to the capacity to store and retrieve information. Pelgrum (2003) again, posited that the term digital technology emerged, signaling the introduction of e – mail and electronic messaging with computer technology. Simply put, digital technology is

changing the phase of computer technology. It is a diverse set of technological tools and resources used to communicate and to create, disseminate, store and manage information (Blurton, 2002). This means that digital technology helps in the storage and management of information. Ayo (2001), defined digital technology tools as the use of computer systems and telecommunications equipment in information processing. Digital technology as described by Scott (2002) encompasses a range of applications, communications and technologies that aid information retrieval and research communication and administration. These include, internet access, electronic mail, CD-ROMS, telephone, on line databases, library services and fax machines.

The emerging phenomenon was welcomed in the 1980's and educational systems needed to prepare pupils to adjust to and survive in this new technologically driven society. This meant preparing pupils for "lifelong learning in an information society" (Pelgrum, 2003) . Early advocates of digital technology integrated education, saw it as a catalyst for change, fostering skills in problem solving and critical thinking, as well as the development of pupil centred learning (McGrail, 2005).

According to Kozma (2005), there are three rationales for the introduction of digital technology into education. The first one is the economic rationale which refers to the role it can play in preparing pupils as future workers and in supporting economic development. The second is the social rationale where digital technology investment aims to: increase knowledge sharing, encourage cultural creativity, increase civic participation, make government services more accessible and finally enhance social cohesion. The third and final rationale is the educational and pedagogic rationale where digital technology can advance

educational reform and improve educational management structures. Similarly, Hepp (2004) broadly concured, identifying three reasons for the use of digital technology in education: the development of new skills for the information age, increased productivity and the development of quality learning.

Whereas Kozma (2005) posited that there are three rationales for the introduction of digital technology into education, Hawkridge (1990) proposed four rationales for the utilization of computers in schools. He noted these as social, vocational, pedagogical and catalytical. The social and vocational rationales point to the increased use of digital technology in all spheres of human activity. The pedagogical and catalytical rationales relate to the effects of technology on pupils and schools. According to Bigum (1997) arguments for using computers in school stem from digital technological and socially determined points of view. His standpoint is that the school systems within which the computer is used, is based on digital technology. He argued that a change occurs within the education system using the computer and that change is as a result of the effect of digital technology. Bigum (1997) also argued that the social context sees computers as neutral technology-technical means of achieving a defined purpose in education. Two contexts emerge and are used in this study. The social context and the pedagogical context. The social context runs along the lines of Hawkridge (1990) social and vocational rationales, whiles the pedagogical context agrees with Hawkridge's (1990) pedagogical and catalytical rationales. The pedagogical context also agrees with the views of Bigum (1997) and Drent (2008) that identify three objectives for the integration of digital technology in education. Digital technology can be gleaned from these objectives that integration involves aiding the teaching and

learning process (apart from the third objective which is a discipline in itself). Successful integration of digital technology in education can lead to a number of benefits. The next session will look at some of the benefits.

Benefits of Digital Technology use in Education

The use of digital technology in the learning environment has become an unstoppable force in recent years. Each and every day, new inventions come out to boost solutions to problems in every human field, especially, education. Digital technology has impacts on education; from record keeping and school websites to the creation of online learning communities (Bishop, 2007). Educational institutions can use specialized websites to make learning resources available online at any time. Some educational institutions do not even require pupils to be physically present. Virtual classrooms have flourished in tandem with improved internet accessibility. The significant barriers of time and distance are rendered almost obsolete in such virtual classrooms (Stennes, 2008).

Nevertheless, the benefits of digital technology use in the classroom depend on the success with which it has been integrated (Condie, 2007). Dawes (2001) asserted that new technologies could support education across the entire curriculum, providing innovative opportunities for effective communication. Digital technology in education has undoubted potential, to be influential in changing teaching methodologies.

Studies have also demonstrated that digital technology use can result in effective gain in literacy. There is empirical evidence that pupils, who have difficulties with reading, can be motivated and engaged through the use of digital technology (Lynch, 2000; Ó Murchú, 2000, Segers 2002).

Condie (2007) concluded that the use of digital technology has had positive effects in a number of subjects, as well as being constructive in assisting pupils that are marginalized as a result of personal or familial issues. Schofield (1985), concluded that using Computer Assisted / Aided Instruction (CAI) considerably diverts the teacher's focus to weaker pupils.

Research has shown that many pupils benefit from the use of digital technology (Frear, 1999).Wishart (2009) claimed that pupils get immediate feedback or rewards. Papert (1993) asserted that allowing digital technology construct higher order thinking, facilitate users to take responsibility for their learning, while Korte (2007) as cited in Rodden (2010) refers to its ability to motivate learning. Modern educational software uses sound, animation, video and interactivity, assisting the different intelligences proposed by Gardner (1993) in his Multiple Intelligences Theory. Forrester (2000) assessed that digital technology has potential in developing the various multiple intelligences proposed by Gardner.

Kozma (2005) suggested that digital technology can be used to improve delivery of and access to education. Learning computer skills, makes the pupil become better equipped for the world of work, which increasingly demands such competency.

Furthermore, Kozma (2005) claimed that digital technology is transforming education by introducing new curricula based on real life problems, providing different tools to enhance learning, providing pupils and teachers with more opportunities for feedback and reflection. Social Constructivism places emphasis on this type of pupil centred learning, viewing

the teacher as a guide or facilitator, motivating pupils to discover things for themselves (Vygotsky, 1978).

Schoepp (2005) claimed that constructivist approaches must dominate the learning environment for digital technology to have a significant impact on learning. However, it must be remembered that the use of digital technology in classrooms is a relatively new phenomenon when compared to traditional teaching methods. While there have been notable critics (Cuban, 2001); most research strongly supports the premise that using digital technology enhances teaching and learning process. Furthermore, it has been argued by Iddrisu (2009) that if one defines pupil learning as the retention of basic skills and content information as reflected in standard tests, then evidence suggests that there is a positive relationship between computer-assisted instruction or computer-based learning and standardized tests.

According to Hawkridge (1990), computers as pedagogical tools in Computer Assisted learning or Computer Assisted Instructions offer advantages over other methods of teaching and have revolutionized education in advanced countries. According to Hawkridge (1990) computers are useful tools for pupil's drills and practice, Tutorial activities, discover, building intellectual structures, data retrieval and data manipulation.

The computer serves as a cognitive tool. Its software is able to extend or enhance human cognition (Kozma, 2005). They are designed to aid users in task relevance, cognitive components of a performance, leaving the performance open-ended hand controlled by the learner (Fouche, 2005). The impedance of digital technology in teaching and learning has prompted Todd (1997) to declare that a real learning revolution has evolved in which educators use digital

technologies to provide learning experiences that are qualitatively different from their predecessors. Despite the advantages that computers offer in education, Bigum (1997) recommends that computers should not be seen as the only educational tool, but as one of a number of possible tools which could be used to teach content and skills.

Hawkridge (1990) considering the relevance of computers in schools, is of the opinion that computers have become catalysts for teaching, helping pupils to be less dependent on teachers and enhance collaborative learning, Thapisa (2008) however, states that evidence shows that to innovate and create stocks of information and knowledge by utilizing digital technology, developing nations need telecommunication networks that can support electronic data exchange. Dankwa (1997) and Parthemore (2003) pointed out that many schools in Ghana can boast of a computer laboratory through which pupils are gaining basic computer literacy. A number of these schools have Internet facilities, enabling pupils to deepen their connection to the outside world. Although this is encouraging information, extensive review of documents of NGOs that are spearheading digital technology implementation in Ghanaian schools reveal that most schools now benefiting from digital technology are either located in urban areas or are classified as premier schools (Dankwa, 1997; Hawkins, 2002; Parthemore, 2003). According to Parthemore (2003), computer literacy education in Ghana has been concentrated in major urban areas. A few better schools in the countryside have attempted to "catch up" with their urban counterparts by contracting with private companies to provide computer education. Contrary to the promising notion of digital technology as a means of acquiring knowledge production, numerous scholars have highlighted the need

to address the numerous problems that the introduction of digital technology will bring. These issues include: a lack of adequate planning for implementation of digital technology (Smeets, 2005); inequalities in digital technology distribution (Sutherland-smith, 2002), lack of information regarding the distribution of digital technology, low levels of literacy in general, and lack of relevant content and technology applications to meet the needs of diverse societies (Hakkarainen, 2002).

A review of the available literature reveals significant inequity in the implementation of digital technology in Ghanaian schools. The literature (Dankwa, 1997; Parthemore, 2003) revealed that digital technology provision in schools is skewed in favour of schools categorized as premier schools and schools in urban areas. Unfortunately, this is not a new trend. Since the introduction of formal schooling in Ghana, educational resources have been unequally distributed in the school system (Folson, 1995). It is critical that policy makers ensure that digital technology does not become another tool for perpetuating educational inequalities in Ghana's school system. Educational policy makers, non-governmental organizations (NGO), bilateral and multilateral donor organizations, and school administrators are making the collective efforts to promote digital technology in Ghanaian schools.

Positive impacts of Digital Technology on Pupils learning

Pupils can derive much positive benefits from the effective and efficient use of digital technology in the teaching and learning process. Some of the benefits are:

- Increased motivation
- High quality output

- More independent Learning and at their own pace
- Increased work-practice

Increased Motivation

Many studies have pointed out to the motivating and positive effects that the use of digital technology can have on pupils attention and efforts in class. Trimmel (2004) studied the impact of introducing laptops into classrooms and one of their conclusions was that "information technology has a positive impact on school attendance and learning interest". The DFES, (2003) drew on a number of research projects to support its statement that digital technology can play an important role in motivating pupils and encouraging them to engage in learning within and beyond the classroom."

The digital technology objectives were useful as digital technology is a key element of the ICT curriculum that pupils learn how to present information in a professional way. Most pupils enjoy working on computers. If it is a novelty rather than the norm, then that makes it more motivating. However, while pupils' enjoyment is an important factor in education, adherence to the curriculum is more important and therefore careful planning is an essential element of teaching with digital technology in schools.

