

UNIVERSITY OF CAPE COAST

THE EFFECTS OF DIGITAL DIVIDE ON TEACHING AND LEARNING
PROCESSES IN SECOND CYCLE SCHOOLS IN THE WENCHI
MUNICIPALITY OF GHANA

BY

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award of Master of Education Degree in Information Technology

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DECLARATION

Candidate's Declaration

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

Candidate's Signature..... Date.....

Name: Kwame Baah

Supervisor's Declaration

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

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

Name: Mr. Paul Ahiatrogah

ABSTRACT

Teaching is becoming one of the most challenging professions in our society. Knowledge is expanding rapidly and modern technology is demanding teachers and students to use technologies in teaching and learning. The study compared the students from two schools; the schools with computers and other schools without computers. Data for this study were collected by performance test and interview in Methodist Senior High School and Istiqarma Senior High School both in Wenchi Municipality. Forty Senior High School students and twenty teachers were randomly selected from both schools for the study. Semi-Structured interview was used to collect data from the teachers and Statistical Package for Social Science (SPSS) software was used to analyze the students' questionnaire.

Formulated research hypothesis were statistically tested using independence sample t-test in SPSS. The study organized a variety of approaches found in the availability of ICT tools and their usage. Results of these analysis showed that students from schools with computers performed better than those without computers. It further identified factors enabling or inhibiting the successful adoption and use of ICT. It also explored the effectiveness of government policy mechanisms at national and regional levels.

However, the study recommended that government and other stakeholders in education should equip the second cycle schools with the necessary ICT infrastructure, professionally trained ICT teachers and adequate financial staff support to facilitate smooth integration of ICT into the curriculum.

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DEDICATION

I have dedicated this dissertation to my grandmother, Akosua Addai for her contributions during my Primary Education.

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CHAPTER ONE

INTRODUCTION

Background to the Study

The term 'digital divide' is the idea that one can separate people of the world into two distinct groups. Those who have access to technology and others who have no access to technology. The concern here is that some of the less fortunate people in the world are not able to take advantage of the very technology that makes society prosper and grow. According to Becta (2001) the use of Information Communication Technology (ICT) in the classroom has the potential to enhance learners' academic achievement when effectively integrated into the curriculum.

Technology is bound to rule the present and the future world. It is therefore good to obtain a knowhow of the technological reforms at the earliest. Children learn faster and can adapt to changes relatively easily. If they are well trained during their school years, they have high chances of becoming experts in ICT. An early beginning is always beneficial in the long run. When it is known that technology is bound to be a part of their future, it is best to introduce them to it during school life. Instead of observing them, struggle with learning later in life, it is advisable to give them the basic idea of the technological reforms.

In furtherance of this national goal, a national commission on ICT was set up in 2002 to develop a national ICT policy. The report of this commission is what is now known as the Ghana ICT for Accelerated Development Policy (ICT4AD) (Republic of Ghana, 2004). The ICT4AD policy represents the vision of Ghana in the information era. To narrow the gap in the digital divide, the government and other organizations have made efforts in progressing to improve the way society interacts with digital gadgets. These efforts include establishing community training centres, supplying teachers and students with ICT tools. The limited accessibility of digital technologies is known as “digital divide”. It is a problem that characterizes both developed and developing countries.

The Virtual Conference on Use of ICT in Special Needs Education (ITC SNE) was initialized by Microsoft Croatia and held from July 15-18, 2009, using Microsoft Live Meeting technology. It was indicated that “For people without disabilities, technology makes things easier”. For people with disabilities, technology makes things possible”. Studies have shown that children conversant with technology show improvement in their writing, reading and mathematical skills. Technology has also contributed to the decrease in dropout rates, improvement in student attendance and enhancement in their learning abilities. Technology in school benefits the children during their higher education. It lays a strong foundation of a successful professional life of an individual in the industrialized areas of the

world. Digital technologies are cheaper but there are still a greater percentage of people who are unable to fully unveil their potentials.

On the other hand, developing countries are limited in their access to digital technologies due to both economic and educational factors. The major issue, however, remains the lack of education that influences many people and does not allow them to access certain information sources that are only reachable via digital technologies.

The view is that closing the digital divide will be most effectively achieved through a two pronged approach, one that is direct and the other indirect: The direct approach will be for government and other stakeholders to work together to change the incentives that shape digital markets. The indirect approach will be for them to team up with public private partnerships that extend rural health care and quality education to the vulnerable in society. Through these two approaches, the vulnerable will be able to reap many of the same benefits from digital technology now derived by the wealthy.

Closing the digital divide is a pre-condition for reducing poverty. Many anti-poverty experts believe that closing the digital divide is not a top priority. Norris (2001) categorises this divide into its three constituent elements: the global divide between advanced industrialised countries and developing countries, the social divide between information rich and information poor within advanced industrialised countries, and the democratic divide between those within the online community who do and do not use digital resources to engage, mobilise and participate in public life.

Normally, we expect education to produce its effects over generations rather than a few years. Now, however, these scientific instruments have reduced the time-allowance within which education can perform its salutary function.

The Goal is to Develop Ghana's ICT Sector and use ICT as a Broad-Based Enabler of Developmental goals. The Government as part of this Policy Statement is guided by the principle that if Ghana is to take full advantage of the opportunities of the information age and develop a vibrant multi-sectorial information and knowledge economy, it should not as a nation be just a consumer of ICT goods and services but also a producer and developer of the technology. As a key towards the realization of the ICT4AD vision, efforts should be directed at achieving the mission to transform Ghana into information – rich, knowledge-based and technology-driven high income economy and society.

The Government has acknowledged the need for ICT training and education in the schools, colleges and universities, and to improve the educational system as a whole. Government is committed to a comprehensive programme of rapid deployment, utilization and exploitation of ICT within the educational system from primary school upwards.

Digital networking (or web videos Technology) has other interesting features. It can present information in visual form in its natural colours and size (in relation to the natural environment) and in motion, synchronized with sound over a large coverage area worldwide. Apart from virtual reality, it is the most advanced universal medium of communication developed so far,

which enables an individual to study on his or her own. For this reason, it is usually recognized as a self-directed form of learning.

Some of the modern sophisticated mobile phones can perform such functions as was discussed on an international broadcasting station (Cable News Network [CNN], 2001) documentary. As such, if we integrate this technology into our educational system, we will overcome some, if not all, of the problems enumerated previously in this chapter.

Digital Networking operates through the internet where it can connect people worldwide with the aid of special computer programmes. One does not need to know how to type in order to communicate with another person when using this technology, even though being a computer literate is a big advantage. The reason being that a web or digital camera attached to the screen or built into the computer screen can capture the image and sound of persons, without necessarily typing and sending the information. Again, one does not need to be within the confines of a classroom or his immediate environment to be able to access the web. This one advantage makes the internet a very reliable means of communication, because it can integrate into desktop applications corporate work flows, and enable with document sharing even after long period of power-outages. It delivers some of the promises for working anywhere and anytime with anybody.