High Quality Output

Using digital technology improves the quality of pupils work (Watts, 2004). Thus, the quality of pupils' work produced on digital technology is generally of much higher quality than if it is hand-written. Homework reports with images and screen shots explain what they have done and embellished with fancy fonts and word-art titles. Though this may not improve the substance of work, it does

demonstrate that pupils care about what they are doing and put in more efforts for its appearance.

A good example of digital technology being used imaginatively to create high quality output is where a Geography lesson on volcanic eruption can be taught using power point to create animation presentation.

Learning Independently

It is common for schools to use the internet as a research tool to allow pupils to find their own information. Sutherland (2004) described the way in which the internet can be used in Geography to develop a "digital earth" concept to enhance pupils understanding of many aspects of the subject. The internet is often used to augment textbooks at a lower cost. For instance, "A Secondary School Art class uses the internet extensively for research and gathering ideas, and even interacting directly with contemporary artists via their websites" (Beta, 2004)

Increased Work-Practice

Digital technology enables high quality output to be produced at a speed that cannot be matched using the traditional methods and resources. Teaching applications such as graphing packages in mathematics, multimedia authoring software and data analysis packages in Geography and science all allow pupils to work much faster than if they had to do the task manually. Morgan (2004) studied a work of Geography teachers using digital technology in their lessons; they describe the advantages of using digital technology as a tool to increase the breadth and speed of learning, increasing the efficiency of both teacher and

pupils. Digital technology was used to gather, analyse and present information. This reduces time where one wants to analyse information.

The integration of digital technology into the teaching and learning process is extremely difficult and will most likely meet a number of challenges. The next session looks at the challenges that prevent the use of digital technologies in education.

Challenges to the use of Digital Technology in Education

A challenge is anything that retards the progress or achievement of any set objective or aim. It, therefore, means that the removal of one or more of these challenges or barriers such as the ones in digital technology integration should assist, perhaps, and significantly advance the process of integration.

Computer integration in the classroom is the application of technology to assist, enhance, and extend pupil knowledge (Omwenga, 2004). Using digital technology in education means more than simply teaching learners how to use computers. Digital technology is a means for improving education and not an end to itself. Muriithi (2005) has argued that in Kenya, like most developing countries, digital technology usage is still limited to computer literacy training. A study recognized by the Organization for Economic Cooperation Development (OECD, 2009) and cited in Rodden (2010), confirmed that there are a number of barriers or challenges that inhibit the use of digital technology in education. These barriers included an inconsistent number of computers to pupils, a deficit in maintenance and technical assistance and finally, a lack of computer skills and/or knowledge among teachers (OECD, 2009). Jensen (2002) classified these barriers as limited equipment, inadequate skills, minimal support, time constraints and lack of interest or knowledge by teachers.

In a research report conducted by British Educational Communications and Technology Agency(BECTA, 2004), a number of other important barriers were identified. These were: lack of confidence, accessibility, lack of time, fear of change, poor appreciation of the benefits of digital technology and age. Ertmer (1999) concurred with Schoepp (2005), asserting that if teachers are aware of and understand such barriers, they can initiate strategies to overcome them.

Digital technology's significant challenges that policymakers and planners, educators, education administrators, and other stakeholders need to consider are the following:

- Educational policy and planning
- Infrastructure
- Language and content
- Capacity building
- Financing

Research has classified these barriers in different ways. Several studies have divided the barriers into two categories namely extrinsic and intrinsic. However, what was meant by extrinsic and intrinsic, differed among studies. In one such study, Ertmer (1999) referred to extrinsic barriers as first order barriers citing as examples: lack of time, support, resources and training. She referred to intrinsic barriers as second order barriers, citing as examples: attitudes, beliefs, practices and resistance to change.

Balanskat (2006) classified barriers as 'micro level' (teacher attitude) and 'meso level' (institutional). He added a third category called 'macro level', to account for the wider educational system. Meanwhile, Pilgrim (2003) identified material

barriers as a lack of real or physical equipment and non-material barriers as somewhat intangible entities such as lack of knowledge, confidence or time.

The challenges that confront the successful integration of digital technology into education will be looked at from two (2) major angles. This approach which was adopted from what the British Educational Communications and Technology Agency (BECTA) used in 2004 will firstly look at the barriers from the teachers' perspective. The second will consider the barriers that confront the school itself .

Teacher Related Barrier

The researcher is of the view that the teacher (s) is/are the principal actors or stakeholders in the learning process. This belief of the researcher is affirmed by the view of Baylor (2002) who posited that teacher related issues were crucial in determining digital technology use in the classroom. Again Gressard (1985) asserted that the teacher's attitude towards digital technology is one of the key factors which determine successful integration, while Jegede (2007) recognized the teacher as a key instigator in fostering digital technology integration in education. From the above it is clear that the teacher is one key determinant factor among the others factors in the integration of digital technology. It, therefore, implies from the above that the barriers of integration in relation to teachers can have a negative impact on the whole integration process. The following sessions will look at some of the teacher related challenges or barriers.

Lack of Teacher Competence

According to Bingimlas (2009) teacher competence refers primarily to the ability to integrate digital technology into pedagogical practice. Lack of

knowledge/competence is regarded as a significant teacher related barrier to digital technology integration.

A teacher's lack of knowledge serves as a considerable challenge to the use of computers in teaching methods and practices. Tezci (2009) as cited in Roden (2010) posited that if teachers have a high level of digital technology knowledge, then there will be a higher level of digital technology use in education.

These barriers according to some researchers vary from country to country. Pelgrum (2003) found that lack of knowledge/competence in technology, among teachers in developing nations, is the primary obstacle to the uptake of digital technology in education.

Lack of Confidence

Numerous studies carried out posit that the lack of confidence prevents teachers from using digital technology. According to a BECTA report in 2004, many teachers who are unskilled in digital technology are not prepared to use them in the classroom or in front of pupils who might probably know more than them. This lack of confidence is further deepened with the expectation of pupils on the competence of the teacher in the use of digital technology. This is so because pupils are of the view that their teachers know more than them and with this at the back of the mind of the teacher if he/she has a fair knowledge about digital technology he/she will not be willing to go and disgrace himself/herself before the pupils.

The lack of confidence in the use of digital technology is in most instances accounted for by the inconsistency between training and usage. This is so because most teachers even if they have received training in the use of digital

technology can still fail to integrate it into teaching. BECTA report in 2004 says that the lack of confidence is linked to other barriers affecting the use of digital technology in education. The report mentioned the fear of digital technology as a factor that can compromise the level of confidence. Other factors that were mentioned included the lack of technical assistance which can lead to low confidence levels, lack of competence and the quality of training received.

According to Jegede (2007) as teachers become more appreciative of the use of digital technology as a pedagogical aid, attitude and interest become positive. The rationale, therefore, is that increased interest fosters commitment to honing skills and thereby boosting competence levels. Beggs (2000) posited that fear of failure is a possible cause of lack of confidence whereas Balanskat (2006) said the limitation in the knowledge base of the teacher in digital technology use, makes them feel anxious about using it and thus not confident to use it in teaching. Some researchers are also of the view that the lack of confidence and experience with the use of technology influences the motivation of teachers in the use of digital technology. Cox (1999) found that teachers who have confidence in using digital technology, identify that technologies are helpful in their teaching and personal work and that they need to use them more frequently.

From the above, it can be concluded that when most of the barriers to the use of digital technology in education is removed, many of the problems associated with lack of confidence will be resolved.

Fear

Computer anxiety or fear is a key barrier, limiting or preventing the use of digital technology by teachers. Underlying these anxieties are a fear of

humiliation when using computers and a fear of losing professional status through the downgrading of traditional teaching skills.

According to a BECTAs 2004 report, teachers who admitted to a lack of confidence, ascribe this lack of confidence primarily to fear. According to several reports, the same teachers have the fear that computers might challenge or compromise their vocation by downgrading their role. The researcher is of the opinion that if teachers are trained in digital technology and digital technology integration, they should realise, that rather than downgrading pedagogical skills, digital technology aims to enhance those skills, in the same way it aims to enhance the learning process and skill acquisition.

Lack of Training

A full and complete integration of the use of digital technology in education requires high quality frequent training and professional development. If this training is not provided, then attempts at integration will inevitably be unsuccessful. This is significant, as according to most researchers, another barrier that is frequently cited, is the lack of effective training. A study by Pelgrum (2003) revealed that there were not enough training opportunities for teachers in the use of digital technology in the classroom.

The training of teachers in the integration of digital technology in the learning and teaching process as cited in Rodden (2010) is a difficult one. This is so because it involves a number of complex factors in order to render the training effective. These complex factors include finding the time for training, training in pedagogy, skills training and the use of digital technology in the teacher's initial training (Bingimlas, 2009). BECTA (2004) concured, asserting that training is particularly complex, because it is important to consider several

components to ensure the effectiveness of the training. A similar study conducted by (Cox, 1999) argued that digital technology training for teachers needs to incorporate pedagogical aspects. This study concluded that when teachers received basic digital technology training without considering the pedagogical aspects of digital technology, they still did not know how to use digital technology in class.

Schoepp (2005) maintained that if new digital technology is going to be integrated into education, teachers should receive training on how to use the specific digital technology, while Trotter (2009) concluded that training in digital technology integration must be preceded by and supplemented with basic skills training. Gomes (2005) also concluded that lack of training in digital literacy, lack of pedagogic and didactic training in how to use digital technology in the classroom and lack of training concerning the use of technologies in specific subject areas, were obstacles to the use of new technologies in the classroom. Cox (1999), again, asserted that if teachers are to be convinced of the value in using digital technology in their teaching, their training should focus on pedagogical issues. This, in the view of the researcher, is due to the fact that it was found that even after teachers had attended professional development courses in digital technology, they still did not know how to effectively use digital technology in their classrooms. This was because too much emphasis was placed on acquiring technical digital technology skills during training, as opposed to skills in how to incorporate digital technology into the curriculum.

Some studies as cited in Rodden (2010) asserted that attention must be given to both skills training and pedagogical training(BECTA, 2004; Schoepp 2005; Ertmer 1999). According to Newhouse (2002) some training is still needed for

teachers to develop appropriate skills, knowledge and attitudes, regarding the effective use of computers to support learning by their pupils. He argued that this also requires continuing professional development, to maintain these appropriate skills and knowledge.

According to Osborne (2003), when there are new tools and approaches in education, teacher training is essential if they are to integrate them into their teaching.

In conclusion, the researcher is of the opinion that enough training can address some of the barriers in the integration of the use of digital technology in the teaching and learning process. This is because acquiring the necessary skills will enhance their knowledge base and competence, and by extension, the level of confidence. The result of this is that it would, in the long run, reduce the fear of digital technology and the anxieties of pupils in the use of digital technologies

Extent of Previous Digital Technology Experience

Poor previous digital technology experience among teachers can clearly be regarded as a very real barrier to digital technology integration in the classroom. Drent (2008) posited that solid experience in the use of digital technology and the changes related to digital technology, support the development of a learner centred pedagogical practice, while Mann (1999) viewed substantial previous computer use by teachers, as one of the key determinants, in his classification of teachers, as either **'**exemplary computer-using' or 'non-exemplary computer-using'.

Difficulty in Changing Teaching Method (Pedagogy)

Teachers have to accept that the widespread use of digital technology in schools is having an impact on teaching methods and requires a significant rethinking of approach. Mann (1999) describes two main teaching methods and their effects on the way in which digital technology is used in lessons.

Traditional transmission institution assumes that pupils will learn through teacher explanation or reading from texts. Skills are learnt through practicing skill in a sequence prescribed by the teacher.

Constructivist institutions assume that understanding comes from relating new ideas to the learners' prior beliefs and skills acquisition comes in as structured way as new skills are used as required to solve practical problems.

In conclusion, one could deduce that using digital technology in lessons, the constructivist approach, is more likely to lead to successful outcomes. Furthermore, teachers with the most constructivist philosophies tend to use computers more often and in a more challenging way, both in classroom and as users themselves.

Age

The researcher's personal observation has it that the age of an individual is a factor in the person's quest to adapt to changes, more especially, in the areas of digital technology. It is against this backdrop that this literature is being reviewed to find out the views of other researchers.

Kumar *et al* (2008), posited in his study with some teachers that age is a significant factor to the use of digital technology. The researcher concurs with this but believes that the age factor in relation to the use of digital technology is

not only peculiar to teachers in the classroom but also permeates all spheres of life.

Young (2009) as cited in Rodden (2010), asserted that younger less experienced teachers use computers more, because they are more likely to be computer fluent, had more technologically rich teacher training and are less likely to be limited by previous habits, perceptions or attitudes, than older teachers. Lee (1997) pointed out that many older teachers have not had any computer education when training and as a result are in need of training to allow them to make use of computers in their work.

Cavas (2009) revealed that there is a relationship between teacher's age and their computer attitudes. Another study by Korte (2007) concluded that younger teachers appear to be less recognized about the benefits of digital technology in learning. A report by the European Commission in 2002 and cited in Rodden (2010) found that age is a factor in the use of computers and the internet, arguing that the percentage of teachers using computers falls as their ages increase, although the report acknowledged that the importance of this factor is declining. Bradley (1997) again, cited in Rodden (2010), pointed out that, although computer anxiety may increase with age, this does not mean that training or professional development should be specifically targeted at older teachers. They strongly dispute the notion that because computer anxiety may increase with age, younger teachers are unlikely to need training in digital technology.

Institution Related Barriers

The environment or conditions prevailing in the various institutions or schools can also be a factor that will inhibit the integration of digital technology into the learning and teaching process. These conditions can be varied depending on

where the school is located and the class or category of the school. Some of these include but not limited to the following:

- ❖ Technical problems and shortage of computers laboratory
- ❖ Lack of detailed planning into how digital technology can be used to enhance teaching and learning.

Technical Problems and shortage of Computers in Laboratory

It is important to acknowledge that digital technology can have technical problems and contingency planning is necessary to ensure that alternative strategies are in place. Where the infrastructure and the platform for the application are unreliable, the output may be affected and this can adversely, affect pupil motivation.

As computers are becoming more sophisticated and the range of software used by schools continues to increase, the schools must recognize the need to employ more and highly qualified technical staff. However, with pressure on budgets and competition from the commercial sector for the best staff, it is becoming increasingly difficult for schools to attract and retain technical staff with the appropriate skills and experience.

Lack of detailed Planning into how Digital Technology could be used to Enhance the Teaching and Learning Process

Much of the research highlights the need to carefully plan the use of digital technology in lessons. Sutherland (2002) sumed this up as, “digital technology alone does not enhance learning, how digital technology is incorporated into learning activities is what is important”. Abbott (2001) also, stressed the importance of detailed lesson planning when using digital technology and that

pupils must be encouraged to understand the process involved rather than simply focusing on the output. Some teachers may use digital technology as a way of encouraging independent learning skill which needs to be planned and supervised. Though it is an effective tool in the hands of an effective teacher, and not a panacea in its own. It would seem that success depends on the knowledge of the teacher and his ability to integrate digital technology in the curriculum. BECTA (2004) suggested that success comes when teachers use applications that open up new ways of working. It acknowledges that this involves planning and imagination, and the result will be "spectacular"

Constructivism Theory

The word constructivism comes from the word construction or structure. The Constructivism theory emphasizes that good and real learning information is not based on what the instructors says or the learners heard even if the learners repeating this information over and over. In addition, Fox (2001) cited that constructivism theory emphasize that the learners construct and built the information inside their mind based on their experiences and prior knowledge. This constructing for the information influences the learners' environment, society and language.

On the other hand, Kalina (2009) also cited that learners have their own methods, ways of understanding and experiences to build knowledge, which affects the learning processing. This means that instructors will spend so much time to repeat and confirm the information, but these ways will not help the learners to retain the information in their mental way. Additionally, there are very important points that explains constructivism theory, which are:

i. The learners working within their mind individually in order to build their own knowledge, which explains that, the knowledge is not transmitted to them in a way or another.

ii. The learners will use their own experience and prior knowledge to explain new knowledge.

iii. Learning is an active dynamic process, which the learners use their sensory receptors to build the meaning from it.

iv. Learning is social and related to the community that the learners live, which effect the individual's construction of information. In fact, the learners learn new things with a new learning way to learn better.

v. The important components for learning new things are understanding the content and having old knowledge experience that the learners built their information from.

vi. In constructivism the best learning will be learning form mistakes because when the learner makes the mistake (he/she) tries to move on from that mistake, which gives a good chance to build their knowledge from what they learnt from that mistake.

vii. The learning experience happens, when the learner practices not from teaching or hearing the information.

viii. The learning is evidentiary and contextual because human being does not learn facts or theories, but the learners learn cause and consequence or relationships for what they want to learn.

In fact, constructivism is not a new learning theory that rises in these days. It can be observed that constructivist theory reaches all the way from Socrates, Plato, and Aristotle (from 320 470 BC. AD) works when all of them spoke about

(Creation of Knowledge). In addition, there are three top persons that made a real good impact in order to demonstrate the pattern of constructivism theory and they are John Dewey, Lev Vygotsky, Jean Piaget.

The benefits and positive points from using constructivism are listed below:

i. The knowledge that learners construct and build are able to transfer from sitting to another or information that the learner learned in one class will be able to use it in other class, for example, learn circular shape in class can transfer to another setting like wheels' car.
ii. Working in groups make the learners develop their skills in order to express their needs.
iii. Develop prior knowledge and experience of the learners.
iv. Learners can transfer skills and knowledge they built to their real world.
v. The learners can collaborate with teachers, friends, family and society.
vi. Constructivism theory helps the learner solve their problems.
vii. Learners construct their knowledge so they actually own their information.

In fact, constructivism theory is one of the most important theories that is used in education setting. It is also one of the best theories that deal with any change or modification occurs in the educational environment. Along with working to harness this change to further enhance the status of this theory in the educational environment. In addition Lunenberg (1998) cited that the most significant change that constructivism theory adapts is integration of technology in education setting. Indeed, constructivism theory has been able to use technology to serve constructivism principles theory. Even constructivism became one of the main approaches that followed by integration of technology in education.

Technology is developing every day and it is become involves in the teaching method. We know that the technology adapts in all age, any groups of learners, and any learning style. On the other hand, using technology in teaching randomly does not achieve the desired results of using it. But using technology with thoughtful scientific approach in order to integrate the technology in education has a big impact and it will be useful in development of education.

The TPACK Framework

Technological Pedagogical Content Knowledge (TPACK) identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. It builds on Shulman's (1986, 1987) idea of Pedagogical Content Knowledge (PCK) to describe how teachers' understanding of educational technologies and PCK interact with one another to produce effective teaching with technology. The conception of the framework has developed over time and through a series of publications, Mishra (2006) and Koehler (2008). At the heart of the TPACK framework, is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). The TPACK approach goes beyond seeing these three knowledge bases in isolation. The TPACK framework goes further by emphasizing the kinds of knowledge that lie at the intersections between three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).

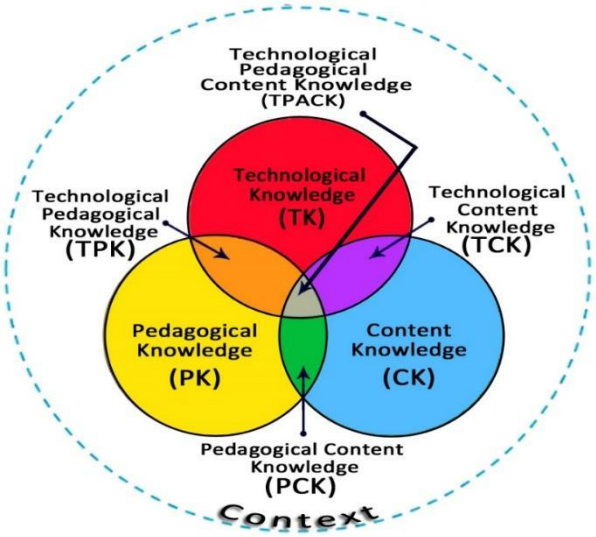

Figure 2.1.1 The TPACK framework and its knowledge components. *http:// matt-koehler.com*

Content Knowledge

Content knowledge (CK) is teachers' knowledge about the subject matter to be learned or taught. The content to be covered in junior high school science or history is different from the content to be covered in an undergraduate course. Knowledge of content is of critical importance for teachers. As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge (Koehler, 2009). Knowledge and the nature of inquiry differ greatly between fields, and teachers should understand the deeper knowledge fundamentals of the disciplines in which they teach.