In Ghana, although on-line service has created the potential for change in most service sectors of the economy, its rate of adoption in education, unlike in business, has been rather slow. In most of Senior High Schools in Ghana, teaching and learning remains fundamentally the same as it was almost

a century ago.

The future success of one student depends, to a large extent, on our ability to broaden our perspective of education. This will assist students to acquire the full range of experience, knowledge, attitude, and skill they need to grow. To some, the failure of education in Ghana stems from weaknesses in our students. They believe our students are not performing to expectation because they are not willing to learn (Talking point (G T V) 26th August 2001). The assumption is that they spend more time on other issues than on their books.

Currently, if we should consider what will take students away from their books it is obvious that the only explanation is that, they get themselves involved in recreational activities. For example, students patronize film shows, view televisions programmes, attend discos or dance theatres, listen to music or have fun games on the computer, or browse the internet. Meanwhile, the question remains, what stops policy makers and implementation agents of our educational system from redesigning policies to include such electronic gadgets to the advantage of students?

Considering the potentials digital net working has, there is the need to undertake a feasibility study into how online teaching will be received first and foremost by the key players. This, in a way, will instill into the teachers and students the necessary academic proficiency, professional competence and humanistic values for teaching and using instructional materials. It will also help to disseminate relevant knowledge at the basic and senior level of education.

Statement of the Problem

The digital divide is far more than a gap in access to ICT, however, it is a major impediment to the social and economic development of poor nations. In the twenty-first century, knowledge and information and a highly skilled labour force are increasingly important determinants of growth in the global economy. Castells (1998), has observed, "Information technology, and the ability to use it and adapt it, is the critical factor in generating and accessing wealth, power, and knowledge in our time" (p. 92).

Cuban (2001) believes that computers have been oversold and underused; they argue that most educational institutions remain essentially as they were decades ago, despite the availability of technology, and are not reaping enough benefits from technology to justify the investments. The ability to use computers effectively has become an essential part of everyone's education. Skills such as bookkeeping, clerical and administrative work, stocktaking, and so forth, now constitute a set of computerized practices that form the core IT skills package: spreadsheets, word processors, and databases (Reffell & Whitworth, 2002).

Teaching and learning has gone beyond the teacher standing in front of a group of pupils and disseminating information to them without the students' adequate participation (Ajayi, 2008). Ajayi, posited that with the aid of ICT, teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore. This new development is a strong indication that

the era of teachers without ICT skills are gone. Any classroom teacher with adequate and professional skills in ICT utilization will definitely have his students perform better in classroom learning. A cursory look at the secondary schools in Ghana has shown that many teachers in the system still rely much on the traditional “chalk and talk” method of teaching rather than embracing the use of ICT.

The role of technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy (Rosen & Michelle, 1995; Thierer, 2000). Most experts in the field of education agreed that, when properly used, information and communication technology hold great promise to improve teaching and learning in addition to shaping workforce opportunities. Poole (1996) has indicated that computer illiteracy is now regarded as the new illiteracy.

A study of this calibre is therefore necessary to unravel the extent at which teachers and students are exposed to using ICT facilities and the challenges associated with the technology gap in the secondary schools in the Wenchi Municipality in the Brong-Ahafo Region.

Purpose of the Study

With the increasing emphasis on the requirement for students to become proficient in the use of information communication technology the study seeks to identify and explore the effects of digital divide in teaching and learning

processes in second cycle schools in Wenchi Municipality in Brong Ahafo Region.

The study also sought to find out whether students in the Municipality have the necessary knowledge and skills in computing and the available tools and equipments in use by the schools under study.

Research Questions

The research questions to be addressed by the study are as follows.

1. What are the available ICT resources in the second cycle schools?
2. What curriculum change has policy makers made to ensure technology integration in the teaching and learning processes?
3. What are the reactions of both teachers and students in the use of information Communication technology in teaching and learning processes?
4. What are the information communication technology tools in use by the various second cycle schools?
5. What are the problems militating against the integration of technology in the schools' curricula?

Hypothesis 1: There is no statistically significant difference in knowledge level in computing between the students in schools with Computers and students in schools without computers.

Hypothesis 2: There is no statistically significant difference in skill level in computing of students in schools with Computers and students in schools without computers.

Significance of the Study

The study aims at bringing to light, to educational authorities and policy makers, the effects of having access to ICT and the effects of lack of access to ICT in the teaching and learning processes. It will also serve as reference for curriculum developers and policy makers concerned to lay more emphasis on the implementation of effective ICT policies in second cycle schools in Ghana to prepare the youth for a better future. It will also give an insight into whether ICT could influence teaching and learning positively or otherwise in our current educational system. Again, it will also reveal to the researcher the readiness of both teachers and students to embrace the use of ICT in various institutions.

Limitation of the Study

There are varied technological tools that can be used to access students learning, but only a few were used as a yard stick to access students. This provides findings limited to the effect of few technological tools on teaching and learning. This makes it difficult to generalized findings on the effect of all technological tools on teaching and learning.

The structured interview used prevented respondents from providing a much broader responses on their individual views on technology use in teaching and learning. This narrows the broader view at the real situation on the ground.

Delimitations of the Study

The following have been identified as the delimitations of this study. First, the sample size for the study covered respondents from only two second cycle schools in the Municipality due to limited ICT tools for the study. The findings from this study, therefore, might not be a generalized view of all respondents in the Municipality, and hence it is important that the findings from this investigation should be extrapolated with care and future research on this topic to be replicated with caution.

Definition of Term

The following terminology has been used throughout this document.

Digital divide Inequality of access to information technology: the difference in opportunities available to people who have access to modern information technology and those who do not.

Computer Electronic machine, operated under the control of instructions

stored in its own memory, that can accept data, manipulate data according specified rules, produce results and store the results for future use.

- Internet** The international network of networks of computers and other devices to share resources.
- Software** Set of instructions and data used by computers, sometimes referred to as computer programmes
- Pretest** A preliminary test administered to determine a student's baseline knowledge or preparedness for an educational experience or course of study.
- Posttest** A test given after a lesson or a period of instruction to determine what the students have learned

Organization of the Rest of the Study

The study was organized into five chapters. In chapter one, the background to the study and problem definition as well as its rationale and research questions, would be presented. The relevant literature review would be presented in Chapter Two. The description of the research design and methodology would be in Chapter Three. Data presentation and analysis were done in Chapter Four. Chapter Five would consist of a summary of findings, discussions, recommendations and suggestions for further investigation into the problem, based on the findings of this study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presents literature review associated with the context of the study and establishes the basis on which the research was to be based upon. As this dissertation is to find out the effects of digital divide on teaching and learning in the second cycle institutions in the Wenchi Municipality in the Brong-Ahafo Region of Ghana, it is therefore important to look at the various views and opinions of other studies carried out on the effects of digital divide on teaching and learning processes in second cycle institutions.

The literature review will consider the following subheadings:

1. Theoretical framework and the Concept of Digital Divide
2. The impact of digital divide in teaching and learning processes.
3. Closing the Digital Divide to Students and Teachers
4. The uses of ICT by the Students and Teachers
5. Challenges militating against the use of ICT in teaching and learning.
6. Policies on the provision of ICT tools in the various institutions.

Theoretical Framework and the Concept of Digital Divide

The speed with which Information Communication Technology (ICT) is developing and its impact on socio-economic activities cannot be

overemphasized. It is imperative that Africa is not excluded from the technological revolution. It is an established fact that the use of ICT has been integrated into virtually every facet of commerce, education, government and civic activity in developed countries and has become a critical factor in creating wealth worldwide. Unfortunately, in Africa, ICT has barely taken a foothold.

Computer illiteracy and lack of access to ICT are widely recognized as an increasingly powerful obstacle to the economic, civic and political development of Africa. According to the UN ICT Task Force (2000), nowhere is the digital divide more pronounced than in countries of the African continent. Africa is the most unconnected in an increasing connected world. This is where Ghana as a country finds itself.

Integration of ICT into communities and people's engagement with those ICTs requires the development of new media literacy if the objective is to provide not only access, but the ability to analyse, critically evaluate and use ICT and the information and knowledge it can carry, along with the ability to create content (Livingstone 2004). Several influential and comprehensive studies of the global digital divide point to a significant positive relationship between levels of economic development and the global digital divide. For example, a study by Hargittai (1999) and another by Rodriguez and Wilson in a World Bank sponsored study (2000) found that the economic wealth of a country measured by per capita GNP was the most important predictor of Internet access.

A more comprehensive, nuanced ICT 'digital divide' was represented at World Summit on Information Society (WSIS). In addition to the ICT access-based stratification said to exist between countries with different levels of economic austerity, the digital divide at WSIS included men and women, rural and urban communities and importantly, the skilled and non-skilled. As Rogers (1986) noted, the usefulness of a new communication system increases for all adopters with each additional adopter. At the present time, the Internet has reached the critical mass threshold suggested by Rogers (1995) to assure that its adoption rate will become self-sustaining.

Technology is not transformative on its own. Evidence indicates that when used effectively, "technology applications can support higher-order thinking by engaging students in authentic, complex tasks within collaborative learning contexts" (Means, Blando, Olson, Middleton, Morocco, Remz, & Zorfass, 1993). Instead of focusing on isolated, skills-based uses of technology, schools should promote the use of various technologies for sophisticated problem-solving and information-retrieving purposes (Means & Olson, 1995).

Technology integration brings changes to teachers' instructional roles in the classroom. The teacher's roles in a technology-infused classroom often shift to that of a facilitator or coach rather than a lecturer (Henriquez & Riconscente, 1998).

Educational technology has had positive effects on student's attitudes toward learning and on student self-concepts. Evidence of such is strongest in languages, arts, mathematics, science, and telecommunication/video technologies. In institutional access, Wilson (2004) states "the numbers of

users are greatly affected by whether access is offered only through individual homes or whether it is offered through schools, community centres, religious institutions, cybercafés, or post offices, especially in poor countries where computer access at work or home is highly limited” (p. 303).

Without continuous technical support, technology integration in the classroom will never be satisfactorily achieved (Bailey & Pownell, 1998).

Most teachers have heard horror stories about equipment failure, software complexity, data loss, embarrassments, and frustration. They don't want to be left hanging with 30 students wondering why nothing is working the way it is supposed to be.

In courses using computer-based network, many students who seldom participated in face-to-face class discussions became more active participants online (The Software Information Industry Association, 1999). Introducing technology into the learning environment has been shown to make learning more student-centered, to encourage cooperative learning, and to stimulate increased teacher/student interaction (The Software Information Industry Association, 1999). However, realistically the poor will not own ICTs or be able to use them in hands-on fashion to any significant degree in the foreseeable future (Heeks, 1999).

The Impact of the Digital Divide on Teaching and Learning Processes

One of the underlying issues surrounding the digital divide is the notion of social inclusion, specifically referring to the meaningful use of

information communication technologies (ICT). Popular sentiment among theories has been leaning towards bridging the digital divide gap by focusing predominantly on issue of access and the subsequent availability of adequate resources and infrastructure (Austin et al, 2003).

The argument surrounding the digital divide assumes that the spread of computers and the Internet access itself will lead to productivity gains in firms and public administrations and lower transaction costs for all (Hunterwade, 2002). The most obvious case in point is the private standards being set for software by Microsoft and their continual upgrading to meet the wishes of savvy computer users in the north, which places developing countries at a big disadvantage (Hunterwade, 2002). World Bank has said that, aid should be distributed to countries with good policies and good governance which is often judged by transparency, quick response, and accountability-achieved by creating unified ICT infrastructures through the public sector (Hunterwade, 2002).

Technology advancement has the potential to alleviate the digital divide especially in education and employment. Education is crucial to prepare people to meet global needs so that well paying jobs are not outsourced. Lack of education and employment slows down progress within a country (Koss, 2001). Similarly, lacking access and computer skills, a whole generation will be missing out on realizing their full potential in an information and communication technology world (Koss, 2001).

According to (Austin et al., 2003), it is virtually impossible to ignore the need for technology in an education curriculum. Infrastructure plays a

major role in bridging the gap in digital divide. In wireless world, two paths of accessing the internet are emerging. One relies on developing Wi-Fi infrastructures so that by using a laptop you can go online from anywhere. The other is through delivery right to your cellular phone. The issue now is which technologies and devices will succeed in terms of usage (Morse, 2003).

The use of information technology in rural and underserved settings has the potential for improving the quality of life and reducing the digital divide. However, high costs coupled with infrastructure tend to weaken the advantages (Kanungo, 2004). People in rural areas are especially disadvantaged in their uptake of information and communication technologies due to the fact that they are already at a disadvantage in terms of education, income and health. Countries such as the USA and New Zealand have begun programmes to deal with the issue of rural disadvantage with the focus on closing the digital divide (Cullen, 2003).

Rapid advancements in mobile telephone technology is likely to improve internet access to some rural areas but only those which are already better served in terms of land-line services and band-width. Rural areas remain outside normal mobile telephone service, and development of these areas is considered more expensive (Cullen, 2003). Carvin (2000) believes the digital divide is caused by more than merely a lack of access to IT. Literacy (basic, functional, technological and information) and content (locally significant and easy to understand and navigate) issues have eventuated because the content needs and skill levels of underserved communities are not being taken into

account by Internet content producers. Carvin (2000), believes that the content of most web-sites is text heavy, and written for people with higher levels of education, which is unappealing to the less-educated.

He advocates the use of library and school Internet enabled computers to improve the IT skills of community members, who can then create content relevant to the needs of their community. Mossberger, Tobert and Stansbury (2003) stress the importance of adequate education for participation in the new economy. Servon (2002), reports that ‘over time, connectivity rates across different levels of educational attainment have soared for all education levels, but a significant gap continues to persist. Technology skills are now a prerequisite for most jobs, a lack of access to technology for those with limited education could render their skills obsolete The digital divide, represented by uneven access to ICT inputs and outputs such as scientists, IT specialists or computers and mobile phones could lead to a widening economic divide between industrialized and developing countries (Campbell, 2001).