Pedagogical Knowledge

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

Technology Knowledge

Technology Knowledge (TK) is the Knowledge about certain ways of thinking about, and working with technology, tools and resources. Working with technology can apply to all technology tools and resources. This includes understanding information technology broadly enough to apply it productively at work and in everyday life, being able to recognize when information technology can assist or impede the achievement of a goal and being able continually adapt to changes in information technology (Koehler, 2009).

Pedagogical Content Knowledge

Pedagogical Content Knowledge is consistent with and similar to Shulman's idea of knowledge of pedagogy that is applicable to the teaching of specific

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

Technological Content Knowledge

An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies" (Koehler, 2009). Understanding the impact of technology on the practices and knowledge of a given discipline is critical to developing appropriate technological tools for educational purposes. The choice of technologies affords and constrains the types of content ideas that can be taught. Likewise, certain content decisions can limit the types of technologies that can be used. Technology can constrain the types of possible representations, but also can afford the construction of newer and more varied representations. Furthermore, technological tools can provide a greater degree of flexibility in navigating across these representations. Teachers need to master more than the subject matter they teach, have a deep understanding of the manner in which the subject matter can be changed by the application of particular technologies and understand which specific technologies are best suited for addressing subject-

matter learning in their domains. According to Graham (2009), studies should be conducted with current teachers with all levels of technological knowledge and in all school situations from wealthy suburban schools to struggling urban schools to spare rural schools.

Technological Pedagogical Knowledge

TPK is an understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies (Koehler, 2009). To build TPK, a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed. TPK becomes particularly important because most popular software programs are not designed for educational purposes. Software programs such as the Microsoft Office Suite (Word, PowerPoint, Excel, Entourage, and MSN Messenger) are usually designed for business environments. Web-based technologies such as blogs or podcasts are designed for purposes of entertainment, communication, and social networking. Teachers need to reject functional fixedness (Duncker, 1945) and develop skills to look beyond most common uses for technologies, reconfiguring them for customized pedagogical purposes.

Technology, Pedagogy, And Content Knowledge

TPACK is an emergent form of knowledge that goes beyond all three core components (content, pedagogy, and technology). Technological pedagogical content knowledge is an understanding that emerges from interactions among

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

By simultaneously integrating knowledge of technology, pedagogy and content, expert teachers bring TPACK into play any time they teach. Each situation presented to teachers is a unique combination of these three factors, and accordingly, there is no single technological solution that applies for every teacher, every course, or every view of teaching. Rather, solutions lie in the ability of a teacher to flexibly navigate the spaces defined by the three elements of content, pedagogy, and technology and the complex interactions among these elements in specific contexts. Ignoring the complexity inherent in each knowledge component or the complexities of the relationships among the components can lead to oversimplified solutions or failure. Thus, teachers need to develop fluency and cognitive flexibility not just in each of the key domains but also in the manner in which these domains and contextual parameters interrelate, so that they can construct effective solutions. This is the kind of deep, flexible, pragmatic, and nuanced understanding of teaching with

technology we involved in considering TPACK as a professional knowledge construct. The act of seeing technology, pedagogy, and content as three interrelated knowledge bases is not straightforward. These components exist in a state of dynamic equilibrium or, as the philosopher Kuhn (1977) said in a different context, in a state of ‘‘essential tension’’. Viewing any of these components in isolation from the others represents a real disservice to good teaching. Teaching and learning with technology exist in a dynamic transactional relationship (Bruce, 1997) between the three components in the framework; a change in any one of the factors has to be ‘‘compensated’’ by changes in the other two (Mishra, 2006). This view inverts the conventional perspective that pedagogical goals and technologies are derived from content area curricula. Things are rarely that simple, particularly when newer technologies are employed. The introduction of the Internet, for example – particularly the rise of online learning – is an example of the arrival of a technology that forced educators to think about core pedagogical issues, such as how to represent content on the Web and how to connect students with subject matter and with one another (Peruski, 2004). Teaching with technology is a difficult thing to do well. The TPACK framework suggests that content, pedagogy, technology, and teaching/learning contexts have roles to play individually and together. Teaching successfully with technology requires continually creating, maintaining, and re-establishing a dynamic equilibrium among all components. It is worth noting that a range of factors influences how this equilibrium is reached.

Computer Assisted Instruction and Learning issues

Computer Assisted Instruction started in the 1950s and 1960s, mainly in the USA. Pioneers such as Suppes (Stanford University), Kemeny and Kurtz and Bitzer (PLATO, University of Illinois, were among the first to use a computer as part of the learning process. The early CAI programs were rudimentary by today's standards, with mainly text-based interfaces. Bitzer was one of the first to realise the importance of graphics and sound in the teaching process. Initially, CAI programs simply tried to teach a particular topic without a basis on any particular educational philosophy. The TICCIT (Time-Shared Interactive Computer Controlled Information Television - (Merrill, 1983) at the Brigham Young University, was based on a specific instructional framework that dictated the actual hardware. The Logo project (Papert, 1980; 1993) was probably the first CAI system that was based on a specific learning approach (the experimental, discovery learning approach).

Benefits of CAI

CAI brings with it several potential benefits as a teaching/learning medium. These include self-paced learning, self-directed learning, the exercising of various senses and the ability to represent content in a variety of media. As these topics will be explored in greater detail throughout this document, only a brief overview will be given here. Although CAI has not been studied in the EL community situation, many of the benefits in the general CAI context should also be available in the EL one. With self-paced learning, learners can move as slowly or as quickly as they like through a program. If they want to repeat some task or review some material again, they can do so as many times as they choose. The program will not be interrupted by repetitions. Learners can skip over a

topic if information is already known, making the learning process more efficient. As regards self-directed learning, learners can decide what they want to and in what order. It has been observed that learners have different learning styles and use different learning strategies. Various studies (Entwistle, 1981; Ford, 2001) have shown that when learners can learn in a way that suits them, improvements in the effectiveness of the learning process improves. Humans are multi-sensorous. The more senses by which we receive information, the easier it is to remember. According to Fletcher (1990), people remember 20% of what they hear, 40% of what they see and hear and 75% of what they see, hear and do. The fact that the computer can exercise various senses and present information in a variety of media can enhance the learning process. Meskill (1991) reported that computers encourage learning as they provide a stimulating environment and promote enthusiasm. Computers may help the reticent pupil who is afraid to make mistakes in a classroom situation (Meskill, 1996). They are good for online reference which is useful in a language learning situation (for example, online dictionaries (Leffa, 1992)) and can cater for pupils of different abilities. Also, the ability to provide quicker (and perhaps more directed) feedback is a further benefit of CAI.

CAI is Not Perfect

CAI is not without its problems. With self-access programs, learners can be left on their own too much and may feel overwhelmed by the information and resources available. On the other hand, there may be too much direction from the computer if classroom methods are transferred to the computer. Dawson (1997) stated that the tendency to use multimedia “gimmicks” should be avoided and that due attention must be paid to current theories on language

acquisition. However, this does not mean that multimedia should be avoided. Some researchers (Levy, 1997; Meskill, 1996) believed that meaningful multimedia practices are possible and can result in more learning. Malfunctioning equipment cannot only result in lost time but also create a negative attitude towards CAI. While the ability to follow links in a Web-based learning system can be of benefit, learners may lose time in navigation. CAI is not yet a mature field. While various CAI models exist, not all CAI programs offer all the benefits of CAI. Sometimes what is theoretically advocated is not implemented in practice (either due to lack of knowledge or technological unfeasibility). Sometimes, the effective or good practices are not easy to identify. Continuing research will help to advance the field of CAI. One interesting research area is that of Web-based Adaptive Educational Systems (WAES), where the system adapts to the learner, providing different levels of information, help and feedback (Brusilovsky, 2000).

Types of CAI

CAI systems fall into two basic types: tutor or tool (Levy, 1997), although the term CAI often refers to computer tutors. In the tutor classification, the computer has the information to be learnt and controls the learning environment. A CAI tool, on the other hand, enhances the teaching process, usually by focusing on one particular learning task and aiming to improve it. Within the tutor classification, there are four modes: drill and practice, tutorials, simulations and games (Gloor, 1997). Drill and practice (also known as "Drill and Kill") is suited to the behaviourist model, with repeated practice on lower-level cognitive skills. Although often frowned upon, it can be useful in certain contexts. The tutorial mode is probably one of the most common ones within

CAI. In this mode, the computer presents the information, guides the learner through the system, allows the learner to practise and then assesses the learner. In simulation mode, the learner works with a simulation of the real world. Simulation is used where it is not practical or feasible to provide the learning in "real-life" (for example, pilot training). In games mode, there is generally a competitive element (e.g.time constraints or a race). The idea is to reinforce knowledge that the learner is assumed to have. While it is often more difficult to develop CAI programs in the simulation and games modes, learners tend to find them entertaining and challenging.

CAI and its Work

It is still unclear exactly what type of instruction is suitable or preferable in a given situation. However, several findings for CAI are generally commendable. Pupils using CAI have performed moderately better than the control group (using various testing methodologies), (Kulik, 1994). They take about 30% less time to complete their tasks (Fletcher, 1998). Schmitt (1990) reported that CAI is at least as effective as non-computer-based instruction. Kosakowski (1998) summarised the observed benefits of CAI, which are: the effective use of educational technology for drill and practice of basic skills (Kulik, 1994), that pupils learn more, and more rapidly in CAI courses (Kosakowski, 1998), that the complex multimedia technologies available make learners have more control over the learning process, that pupils feel more successful, are more motivated to learn and have increased self-confidence and self-esteem (Bialo, 1995) and that teachers and administrators can use computers and information technologies to improve their roles in the education process.