Evidence shows that durable productivity gains have been greatest in enterprises in which ICT use has been greatest (Bresnahan, Brynjolfsson and Hitt, 1999). A similar study states that: areas with high levels of resources and skilled labor but with lower levels of telephony have fewer ‘productive enterprises’ (as cited by Robison and Crenshaw in Campbell (2001). This suggests that it is quite plausible that countries with poor access to ICT are poorer in turn as a result a good telecom infrastructure is not only the outcome of economic growth, but is an input to growth as well.

This study highlights the fact that updated resources make a huge difference at school sites, and they affect every level of technology access and use. Although cost is a major barrier to Internet adoption by low-income earners it is not the only one. Mills and Whitacre (2003), assert that there is less content on the internet catering for the needs of low-income earners, such as information on assistance programs, entry level jobs and rental housing.

However, there are a number of obstacles to the successful integration of technology and education. While access to technical support and budget allocation for this specialized skill; is an issue, one of the major challenges is getting teachers on side and giving them appropriate training in using technology in the classroom.

Closing the Digital Divide to Students and Teachers

Computer is among the range of strategies being used to improve student achievement in school subjects, including reading. Programs for CAI have come a very long way since they were first developed over two decades ago. These programs tutor and drill students diagnose problems, keep records of student progress, and present material in print and other manifestations. It is believed that they reflect what good teachers do in the classroom (Kulik, Bangert, & Williams, 1983).

Although technology is more prevalent in the schools, several factors affect whether and how it is used. Those factors include placement of computers for equitable access, technical support, effective goals for

technology use, and new roles for teachers, time for ongoing professional development, appropriate coaching of teachers at different skill levels, teacher incentives for use, availability of educational software, and sustained funding for technology.

However, according to Education Week (2001), we should go beyond machines. That is, we should be aware that human factors are as important as hardware and software improvements. In order to enhance the use of technology for students, one human factor that is crucial is teachers' engagement with computers. Despite increases in resources and training opportunities, according to Rowand (2000), several factors still affect teachers' use of computers and the Internet in classrooms. The first factor is years of teaching experience. Newer teachers are more likely to utilize computers or the Internet to facilitate various teaching activities than those with 20 or more years of teaching experience. The second factor is poverty level.

Teachers in wealthy school districts are more likely to utilize computers or the Internet in teaching than those in poor school districts. In addition, only about one third of teachers surveyed reported feeling well prepared or very well prepared for utilizing computers or technology in teaching. One of the most frequently cited reasons that experienced classroom teachers do not use technology in their teaching is that they find it difficult to implement in the regular classroom Picciano (1994). The research regarding the effects of technology on student learning and attitudes is somewhat mixed. On one hand, Clark (1983, 1994) maintained that media do not influence

learning in any condition. On the other hand, Kozma (1994) debated that technologies such as computers and video will influence learning by interacting with an individual's cognitive and social processes in constructing knowledge.

An optimistic scenario for developing countries in the face of the diffusion of ICT envisages a massive transfer of tacit knowledge into information systems giving these countries access to new process technologies and products developed in the industrialized countries both rapidly and at low cost. In theory this would lead to an acceleration of the catching up process and a reduction in global inequalities' (Mansell & Wehn, 1998).

However, while the need to upskill students is important, skills alone is not enough to encourage students to confidently integrate ICT into their classroom programmes (Wang, 2002). In light of the fact that "teaching with computers requires a shift from traditional teaching practices" (Wang, 2002), teachers who hold teacher centered beliefs of teaching and learning will be less likely to view technology as an integral learning tool.

According to Technology and Education Reform, a U.S. Department of Education report by Singh and Means (1994), "If technical problems arise frequently and teachers have to wait hours, days, or weeks to get them resolved, they will abandon their efforts to incorporate technology." If, as Wang (2002) suggests, teachers who work in technology-rich classrooms are unable to teach in traditional, transmissionist ways, then they must be guided in their efforts to identify constructivist pedagogies that actually work.

There is clearly a parallel in the international digital divide where private corporations will seek to 'equalize' the digital divide without considering local understandings of what a country's digital needs might be. James asserts that in developing countries, "internet use has taken place overwhelmingly among the upper-income, educated, and urban segments" (James, 2008) largely due to the high literacy rates of this sector of the population. As such, James suggests that part of the solution requires that developing countries first build up the literacy/language skills, computer literacy, and technical competence that low-income and rural populations need in order to make use of ICT.

When teachers are trying to use technology in their classrooms and they encounter difficulties, they need immediate help and support. "Helping technology users while they are actively engaged with technology at their work location is probably the most meaningful, essential and appreciative support that can be provided," (Brody, 1995).

The Uses of ICT by Teachers and Students

Along similar lines, the 1999 World Bank World Development Report entitled 'Knowledge for Development' (World Bank, 1999) saw Information Technology as a powerful tool to fight poverty and underdevelopment. The report argued that the developmental significance of ICT lies in its capacity to provide access to information sources and communication media necessary for

building such social capabilities, in other words as tools for learning and innovation.

The computer hardware and software come with their potentials, making the learner build in him or herself some form of challenge and visual difficulties that cause intrinsic and extrinsic rewards in the individual and also graphical and epistemological curiosity while the individual is in control of the software (Wishart 1990). The teachers in the Senior High Schools are the source of information when it comes to information retrieval. Graduate teachers in particular have the optimism to be current in a way of accessing and retrieving information from the internet. Where this is lacking, the graduate teachers become desperate and are not convinced to stay in those areas.

Teachers and students in the rural areas in Ghana become backward and semi-literate in terms of information searching on the internet using current electronic process. This leaves a big gap in terms of knowledge acquisition. As students become more self-directed, teachers who are not accustomed to acting as facilitators or coaches may not understand how technology can be used as part of activities that are not teacher-directed. This situation may be an excellent opportunity for the teacher not only to learn from the student but also to model being an information seeker, lifelong learner, and risk taker. Kozma and Schank (1998) noted, "Teachers must become comfortable letting students move into domains of knowledge where they themselves lack expertise, and they must be able to model their own

learning process when they encounter phenomena they do not understand or questions they cannot answer".

Now, since the industrial society is giving way to knowledge society, the current resources of the knowledge society are education and training and their driving force is the internet. As such, Distance Education will now change from postal and printed media to a form of web technology called electronic learning to comprehend the network knowledge society. This implies that the teacher is the focus around which initiating an internet open learning can be possible and effective. This means that teachers approach to teaching and learning should change.

Vosniadou (1994) argues that a belief in constructivism will determine the type of computer software used in classrooms and the manner in which computer-use is integrated with the curriculum and implemented into the classroom. The presence of technology alone will not improve practice or education. Technology integrated effectively into learning environments by reflective and flexible educators will help in the restructuring of classrooms and schools (Watson, 2002). The collaborative work around ICT needs careful preparation and skilled support (Hoyles, C., Healy, L., & Pozzi, S. 1994). Most importantly, tasks need to lend themselves to group work and the software should be appropriate and the hardware sufficient for the task.

Woollard, (2007), also stated the following points as benefits that could be derived from the use of information communication technology.

i. General ICT benefits:

1. Enables greater learner autonomy;
2. Unlocks hidden potential for those with communication difficulties;
3. Enables students to demonstrate achievement in ways which might not be possible with traditional methods;
4. Enables tasks to be tailored to suit individual skills and abilities.

ii. ICT benefits for students:

1. Computers can improve independent access for students to education;
2. Student with special educational needs are able to accomplish tasks working at their own pace;
3. Visually impaired students using the internet can access information alongside their sighted peers;
4. Students with profound and multiple learning difficulties can communicate more easily, and
5. Students using voice communication aids gain confidence and social credibility at school and in their communities.

iii. ICT benefits for teachers and non-teaching staff:

1. Reduces isolation for teachers working in special educational needs by enabling them to communicate electronically with colleagues;
2. Supports reflection on professional practice via online communication;

3. Improved skills for staff and a greater understanding of technology used by students;
4. Enhances professional development and the effectiveness of the use of ICT by students through collaboration with peers;
5. Materials already in electronic form (for example, from the internet) are more easily adapted into accessible resources such as large print or braille.

iv. ICT benefits for parents and careers:

Use of voice communication aids encourages parents and guardians to have higher expectations of children's sociability and potential level of participation.

Challenges Militating Against the Use of ICT in Teaching and Learning

ICT may be used to provide learning experiences when and where they are needed and allow students to progress at their own pace. ICT tools can be used to create records of thought, support reflection and assessment of progress. If computers are to be used in this way, then teachers need to confront their perceptions about the nature of learning, the role of the student and, in particular, the role of the teacher (Niederhauser, Salem & Fields, 1999).

Although valuable lessons may be learned from best practices around the world, there is no one formula for determining the optimal level of ICT integration in the educational system. Significant challenges that policymakers and planners, educators, education administrators, and other stakeholders need

to consider include educational policy and planning, infrastructure, language and content, capacity building and financing.

There is an assumption that Ghanaian teachers' right from basic schools to second cycle institutions are less well equipped with competencies in the emerging technologies than their international counterparts.

Information and communication technology is playing an increasingly influential role in reshaping employment in large parts of the world.

Information and communication technologies present unprecedented opportunities to combat poverty by increasing income, opening markets and providing employment opportunities. Barnett (2000) observed that there is significant pressure in schools today to change due to economic, social, and political transformations, and in these, entirely he says, they need new skills and approaches to learning. The ICT4AD policy statement therefore sets out the road map for the development of Ghana's information society and economy.

Camacho (1995, p. 421) states "In this climate, which is not proclive to experiments it is not surprising that many teachers' behaviour respond to stereotypes or routines which have been maintained –without being modified– throughout a long professional life". Different factors that condition the teaching task of teachers. Firstly, the author mentions the existence of a technological infrastructure in which communication is set. Secondly, the author accounts for the availability of space to carry out the different tasks. Thirdly, the teacher's preparation to use technology efficiently.

Last, by the teacher's readiness for a life-long learning which will ensure him/her constant updating and renewal of knowledge

(Condie et al. 2005).

Majó and Marquès (2002) account for the following reasons regarding the attitude of teachers towards the fact of adopting a positive attitude towards the use of technology in teaching and learning processes: First, they mention a low competence in the use of technology, influence of social stereotypes, reluctance towards the effectiveness of using ICT and finally the existence of prejudices at work. It is evident, as many other authors such as Facer (2004) highlighted that lack of technical knowledge and a successfully implemented habit and good practice in the use of ICT into teaching and learning processes would become one of the main objectives when trying to elicit from teachers a positive attitude towards the use of technology.

BESA (2005), reported that the best opportunities for exploiting the potential of ICT were in schools where technology was an integral part of institutional planning strategies which included procedures for maintaining and enhancing the ICT capability and infrastructure of the institution on a regular basis.

A recent 2004 report by the British Educational Communications and Technology Agency, BECTA, based on an analysis of current research about the barriers to an efficient use of information and communication technology, draws a distinction among the different types of barriers under consideration and highlights teacher's attitudinal factors among a typology of barriers:

- i. resource-related factors

- ii. factors associated with training, skills, knowledge and computer experience,
- iii. attitudinal and personality factors
- iv. institutional and cultural factors

Condie et al, 2005) points out that student instruction would have to be articulated around three main areas: training to consume (ICT materials), training to use (telematic tools and resources) and training to produce (electronic materials). According to Cabero (2000) the abilities and skill the student will have to develop in order to succeed in technology-rich environments are the following: The student will have to:

- i. be able to know when there is a need for information
- ii. identify the necessity of information to solve a problem or investigation
- iii. locate the necessities for information
- iv. organize the information and use it efficiently to solve the problem or investigation
- v. work in a team in a collaborative form
- vi. use creativity to solve problems
- vii. learn new concepts and assimilate new ideas quickly
- viii. lead new initiatives and be independent
- ix. identify problems and come up with solutions
- x. gather and organize facts
- xi. carry out systematic comparisons
- xii. identify and develop alternative solutions

xiii. and solve problems in an independent way.

As far as these changes in the educational organization of teaching and learning processes are concerned, traditionally, the concept of curriculum has been centered upon teaching rather than learning, the role of teachers has been that of transmitting information instead of awakening the students' interest towards learning and their ability to interpret and make sense of information in order to solve educational requirements. Schools do not have autonomy to decide upon educational resources and media, and what is more, they cannot decide what to teach, since that is regulated by the Ministry of Education. It is for this reason that the decisions on how to teach are extremely interrelated with the selections and contents of the curriculum.

Thus, teachers who may endeavour to try an instructive use of ICT in order to improve teaching and learning processes will have to pay attention to aspects which will range from the kind of curriculum that is used, the type of learning it favours, the available media at schools in order to support this type of learning, the type of usage that teachers can make of the media they have at reach and fundamentally, in what sense the conception and practice of the curriculum should vary in order that the use of ICT would give way to a significant improvement of teaching and learning processes.

Fullan (2005), argues that where initiatives are sustained, and where they become embedded in institutional practice and culture, management and leadership are critical factors. In particular, where responsibility and leadership are distributed throughout an organization, it is more likely that sustained change will be achieved. This would imply that, while an

enthusiastic teacher or headteacher might make some impact, unless there is a commitment throughout the institution, with accountability for progress at key points, it is unlikely to be sustained or become part of the culture.

The Policies on the Provision of ICT Tools in the Teaching and Learning in Senior High School.

Ghana's development process can be accelerated through the development, deployment and exploitation of ICT within the economy and society. Technology then should not drive education, rather, educational goals and needs, and careful economics, must drive technology use. ICT as educational tools can if they are used prudently, enable developing countries to expand access to and raise the quality of education.

Prudence requires careful consideration of the interacting issues that underpin ICT use in the school-policy and politics, infrastructure development, human capacity, language and content, culture, equity, cost and not the least, curriculum and pedagogy. By developing IT skills through government subsidized or not-for profit training initiatives, low income earners will be able to command higher incomes in the new economy, therefore raising the GDP of their nation.