Testing the Effectiveness Of CAI

Tests to evaluate the effectiveness of CAI usually follow the psychometric tradition. This involves using standardised proficiency tests to measure the effects of instructional programs or methods on pupil learning outcomes and comparing the results. In the psychometric tradition, there will typically be two groups of pupils: one group will use a CAI program and the control group will be taught in the traditional classroom setting. Sometimes a pre-test is carried out whereby each group is examined on knowledge before partaking in the learning process. At the end of the instruction period, the two groups undertake a test to determine what has been learnt. This type of evaluation of the CAI process is perhaps the most common because it follows traditional methods and is the easiest and least labour intensive to perform. However, it has been recognised that the psychometric tradition alone cannot fully analyse CAI effectiveness as it is often too simplistic.

According to Chaudron (1988), the interaction between the learner and the CAI program is observed. Interaction analysis is pedagogically motivated. Pedagogically-motivated research tries to determine what works? What resources does the learner use? Is the program being used in the way that the designer intended? However, as it is generally agreed that CAI programs are at least as effective as traditional methods, it will be assumed that they are of benefit, especially where the traditional methods may not be available.

Learning and Learning Styles

One of the criticisms of CAI in general is that it sometimes tends to focus on what is technologically possible, without taking into consideration pedagogical issues. This section briefly reviews the topic of learning. Second Language

Acquisition (SLA) provides insight into how learners learn second languages and the impact of different learning situations on the language learning process. SLA is important in the field of CAI. Definitions of what learning is about and it is difficult to find one that scholars agree with. Mayer (1982, p. 1040) defined learning as a "relatively permanent change in a person's knowledge or behaviour due to experience". However, Kolb (1984) suggested that determining that learning has occurred and what has been learnt may depend on one's perspective.

Learning Style and CAI

CAI has the potential as an instructional medium to individualise the learning process (Kolb, 1984). It may be more beneficial to some learners than others. For example, graphics and visually active instruction help field dependent learners. Motivated learners who require specific instruction in a sequential format and enjoy frequent feedback, will generally benefit from CAI. Kinaesthetic, peer-oriented learners will not gain as much from CAI (Dunn, 1979) as there are limitations regarding what a learner can physically do with a computer (as least with the current technological restrictions). Each model can be used to identify those learner types that will benefit most from CAI. In the Kolb model (Kolb, 1984), it is the concrete learners (i.e. those that learn from direct involvement in a new experience) that benefit. In the Gardner model (Gardner, 1983), different techniques can be used to accommodate each type of intelligence (e.g. moving things around with a mouse for bodily intelligence, paint for spatial and telecommunications for interpersonal intelligence). According to (Herrmann, 2001), it is the right-brain learners who will gain most from CAI. Under the Gregorc mind styles, the Concrete-Sequential (hands-on)

and Abstract-Sequential (logical) learners are suited to CAI whereas the Concrete-Random (risk-takers) and Abstract-Random (holistic) learners can often become flustered (Kolb, 1984). Ideally, the aim is to create an interface that can accommodate all learners, but this may be hard to do. Also, it may be difficult for people that cannot adapt their learning style to CAI. Some degree of style flex (i.e. when the user learning style is adapted to match the CAI application) may be required. This is not necessarily a bad thing as it may expand the learner's style range but it should not be such that it causes undue stress on the learner (Kolb, 1984). However, the studies are not conclusive.

Ross (1991) found that CAI may not be suitable for all learning styles. Interestingly, theories of learning styles and the testing of the interaction between learning style and CAI have mainly been carried out in developed countries and with learners familiar with traditional educational environments. Most EL community members would have limited formal education. Very little is known about the learning styles of those with minimal exposure to the traditional education setting. Culture may also play an important role. Cultures that have a well-established hierarchical system may foster field dependent learners, for example. People who live in an environment in which learning usually takes place by doing, may tend to have a concrete-sequential mind style. While there may be no specific information about the learning style preferences of people from EL communities, it cannot be assumed that they have a homogenous learning style. It is more likely that they will probably show somewhat similar variation to people from non-EL communities

Learner Autonomy (LA)

Learner Autonomy is seen as one of the most important elements of CAI. It has been widely discussed in the research literature (Little, 1991). It is generally defined as an ability to take charge of one's own learning (Littlewood, 1996). Learner Autonomy occurs when the learner has the “capacity for detachment, critical reflection, decision-making and independent action" (Little, 1991 p.4). Independence and individual responsibility are core notions of LA. With the increased use of modern communications technology (email, discussion groups) and co-operative approaches to learning, most noticeably in CAI, the notion of learner interdependence (between a group of learners and teacher) has emerged (Little, 1991).

In the traditional classroom situation, all the learners must follow the teacher and often LA is not encouraged. The task to be learnt is decided by the teacher, who also controls the pace of a lesson. This makes it hard on many learners, whose ideal learning pace is different from that established by the teacher. With a CAI program, (Little, 1991)learners can work at their own pace. The learner can spend more time on those topics that are causing difficulty. Information can be reviewed and tasks can be repeated until the learner is happy to move on to a new topic. The learner feels he or she is in control and that usually enhances satisfaction levels with the learning process.

LA – The Benefits and Problems

LA has many benefits. It increases the motivation to learn and thus the learning effectiveness (Ulitsky,2000). Self-esteem can be raised and often actual/perceived proficiency (in the learning task) is enhanced. Little (1991), however, cautioned against assuming that learner autonomy equals self-

instruction, in that self-instruction is not the only or sufficient condition under which learner autonomy can occur or be exercised. Learners can gain greater autonomy when they are aware of different learning strategies and their effectiveness and know how to use them. Despite the accepted benefits of LA, its potential has not been fully realised. Many educational systems do not explicitly teach their students how to be autonomous learners and this gives rise to problems with some CAI programs. LA can be very powerful if used correctly, but if not handled correctly it can negatively affect the learning outcome, as learners can become confused and frustrated by their new found freedoms.

Learner-Centred CAI

The concept of Learner-centred design is an important one in education. It means focusing on the learner and his/her needs and motivations. The concept of learner-centredness is also important in the area of curriculum/syllabus design. Various authors have proposed Learner-centred principles. Hoven (1999) proposed the following five principles for learner-centred CALL

1. A socio-cultural methodology provides a suitable paradigm.

2. Learner-centred features include recognition of features and their propensity to change. Depending on its potential to be modified, a feature will either be identified as less amenable to change (e.g. sex or age) or somewhat/more amenable to change (e.g. learning style) and dealt with accordingly.

3. Learners must be taught how to manage control in a learner-controlled environment.

4. Task-based pedagogy (e.g. one that recognises that language learning is a developmental process – Kumaravadivelu, 1993) is a good framework to use.

5. Models of good practice from SLA and CALL should be used.

Locus of Control

Definition

The locus of control refers to what controls the learning process. A program is defined as either program controlled or learner controlled. Learner-controlled programs (as opposed to program-controlled programs) allow learners to decide what and how they are going to learn. Learner control can refer to many different factors. It may refer to the learner's ability to control the amount of practice, feedback and review. It can also refer to the method of instructional delivery (lecture, discussion). The amount of instruction may also be under learner control. Under learner control, learners can tailor instruction to their own needs and preferences. We have seen that learners have different learning styles and the ability to tailor a program to their own style should improve the learning outcome. Learner control over the learning environment is pedagogically compelling (Meskill, 1991).

Increased Learning

Ulitsky (2000) stated that the potential of learner control has not been empirically proved. Different studies have produced different answers to the question of whether or not learner control actually increases learning. In theory, the ability to tailor a program to one's own style preferences should enhance learning. Some studies (Ross, 1981) have shown that learners learn less with learner controlled programs. However, other studies (Gray, 1987; Ross, 1991) have reported that learners learn more with learner-controlled programs.

The Learner Control Paradox

On the one hand, the increased flexibility and customisation offered by learner-controlled programs fits well with the "each learner is an individual" and learner autonomy philosophies. However, sometimes the switch to a learner-driven approach does not work well. Why would this be the case? Surely, allowing learners to determine what, when and in what order they learn, would enhance the learning outcome? One explanation is that the learner does not know "how to learn". While the advantages of such an approach may work for higher-ability learners, this may not be the case for lower-ability learners. O'Sullivan (2000) contended that learner-centred programs may not be suitable for all types of learners. The underlying philosophy in learner-centred programs is that learners are aware of their needs and know how to achieve them. While this may be the case for higher-ability learners, is does not always hold for lower-ability learners. Lower ability learners need the guidance provided by a Program-Centred program to get the maximum benefit from a CAI program. A program that makes a relatively high amount of practice available to learners as the default route is likely to be more effective than one that offers less practice opportunities. Several researchers (Salomon et al., 1989; King, 1991) refer to the value of providing online learning guidance to students lacking (language) learning skills and strategies. Well-designed instruction in learning strategies is the most effective method in assisting all learners to control their own learning process. However, up to now, the whole process of learning strategy instruction has not been extensively integrated into the teaching process, perhaps because it is a relatively new element in the whole process. The locus of control should be viewed as a spectrum rather than an either/or dichotomy. A CAI program can

be considered to allow more or less learner control. With lower ability learners, the presentation of more (rather than less) information and exercises should be provided as the default option. Learners tend to stick with the default settings (eventually, if not initially) and thus the program should guide the learner through the system in a "fuller" (more information) rather than a "learner" (less information) mode.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter is about the various techniques that will be used to assist the study. It covers the following; targeted population, sampling technique(s), the research design and study area. The chapter also takes into consideration the data collection instrument, data collection methods and data analysis.

Research Design

The descriptive method was used in this research, taking into consideration the research objective and statement of the problem. This design will not actually influence the respondent but rather will motivate them to open up and allow them to provide as to what is expected of them. Iddrisu (2009) recommended the survey technique for research where attitudes, ideas, comments and public opinion on a problem or issue are studied. Each person's view will not be altered but the respondents' view will greatly help such research to be successful.

Study Area

Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas are areas in Ashanti Region. People living in the Ahafo Ano South East district are mostly farmers while that of Nhyiaeso sub-metropolitan Assembly are business minded. This farming community is located about 45 minutes' drive from the Regional capital, Kumasi, while the other group of people who are into business are in Kumasi and its environs around the capital city, Kumasi. Teachers are facing a lot of problems with pupils in Ahafo Ano South East

district because they preferred to work on the farms to going to school but the situation of those pupils in and around the Nhyiaeso sub-metropolis is different.

Population

The total number of individuals or items under consideration is all about population. Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas are made up of circuits of schools. All Junior High schools in these areas belong to a circuit. The said areas are located in the Ashanti Region of Ghana and all the schools are mixed. There are six circuits in Ahafo Ano South East district. A simple random sampling was conducted to take three out of the six circuits for fairly representation of the population. Nhyiaeso circuit is a subset of Nhyiaeso sub-metropolitan Assembly. Nhyiaeso circuit has all the resources when it comes to digital technology. A well-equipped computer laboratory, trained teachers and pupils in the use of digital technology to facilitate teaching and learning. The accessible population for the study was second year teachers and pupils in 2017/2018 academic year. Table 3.2 clearly shows the results of all the Four circuits which were considered and the various teachers and pupils under each circuit are as follows:

Table 3.2: 2017/2018 second year pupils and teachers in Junior High Schools in Ahafo Ano South-East district and Nhyiaeso sub-metropolis

Study Areas	Circuit of Schools	Number of second year pupils	Number of second year teachers
Nhyiaeso sub-metropolitan areas	Nhyiaeso	349	52
Ahafo Ano South East district	Pokukrom	98	14
	Adugyama	87	13
	Fawoman	101	16
	Total	635	95

Source: Field survey, 2018

Nhyiaeso circuit with four hundred and one (401) teachers and pupils, Adugyama circuit having one hundred (100) teachers and pupils, one hundred and twelve (112) teachers and pupils belong to Pokukrom circuit and Fawoman circuit with one hundred and seventeen (117) teachers and pupils. The total number of teachers and pupils in these four circuits are seven hundred and thirty (730).

Sample and Sampling Procedure

The procedure taken when selecting a part of population under a study area under research can keenly reflect Sampling. The selected samples make way for inference and conclusion of the research study to be conducted for the entire population. Sampling is not a guarantee for getting information but it enables any technique used for getting information from a smaller group, which could accurately represent the entire group. The total number of teachers and pupils ideally to be used in the study is seven hundred and thirty (730). In reality, the sample size was two hundred and forty-eight (258)

teachers and pupils. Considering the fact that the total population was made up of the sum from four (4) different circuit Junior High Schools with different populations, there is therefore the need that the sample taken from each circuit school is taken with respect to the real size of the school involved.

The four (4) circuit schools were grouped into four (4) different strata. Proportional allocation was used in calculating the size that is supposed to be taken from each stratum.

For selecting the respondent for the questionnaire, simple random sampling was used. This technique availed the opportunity for any member to have equal chance of being selected.

Sources of Data

Primary data was used as the main source of data. The use of open-ended and close-ended questions will be deployed during the data collection stage. It is normally collected through the use of both open-ended and close-ended questions. Primary data gives out first-hand experience on your data collection

Instrument for Data Collection

The main instrument used in this study is questionnaire. The questionnaires were given to the respondents (teachers and pupils) in their working environment for them to give their views on them. The questionnaires consisted of both closed and opened-ended questions. The questionnaire for analysis was broken down into three units. The first unit under review was based on the background information about the respondent. The second session discussed the first objective was to examine the outcome on the use of digital technologies to teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan area. The last unit talks about

integration of Computer Assisted Instruction (CAI) that will facilitate teaching and learning in the classroom. The open-ended questions were used to allow the respondents to express themselves without any given limit. Reliability on the part of the study was assured since all the responses gave first-hand information to the said questions. The data collected would help to achieve the purpose of the study and so justification for its use. The questionnaire which was used was adapted and modified from Rodden (2010).

Data Collection Procedure

The respondents in each area under study were visited. This happened in the mornings and afternoons break time of their working hours. Not all the respondents were willing to part-take in the research, others showed a hostile behaviour. With the permission from the various heads of the institutions visited, the researcher managed to give out the questionnaires. Data was collected from both teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas

Data Processing and Analysis

The data collected on each respondent was checked for consistency with the help of Microsoft Excel 2016. Demographics and background information was analysed with histography and pie chart.

The first research question was the effect on the use of digital technologies to teachers and pupils in Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas. The independent variable was the effect on the use of digital technologies and the dependent variables are Junior High

Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas. Cross tabulation was used for the analysis.

The second research question was which Computer Assisted Instruction will provide easy understanding of instruction. The independent variable was Computer Assisted Instruction and dependent variables were Junior High Schools in Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas. Cross tabulation was used for the analysis.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

A total of two hundred and fifty-eight (258) questionnaires were administered and all retrieved, which represented a 100% response rate.

Demographic characteristics and background information

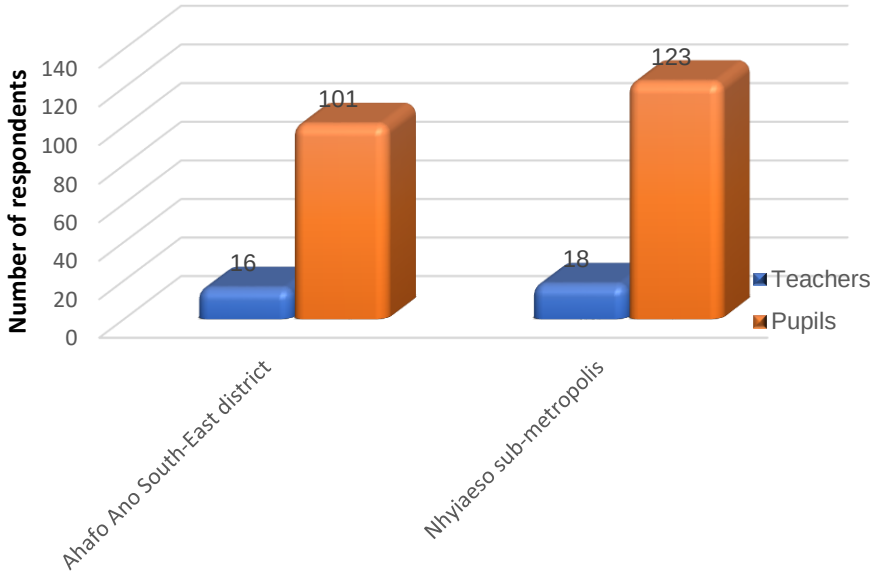

Figure 4.1.1: Type of Respondent

Source: Field survey, 2018

The figure 4.1.1 shows clearly the type of respondent and the area under study. The number of respondents from the Ahafo Ano South East district were 117 out of which 16 (13.7%) were teachers and 101 (86.3%) were pupils. The Nhyiaeso sub-metropolis had 141 number of respondents out of which 18 (12.8%) were teachers and 123 (87.2%) were pupils. The above information

in the table clearly shows that most of the respondents were in the Nhyiaeso sub-metropolis.

Basic education is compulsory for every pupil in Ghana. The respondents in Nhyiaeso have shown more interest in going to school more than Ahafo Ano South-East district. Although education is free in Ghanaian public schools, there might be an economic challenge which deters parents from sending pupils to school. Most of the parents in Ahafo Ano South-East district are subsistence farmers and some of them do not value the importance of education and so they prefer their children assisting them on the farm.

Education is in balance when the ratio between males and females are equal. Putting gender equity in place in the classroom, is a key to connecting schooling and citizenship with human rights (Aikman, 2006). Present education cannot completely remove gender inequality. Reading from the figure 4.1.2, the number of males in Ahafo Ano South-East district was less than Nhyiaeso sub-metropolis but that of females was the other way around.

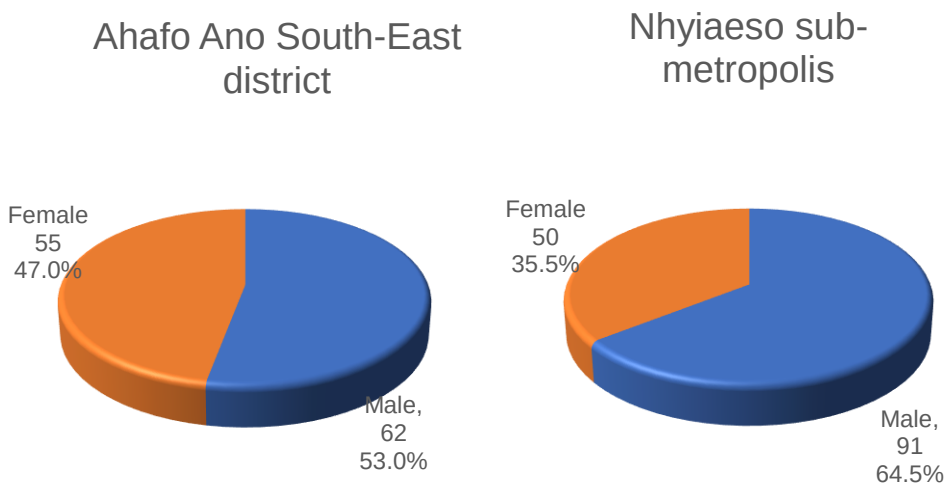

Figure 4.1.2: Gender of Respondents
Source: Field survey, 2018

In all there were moremales in both districts than females. Both genders need educational awareness in order to promote equal opportunity for all. Gender balance will improve the declining state of women empowerment as equal opportunities are given to all.