A key development challenge facing the nation entails the development, expansion and the modernization of the nation's communication infrastructure to achieve universal service and access to basic and value added telecommunications services, support and development process. It is recognized that the socio-economic problems and challenges facing Ghana are likely to be compounded by the new challenges posed by

globalization and the information age. And that, for Ghana to make progress in its development process, the nation in addition to taking steps to address these developmental challenges will also need to put in place efforts to address the additional challenges posed by globalization and the information revolution. Various competencies must be developed throughout the educational system for ICT integration to be successful.

While Brown's (2002) description of the teacher's multifaceted role (learner, manager, designer and researcher) is useful, it stops short of exploring the numerous other factors that contribute to effective ICT learning environments. This is problematic given that the whole configuration of events, activities, contents and interpersonal processes within classrooms are important determinants in the success and failure of ICT learning environments (Salomon, 1993).

Education is important because it provides the skills required for creating, adapting, and utilizing such technologies. Governments and education systems around the world recognize the need for students to be skilled, creative and confident users of a wide range of information and communication technologies (Brush et al, 2001; This is not to deny that even the illiterate or near-literate can possibly take advantage of certain technological applications. But to go beyond elementary applications, education becomes increasingly important.

Indeed, international evidence suggests that education is a strong complement to Internet use and that the relevant educational levels are secondary and tertiary levels as they are expected to upgrade the national

capacity for adaptation and innovation. Therefore, if a country aspires to exploit in significant ways the opportunities offered by new ICT, particularly the creation of new industries, it needs to emphasize secondary and tertiary education. This lesson is in contrast with conventional wisdom that poorer countries should emphasize primary education that yields the higher rate of social returns to these countries (Psacharopoulos, 1994).

In addition to formal education, a rapidly changing technology like ICT would require continuous training on the part of the workforce. But the principal responsibility of imparting such training should lie with the concerned firms in line with their requirements. However, the government can also play an important part in inducing the firms to impart such training through various types of tax incentives (UNDP, 2001).

For a country to succeed in ICT, one critical element is physical infrastructure in telecommunications links. The government has an important role in creating such infrastructure, especially in the poorer countries. It appears that there are potentially many opportunities for fostering partnerships in the creation of infrastructure. To attract the private sector, the government may have to play the role of a catalyst by instituting various innovative incentive mechanisms such as build-own-operate, build-own-transfer, etc.

Even when the private sector is already there, the government has an important function as a regulator. It may be noted that the telecommunications industry, which constitutes the basic infrastructure for ICT, is a natural monopoly.

Similarly, research suggests that the use of ICT has been most productive in firms with a flat and less hierarchical organizational structure. The government policy should therefore avoid pursuing policies that foster a closed and monopolistic environment in the name of “nurturing the infant industry.”

The advent of new types of ICT, in conjunction with globalization, has opened up fresh opportunities for economic and social transformations from which both developed and developing countries can immensely benefit. New ICT can be applied selectively and innovatively to directly enhance the welfare of the poor, although the existing data do not afford a full-fledged cost-benefit assessment (Quibria & Tschang, 2001).

CHAPTER THREE

METHODOLOGY

This study aimed at investigating and evaluating the effects of digital divide on teaching and learning processes in second cycle schools in the Wenchi Municipality. The chapter presents the research methodology of the study. It deals with the research design, population of the study, sample and sampling procedures, and instrumentation. Further, it covers pre-testing of the questionnaire, the data collection procedure, data analysis, limitations as well as delimitations.

Research Design

In many true experimental designs, pretest and posttest designs are the preferred method to compare participant groups and measure the degree of change occurring as result of treatments or interventions. In view of this, the researcher adopted the two group control group design for the study. This is the simplest and most common of the pretest-posttest design. It is one of the useful ways of ensuring that an experiment has a strong level of internal validity. The principle behind this design is relatively simple, and involves randomly assigning subjects between two groups, a test group and a control. Both groups are pre-tested, and both are post-tested, the ultimate difference being that one group was administered the treatment.

This test allows a number of distinct analyses, giving the researcher the tools to filter out experimental noise and confounding variables. The internal

validity of this design is strong, because the pretest ensures that the groups are equivalent.

1. This design allowed the researcher to compare the final posttest results between the two groups, giving them an idea of the overall effectiveness of the intervention or treatment.
2. The researcher could see how both groups changed from pretest to posttest, whether one, both or neither improved over time. If the control group also showed a significant improvement, then the researcher must attempt to uncover the reasons behind this.
3. The researchers can compare the scores in the two pretest groups, to ensure that the randomization process was effective.

These checks evaluate the efficiency of the randomization process and also determine whether the group given the treatment showed a significant difference. A series of semi-structured interview was employed to gather data from the teachers for this study. Given the attention to the human factors impacting upon the effects of digital divide and ICT use for teaching and learning this method was deemed most appropriate because the interview as a data gathering technique can be most effective, particularly “where human motivation is revealed through actions, feelings and attitudes” (Best & Kahn, 1998, p. 322).

Population of the Study

Population refers to the entire group of individuals or objects to which researchers are interested in generalizing the conclusions. The population of this study was made up of five hundred (500) students and fifty (50)

teachers. The third year students were the target population for the study simply because they have been in their respective schools for the past three years and have been taught Core ICT for the period.

Teachers from the two selected schools formed part of the population of the study to derive more information that will help give meaningful conclusions to the study.

Sample and Sampling Procedure

Simple random sampling was done for the sample selection. This sampling method is conducted where each member of a population has an equal opportunity to become part of the sample. As all members of the population have an equal chance of becoming a research participant, this is said to be the most efficient sampling procedure. In order to conduct this sampling strategy, the researcher defined the population first, listed down all the members of the population and then selected members to make the sample. For this procedure, the lottery sampling or the fish bowl technique was employed. This method involves the selection of the sample at random from the sampling frame through the use of random number tables.

Numbers were written on pieces of paper and drawn from a box; the process was repeated until the sample size was reached. The sample for this project comprised forty (40) students who were selected amongst the target population of two hundred (200) third year Senior High School students from the two schools and ten (10) teachers each from the two schools. These

students have been studying the subject 'Information and Communication Technologies for the period.

Research Instrument

The survey questionnaire was used as the main data-gathering instrument for this study (See Appendix A). The questionnaire was divided into three main sections: a profile and the two pretest-posttest survey. The profile contains socio-demographic characteristics of the respondents such as age, gender, civil status, the number of years they had used computers in their day to day activities as well as ICT tools in used in their schools. The researcher used interview guide to explore the perceptions of teachers on usability and availability of ICT tools. The pretest questionnaire for testing the student's knowledge level in ICT contains ten questions and four choices were provided for every question or statement.

On the other hand, the posttest questionnaire for the students were made up of Microsoft Word processing and Microsoft Excel suit hands on to test for their skill levels in computing as these two Microsoft suits were the most common application software being used by many of the institutions in Ghana. In addition, this research instrument allowed the researcher to carry out the quantitative approach effectively with the use of statistics for data interpretation.