Every country depends on technology for development. Technology works with electricity. Technological devices facilitate teaching and learning in the classroom. This implies that for easy learning and teaching to take place, there has to be a supporting mechanism. Looking at the number of respondents; almost all of those from Nhyiaeso sub-metropolis have electricity in their schools. Electricity distribution in the Ahafo Ano South-East district is not as widespread, compared with Nhyiaeso sub-metropolis. The limited access to electricity in the Ahafo Ano South East compared to Nhyiaeso sub-metropolis could affect pupils ability to use technology in Ahafo Ano South-East district a lot as indicated in the table 4.1.1

Table 4.1.1 Computer distribution

		Location of school		Total
		Ahafo Ano South East district	Nhyiaeso sub-metropolis	
Number of individuals with computers	Yes	1 0.9%	123 87.2%	124 48.1%
	No	116 99.1%	18 12.8%	134 51.9%
Total		**117**	**141**	**258**
Number of schools with computers	Yes	1 0.9%	139 98.6%	140 54.3%
	No	116 99.1%	2 1.4%	118 45.7%
Total		**117**	**141**	**258**

Source: Field survey, 2018

The use of computers facilitates easy learning and teaching. The computer is now a companion that cannot be left out when it comes to teaching and learning. Everywhere one finds himself or herself, there has to be a friend called computer. Computers assist pupils to learn no matter where they are. Reading from table 4.1.1, Ahafo Ano South-East district respondents were lacking in terms of the use of computers and this is a challenge to their academic performance.

Thinking is engaged by activities, which can be fostered by computer or teacher (Jonassen, 2000). The computer itself is not an issue but rather what to do with it. In-order to use a computer, there are some basic computer skills that one needs to know. These fundamentals will allow the smooth running of the computer. If one is lacking these fundamentals, then the use of the computer might be a challenge to that particular person. Some of the fundamentals are copy text or image, paste text or image, open or install a program, type a document, click and double click, etc.

As shown in table 4.1.2, of a total number of 117 respondents from Ahafo Ano South-East district out of which, 17(14.5%) had the fundamental basic skills of using the computer while the rest were not up-to-date with the basic skills.

Table4.1.2 Computer literacy skills

		Location of school		
		Ahafo Ano South East district	Nhyiaeso sub-metropolis	Total
Average number of respondents with computer literacy skills	Yes	17	134	151
		14.5%	95.1%	58.5%
	No	100	7	107
		85.5%	4.9%	41.5%
Total		**117**	**141**	**258**

Source: Field survey, 2018

Nhyiaeso sub-metropolis also recorded 141 respondents out of which 134 (95.1%) who were conversant with the fundamental skills in the use computer. To have a computer does not mean you know everything about it. Proper usage of the computer means that you might have known some basics. A lot of people have computers but the ability to use it is a problem. To improve upon the computer basics there has to be gradual or constant practice with the computers.

Respondents in Nhiayeso sub-metropolis understand why there is the need to have basic computer literacy skills to help improve and adopt the different teaching methodology which will facilitate teaching and learning in the classroom. On the other hand, Ahafo Ano South-East lacks a lot when it comes to basic computer literacy skills. This is due to low income earnings of the residents there. Majority of the residents are subsistence farmers who depend on their farm products for their livelihood. Computers use electricity and because of the non-availability of electricity in some parts of Ahafo Ano South East, using a computer becomes a challenge.

The Internet enables its users to get connected to the World Wide Web. Although one needs to know much about the computer internet to get access to information, to aid in teaching and learning is very paramount.

Table 4.1.3, shows that the number of respondents from Nhyiaeso sub-metropolis clearly gave a massive support to the use of the internet while Ahafo Ano South-East district showed a decline in support to that. When it comes to the use of internet, those in areas that electricity is deprived hardly get the necessary network support to enable them have internet services. As soon as one gets to these areas, internet services become a challenge. The

network companies prefer to work in cities much more than small towns and villages in Ghana. This situation is a huge problem for pupils and teachers in these particular areas.

Table 4.1.3 Basic Internet technology skills

		Location of school		
		Ahafo Ano South East district	Nhyiaeso sub-metropolis	Total
Average number of respondents who can use the internet	Yes	0	56	56
		0.0%	40.0%	21.8 %
	Somehow	1	18	19
		0.9%	12.9%	7.4%
	No	116	66	182
		99.1%	47.1%	70.8 %
Total		**117**	**141**	**258**
Average number of respondents who can use technology tools to teach or learn	Yes	1	101	102
		0.9%	71.6%	39.5 %
	Somehow	0	10	10
		0.0%	7.1%%	3.8%
	No	116	30	146
		99.1%	21.3%	56.6 %
Total		**117**	**141**	**258**

Source: Field survey, 2018

Apart from the computer, there are other technological tools like projector, television, mobile phone, camera etc. that aid in teaching and learning. These tools assist teachers and pupils so that there can be proper participation during lesson delivery. Again, from table 4.1.3, the ability of the teacher and the pupil to use these technological tools will facilitate teaching and learning.

Ahafo Ano South-East district recorded a total of 117 respondents out of which only one of them opted for “Yes”, one of the respondents for “Somehow” and the rest are saying “No” when it comes to the use of technology tools. This

demonstrates how ignorant they are when it comes to technology issues. On the other hand, of the 141 respondents for Nhyiaeso sub-metropolis, 101 (71.6%) responded "Yes", 10 (7.1%) of the respondents responded "some how" and the remaining 30 (21.3%) of the respondents said "No". Economic challenge might be a problem to teachers and pupils in Ahafo Ano South-East district as the numbers in table 4.1.3 are not favouring them. Training of teachers and pupils on the use of technology tools is a problem to these respondents. Pupils and teachers need a lot of assistance in order to operate these technological tools. Training of persons in Ghana come with a cost. If a s chool somehow get the opportunity of getting a technological tool, the skilled person to assist them might deter them to hold on for a while since everything in Ghanaian public schools depends on the government. The Ghanaian government supports everything in basic schools and so if the government has not released the money for the support, then it might be a challenge for the schools.

The main duty of teachers is to teach using methodologies that will help pupils to understand the topic being treated. Pupils understand better if the teacher is well advanced in the said topic and also has the skill to impart that knowledge to the pupils. The teaching and learning becomes effective when ICT is used as a complementary tool. There are different methods in which the computer can assist the teacher and learner. Reading from figure 4.1.3, the number of respondents (pupils or teachers) from Nhyiaeso sub-metropolis

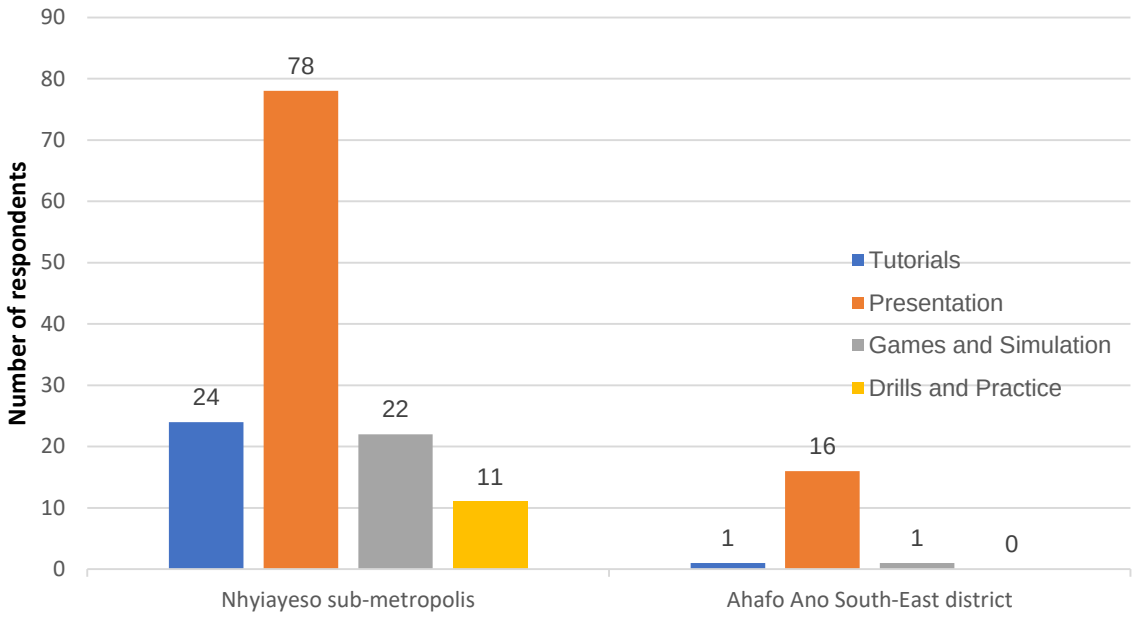

Figure 4.1.3: Methods of lesson delivery using CAI
Source: Field survey, 2018

demonstrated their ability to use the different methodology of the computer during teaching and learning. Almost the entire respondents of Nhyiaeso sub-metropolis are saying so. This shows how conversant they are, with the use of computer to aid their teaching and learning in the metropolis. Respondents from Ahafo Ano South-East district barely have or use the computer and so few of the respondents know how to use the different methodologies on the computer to teach and learn.

The ability to use CAI (Computer Assisted Instruction) will facilitate teaching and learning in and around the classroom. The district that uses CAI not only teaches very well but rather broadens the understanding of the concepts. The introduction of CAI bridges the gap between abstract and concrete learning.

Pupils see, hear and practise what is being taught.

The availability of teachers and pupils to avail themselves for instructors to assist them is a challenge. Instructors may be willing to help but due to the

non- availability of the trainees, he or she may not be able to perform that role. Due to economic challenges committing more hours to the learning of the ICT skills will deter some of the respondents from engaging in these activities since they prefer to work to learn.

Both teachers and pupils need extra tuition when it comes to using computer. The use of computer is not a book which requires reading but rather it needs hands-on practice. Reading books about the use of the computer is very easy but sitting down to work on the computer is sometimes very tedious. Due to lack of computer distribution and non-availability of electricity, Ahafo Ano South-East district is greatly affected more than Nhyiaeso sub-metropolis when it comes to hands-on practice with the computer.

Table 4.1.4 is about the impression of the respondents who are being affected by the non-use of CAI.