Pretesting of the Research Instrument

In order to test the validity of the questionnaire used for the study, the researcher tested the questionnaire to five respondents of students. These

respondents as well as their answers were not part of the actual study process and were only used for testing purposes. After the questions have been answered, the researcher asked the respondents for any suggestions or any necessary corrections to ensure further improvement and validity of the instrument. The researcher revised the survey questionnaire based on the suggestion of the respondents. The researcher then excluded irrelevant questions and changed vague or difficult terminologies into simpler ones in order to ensure comprehension.

Data Collection Procedure

This refers to the method, steps or process used by the researcher to do actual field work of data gathering. It is the way by which the instruments prepared were administered. Upon obtaining a letter of introduction from the Director, University of Cape Coast, the researcher presented the letter to the headmasters of the selected Senior High Schools. The letter requested for assistance to be extended to the researcher in his bid to obtain relevant information. The researcher requested for assistance of four teachers to assist during the data collection from the students. The researcher briefed them on what to do during the data collection. The researcher used the students' general questionnaire as pretest to test for their knowledge levels and administered it at the same time to both groups of students to ensure greater internal validity. This enabled the researcher to also avoid any possible external influence. The second students' questionnaire was used as posttest to test for the skill levels of the student and it was administered after completion

of the pretest. The pretest question lasted for ten minutes and the posttest also lasted for thirty minutes.

The researcher ensured that the results of the experiment were accurate as much as possible. The experimentation was used to test the existing theories. Two groups of treatments were used, the treatment group or experimental group and control group. The school without or with little ICT equipment was the controlled group while the school with well equipped computers was the treatment group. Both schools took the same performance test and the results from pretest-posttest were compared to see the amount of changes over time between the two groups. The questionnaires made up of ten general ICT questions and ten ICT practical questions on Microsoft Word Processing and Microsoft Excel suit were administrated by the researcher to the controlled and treatment groups to answer for forty (40) minutes. The researcher used the computer laboratory of Wenchi Secondary School which has about forty new PIV (4) computers with Windows Xp Operating System with Microsoft Office 2007 installed.

The researcher used the semi structured interview guide to collect data from the teachers. The researcher interviewed the ten teachers randomly at different intervals from each school and recorded the outcome. The observations were also noted.

Data Analysis

The completed questionnaires were serially numbered, coded and tabulated with the aid of the Statistical Package for Social Sciences (SPSS) computer programme. Descriptive statistical analysis was used. The data collected from the student performance test and interview guide, were analyzed using independent sample t-test. The results after the experimental treatment were compared and discussed.

For computation into the SPSS, the coded marks and interview guide were fed into the computer. In scoring the items, each item was weighted as follows: ten (10) marks for the pretest, thirty (30) marks for practical activity I, and twenty (20) marks for practical activity II. Frequencies for the items were computed and converted into percentages. After gathering all the completed questionnaires from the respondents, total responses for each item were obtained and tabulated for further interpretation. Weighted mean to represent each question was computed.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter covers the analysis of the data and the presentation of findings of the study. The analysis was done using the Statistical Package for Social Science (SPSS) and for the purpose of clarity, tables were used to depict the results.

Background Information on the Study

The data collected were analyzed along the lines of Senior High School with ICT facilities and the other Senior High School without ICT facilities.

Demographic Information

The characteristics of respondents such as age, sex, teaching experience, computer usage, access to internet, ownership of computers, qualification and others were analyzed. The category of respondents used for the study is analyzed in Table 1.

Table 1: Category of Respondents

Category	Frequency	Percentage
Teachers	20	33.3
Students	40	66.7
Total	60	100

Source: Field data, 2011.

The information analyzed in Table 1 shows that 20 (33.3%) of the respondents for the study were teachers while 40 (66.7%) were students. The total number therefore stood at 60 representing 100%.

The data collected was analyzed along the lines of category of schools. The result is reflected in Table 2 below.

Table 2: Schools used for the Study

Category	Frequency	Percentage
Methodist SHS	30	50.0
Istiqarm SHS	30	50.0
Total	60	100

Source: Field data, 2011.

The analysis in Table 2 shows that equal number of 30 (50.0%) respondents was sampled from the two schools for the study.

The data analyzed so far reveals that there are commonalities in the schools chosen for the study and therefore meaningful conclusion can be drawn on the information gathered.

Table 3: Age Distribution of Teachers and Students

Ages	Frequency	Percentages (%)
Below 20 years	40	67.7
20-30 years	5	8.3
Above 30 years	15	25
Total	60	100

Source: Field data, 2011.

From the data collected, Table 3 shows that 67.7% of the respondents were below 20 years. Fifteen (15) respondents representing 25.0% were age above 30 years while five (5) representing 8.3% were between 20 to 30 years. It was realized that the respondents are at their youthful age to be in better position to acquire the necessary knowledge and skills in ICT. This is crucial in terms of bridging the digital divide gap by focusing predominantly on issue of access and the subsequent availability of adequate resources and infrastructure (Austin et al., 2003).

It is important to establish whether gender play any significant role in accessing the performance of students in ICT.

The Table 4 below shows the break down of gender of the respondents.

Table 4: Gender of Respondents

Gender	Frequency	Percentage
Male	40	66.7
Female	20	33.3
Total	60	100

Source: Field data, 2011.

From Table 4, 40 respondents representing 66.7% were male while 20 (33.3%) were female. It can thus be said that male respondents outnumbered the female respondents in this study.

The knowledge and skill level in Information Technology depends largely on the use of ICT tools. The Table 5 below shows the responses of the teachers interviewed as to how the schools acquired ICT tools.

Table 5: Teachers Responses on the Acquisition of ICT for the Schools

Provision of ICT	Frequency	Percentage
Government Assisted	16	80
Donations/PTA	4	20
Total	20	100

Source: Field data, 2011

In Table 5, 16 respondents representing 80% have access to ICT tools through the government while 4 (20%) of the respondents said ICT tools are acquired through donations/PTA. Governments and education systems around

the world recognize the need for students to be skilled, creative and confident users of a wide range of information and communication technologies (Brush et al, 2001). The lower status in ICT donations to school could be due to high initial cost of ICT tools.

Table 6: Teaching Experience of Respondents Interviewed

Years of experience	Frequency	Percentage
Below 5 years	4	20.0
5-10 years	10	50.0
Above 10 years	6	30.0
Total	20	100

Source: Field data, 2011

From the data presented in Table 6, teachers with teaching experience between 5-10 years are greater in number, representing 50.0% of the respondents. Six (6) (30%) respondents have 10 years and above teaching experience. Only 4 (20%) have teaching experience below 5 years. According to Rowand (2000), newer teachers are more likely to utilize computers or the Internet to facilitate various teaching activities than those with twenty (20) or more years of teaching experience. Similarly, the reasons why experienced classroom teachers do not use technology in their teaching is that they find it difficult to implement in the regular classroom (Picciano, 1994).

Bridging the digital divide in various schools requires access to ICT tools by both teachers and students. The table 7 shows the number of teachers who owned computer.