Table 4.1.4 Factors affecting CAI approach

		Location of school		
		Ahafo Ano South East district	Nhyiaeso sub-metropolis	Total
Number of factors affecting respondents non-use of the CAI approach in the classroom	Lack of time to use computers	16 13.7%	9 19.1%	25 15.2%
	Lack of knowledge about computers	1 0.9%	9 19.1%	10 6.1%
	Fear	20 0.0%	3 6.4%	3 1.8%
	Lack of computer training	80 85.5%	12 25.5%	112 68.3%
	Little previous experience	0 0.0%	14 29.8%	14 8.5%
Total		**117**	**47**	**164**

Source: Field survey, 2018

Again, teachers and pupils are afraid to use the computer because of their perception. They have the notion that the computer is very expensive and so if something goes wrong with it, it might be their responsibility to pay for that. This idea has always been a stumbling block which is preventing most respondents from using these machines. Some of the parents prevent their pupils from using their computers when they are not around. Some of the teachers are also reluctant to learn how to use the computer. These perceptions and attitudes hinder the use of CAI in the classroom.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Introduction

This chapter consists of the summary of findings, conclusion that was drawn and recommendations for solving any problem found.

Summary

The main aim of the study was to examine the outcome on the use of digital technologies to teachers and pupils in the Ahafo Ano South East district and Nhyiaeso sub-metropolitan areas and also to integrate Computer Assisted Instruction (CAI) that will facilitate teaching and learning in the classroom. The findings of the study revealed the following key factors contributing to the non-use of digital technologies in junior high schools in the Ahafo Ano South East district and the Nhyiaeso sub-metropolis;

I. Limited access to electricity

II. Lack of adequate Computer distribution,

III. Lack of fundamental Computer literacy skills,

IV. Economic challenge

With regard to the integration of computers assisted instruction in teaching and learning, the following factors prevented the successful integration;

- Lack of Internet and technology skills,
- Lack of Computer assisted instruction methodologies,
- Lack of time to use computers,

- Lack of computer training,
- The concept of fear when it comes to technology usage.

All the factors mentioned strongly suggest the shortfall of Ahafo Ano South East district while that of the Nhyiaeso sub-metropolis was the other way round

Conclusion

It could be concluded from the study that the use of computer assisted instruction in our educational institutions is not totally a new concept to stakeholders, schools and pupils and that teachers and pupils find computer assisted instruction very useful.

Recommendations

Based on the findings of the study, it is recommended that teachers need to be trained and encouraged to integrate digital technology in their lesso n delivery. They have to be motivated enough and given the necessary support including devices, applications, and training where necessary.

Secondly, stakeholders have to take it upon themselves to encourage the use of computer assisted instruction by teachers and pupils. School authorities, firstly, have to change their policies to enable teachers integrate the use of computer assisted instruction in their curriculum and the schools must be made to allow the teachers and pupils to use these digital technologies during lesson delivery and learning. The Ministry of Education should also strongly consider the use of computer assisted instruction for lesson delivery in teaching and learning.

Suggestions for Further Research

Besides the success of the study, the scope of the project, time, and financial limitations prevented the researcher from carrying out the study on a larger scale. The current study was limited in scope as it covered the Ahafo Ano South East District and Nhyiaeso sub-metropolis in the Ashanti Region of Ghana. A replication of this study could be conducted in other schools in the country to find out what the situation is.

The study was limited as it only investigated pupils and teachers from junior high schools. Future research may want to include different levels of institutions and examine differences based on region, available resources, and teachers' technology training.

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APPENDIX A

A: QUESTIONNAIRE FOR PUPILS

I am Aboagye Stephen, a second year pupil from CoDE. I am pursuing a Master of Education in Information Technology. This questionnaire is purely for academic purpose and any response will strictly be confidential.

A. Please tick (√) where appropriate

1. Name:…….
2. Age: 10 – 19 [ ]20 – 30 [ ] 31-40[ ] 41 – 50[ ] 51 – 60[ ] Above 60[ ]
3. Teacher [ ] / Pupil [ ]
4. Gender: Male [ ] Female [ ]
5. Class level: JHS 1 [ ] JHS 2 [ ] JHS 3 [ ]
6. Location of school: Mankraso district [ ] Nhyiaeso sub-metropolis [ ]
7. Name of School:…….
8. Subject Area:……
9. Number in class: 20 – 30 [ ] 31-40[ ] 41 – 50[ ] 51 – 60[ ] 61 – 70[ ]
10. Years in teaching field: 1-3yrs [ ] 4- 6yrs[ ] 7- 10yrs[ ]Above 10yrs[ ]
11. How many hours do you use the computer in a day?
    Less than 1hr [ ] 1-3 hrs [ ] More than 5 hrs [ ]

B. Please tick (√) where appropriate

12. Does your school have electricity? YES [ ] NO [ ]
13. Do you have a personal computer at home? YES [ ] NO [ ]
14. Does your school have computers? YES [ ] NO [ ]
15. Have you ever turned on the computer? YES [ ] NO [ ]
16. Have you ever turned off the computer? YES [ ] NO [ ]
17. Have you ever copied a text on the computer? YES [ ] NO [ ]
18. Have you ever copied an image on the computer? YES [ ] NO [ ]
19. Have you ever pasted a text on the computer? YES [ ] NO [ ]
20. Have you ever pasted an image on the computer? YES [ ] NO [ ]
21. Have you ever opened a program on the computer? YES [ ] NO [ ]
22. Can you use the computer to type a document? YES [ ] NO [ ]
23. Can you use the mouse to click and double click? YES [ ] NO [ ]

24. Have you ever undertaken any ICT program? YES [ ] NO [ ]
25. Have you ever taken part in any ICT workshop or course? YES [ ] NO [ ]
26. Does your school have a computer laboratory? YES [ ] NO [ ]
27. Can you install a program on the computer? YES [ ] NO [ ]
28. Have you ever used the television to teach? YES [ ] SOMEHOW [ ] NO [ ]
29. Are you familiar with software's? YES [ ] SOMEHOW [ ] NO [ ]
30. Which of these do you regularly use? Mobile phone [ ] tablet [ ] camera [ ] projector [ ]
31. Can you use the computer to get connected to the internet?
    YES [ ] SOMEHOW [ ] NO [ ]
32. Can you use the modem? YES [ ] SOMEHOW [ ] NO [ ]
33. Can you navigate through the internet? YES [ ] SOMEHOW [ ] NO [ ]
34. Can you operate a projector? YES [ ] SOMEHOW [ ] NO [ ]
35. Have you ever used a projector to teach? YES [ ] SOMEHOW [ ] NO [ ]
36. Can you search for information using the internet? YES [ ] SOMEHOW [ ] NO [ ]
37. Have you ever worked with a web browser? YES [ ] SOMEHOW [ ] NO [ ]

C. Please tick (√) where appropriate

1. Which method of delivery are you conversant?

Tutorial [ ] Presentation [ ] Game and Simulation [ ] Drills and Practice[ ] None of them[ ]

2. Do you teach using the presentation approach? Yes [ ] No [ ]
3. Have you ever been taught with the presentation approach? Yes [ ] No [ ]
4. What factors affect your non – use of the presentation approach in the classroom? (Tick all that apply)

a) Lack of time to use computers [ ] b) Lack of knowledge about computers [ ]

c) Lack of confidence [ ] d) Fear [ ] e) Lack of training [ ] f) My age [ ]

g) Little previous experience [ ] l) No support if something goes wrong with the computer [ ]

4. Do you teach using game and simulation approach? Yes [ ] No [ ]

5. Have you ever been taught with a game and simulation approach? Yes [ ] No [ ]

6. What factors affect your non – use of the game and simulation approach in the classroom? (Tick all that apply)

a) Lack of time to use computers [ ] b) Lack of knowledge about computers [ ]

c) Lack of confidence [ ] d) Fear [ ] e) Lack of training [ ] f) My age [ ]

g) Little previous experience [ ] l) No support if something goes wrong with computer [ ]

6. Do you teach using the drills and practice approach? Yes [ ] No [ ]

7. Have you ever been taught with a drill and practice approach? Yes [ ] No [ ]

8. What factors affect your non – use of the drills and practice method in the classroom? (Tick all that apply)

a) Lack of time to use computers [ ] b) Lack of knowledge about computers [ ]

c) Lack of confidence [ ] d) Fear [ ] e) Lack of training [ ] f) My age [ ]

g) Little previous experience [ ] l) No support if something goes wrong with computer [ ]

8.Do you teach using the tutorials approach? Yes [ ] No [ ]

9. Have you ever been taught with a the tutorial approach? Yes [ ] No [ ]

10. What factors affect your non – use the tutorials approach in the classroom? (Tick all that apply)

a) Lack of time to use computers [ ] b) Lack of knowledge about computers [ ]

c) Lack of confidence [ ] d) Fear [ ] e) Lack of training [ ] f) My age [ ]

g) Little previous experience [ ] l) No support if something goes wrong with computer [ ]

B: SAMPLE SIZE

The formula that was developed by Yamane (1973) for calculating sample size was used. The formula is produced below.

$$n = \frac{N}{1 + N(e)^2}$$

n = is the required sample size.

N = the population size

e = Tolerable error (which in this study was pegged at 0.05).

The sample size was thus calculated as follows:

$$n = \frac{730}{1 + 730(0.05)^2}$$

$$n = \frac{730}{1 + 730(0.0025)}$$

$$n = \frac{730}{1 + 1.825}$$

= 258.4070

= 258

The formula that was used in calculating the sample to be taken from each stratum is presented below:

$n_h = \frac{Nh}{N} X\ n$

Where

n_h= sample size of stratum h (that is the sample size for each school)

N = Total size of population

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

n = Total sample size

The calculation for taking the sample for each circuit within the district is as follows:

Nhyiaeso Circuit = $\frac{401}{730}$ X 258

= 142

Adugyama Circuit = $\frac{100}{730}$ X 258

= 35

Fawoman Circuit = $\frac{117}{730}$ X 258

= 41

Pokukrom Circuit = $\frac{112}{730}$ X 258

= 40