Table 7: Ownership of Computers by Teachers

Ownership	Owned PC	Do not have PC
Methodist SHS	4(40.0%)	6(60.0%)
Istiqarma SHS	2(20.0%)	8(80.0%)

Source: Field data, 2011

From the data presented in Table 7, 6 (60%) of the respondents from Wenchi Methodist Senior High School did not have their own computers. Four out of ten respondents representing 4(40%) had their own personal computers while 2(20%) representing number of teachers who had computers in Isiqarma Senior High School. Integrating ICT and the bridging of the technology gap requires that teachers owned their ICT tools to facilitate effective teaching and learning processes. Computer ownership will help the teachers to access internet, prepare and deliver their lessons.

The Table 8 below shows number of period the sampled teachers have owned computers

Table 8: Time/Period of Ownership of Computers by Teachers

Period of ownership	Frequency	Percentage
1-2 years	3	50.0
3-5 years	2	33.3
5 years and above	1	16.7
Total	6	100

Source: Field data, 2011

From Table 8, 3(50%) of the teachers have had computers for a period between one to two years. Two (2) representing 33.3% of the teachers had their own personal computers for a period between three (3) to five (5) years. One (1) teacher representing 16.7% of the respondents had computers for a period above five (5) years and above. The numbers of teachers with computers need to be increased with programmes updated to meet the new challenges in the use of computers.

The use of the internet helps teachers to acquire more knowledge and information to impart onto their students. Below is the distribution of respondent teachers who have access to the internet in their various homes

Table 9: Internet Access at Home by the Teachers

School	Yes	No
Methodist SHS	6(60.0%)	4(40.0%)
Istiqarma SHS	3(30.0%)	7(70.0%)

Source: Field data, 2011

The information tabulated in Table 9 indicates that 6 representing 60% of the teachers had access to internet in their various homes. Only 4 of the teachers representing 40% had no access to internet in their homes. For teachers in Istiqarma Senior High School 3 (30%) had internet access at home while 7(70%) of teachers had no interne access. In this regard, it points to the assertion made by Hunter wade (2002) that the internet access itself will lead to productivity gains in firms and public administrations and lower transaction costs for all.

The world is now considered as a “Global village” with internet facilities since volume of information could be accessed from all corners of the globe with ease. Any classroom teacher with adequate and professional skills in ICT utilization will definitely have his students perform better in classroom learning. Graduate teachers in particular have the optimism to be current in a way of accessing and retrieving information from the internet.

The teachers who have access to computers in the schools under the study are shown in table 10.

Table 10: Access to Computers at School by Teachers

Computer access in school	Yes	No
Methodist SHS	10(100.0%)	0(0.0%)
Istiqama SHS	0(0.0%)	10(100%)
Total	20	100

Source: Field data, 2011.

The analysis presented in Table 10 shows a split decision on the computer access in the schools as 10 representing 100.0% of the respondents had access to computers while the other 10(100.0%) had no access to computers at their school. Ajayi (2008), posited that with the aid of ICT, teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore. All these assertions will materialize if computers are made available in second cycle schools for teachers and students to use. Also, it is clear that the schools lack computers and regular maintenance of the existing ones. Promoting effective teaching and learning through the use of child centered method where they search for the information themselves on the net is important.

Similarly, lacking access and computer skills, a whole generation will be missing out on realizing their full potential in an information and communication technology world (Koss, 2001). The teachers in the Senior High Schools are regarded as the source of information when it comes to

information retrieval. Where this is lacking, the teachers become desperate and are not convinced to stay in those areas.

Frequent use of computers improves the skills of the user and at the same time updates his/her knowledge and skills. Below is a distribution of daily computer usage by the teachers in Table 11.

Table 11: Computer usage by the Teachers

Daily computer usage	3-4 Hrs.	4-6 Hrs.	More than 6 Hrs
Methodist SHS	2(50.0%)	1(25.0%)	1(25.0%)
Istiqarma SHS	1(50.0%)	1(50.0%)	0(0.0%)

Source: Field data, 2011

From Table 11, 2 respondents which represent 50% use computers daily. One (1) 25.0% use computers between four to three and more than six (6) hours daily. One (1) representing 50.0% of the respondents from Istiqarma Senior High School use computers daily for three to four hours and four to six hours respectively.

It must be noted that the knowledge and skill level of the teachers in computing will have positive or negative effect on the ICT integration in normal classroom teaching and learning processes if they do not use computers regularly. Constant use of computers by the teachers and the student will foster proper understanding of ICT concepts and in effect engage them in critical thinking in decision making.

Availability of trained ICT teachers promotes skill acquisition by students and teachers alike. The distribution of the table below indicates the qualification of the respondent teachers under the study.

Table 12: Qualification of Teachers

Teachers Qualification	Frequency	Percentage
Bachelor of Edu.(Computer Sc.)	1	5.0
Bachelor of Edu. (Social Std.)	15	75.0
Bachelor of Edu. (Mathematics)	2	10.0
Others.	2	10.0
Total	20	100

Source: Field data, 2011.

Table 12 depicts that 15 (75.0%) of the respondents are qualified Social Studies teachers with bachelors' degree. Two of the teachers representing 10% were qualified Mathematics teachers with bachelors' degree. Only one (1) representing 5.0% of the respondents had bachelors' degree in Computer Science. However, it was noted that well trained ICT teachers are lacking in various second cycle schools.

This situation needs to be looked at as the students are to be prepared to meet future challenges in the technological world. It has been observed by (Condie et al, 2005), that student instruction would have to be articulated around three main areas: training to consume (ICT materials), training to use

(telematic tools and resources) and training to produce (electronic materials). If qualified teachers who are to teach ICT at the secondary school level are not available, Ghana's ICT for Accelerated Development Policy (ICT4AD) (Republic of Ghana, 2004) will have different turn.

Analysis of the Main Data

In this section, the findings that emanated from the study in terms of effort of government towards bridging the ICT gap in schools, curriculum change policy makers have made to integrate ICT in teaching and learning, reactions of both teachers and students on computer usage, ICT tools being used in schools and problems militating against the integration of ICT into the school curricular are presented.

Research Question One

What are the available ICT resources in second cycle schools?

With the increasing popularity of computer technology, it is essential for administrators to support and encourage computer technology in our educational system. It is in this direction that the researcher sought to examine the ICT infrastructures available towards bridging the technology gap in second cycle schools. The data collected in this regard is presented in Table 12.

The Table 13 indicates the response of teachers in respect of available ICT resources in their schools.

Table 13: Available ICT Resources in the Schools

ICT Facilities	Methodist SHS		Istiqarma SHS	
	Available	Not Available	Available	Not Available
Computer labs	10(100%)	0.0(0%)	0.0(0%)	10(100%)
Digital camera.	9 (90.0%)	1(10.0%)	0(0.0.0%)	10(100.0%)
Municipal ICT centre	0.0(0%)	10(100%)	0.0(0%)	10(100%)
SHS are networked	0.0(0%)	10(100%)	0.0(0%)	10(100%)
Line phones	10(100)	0.0(0%)	0.0(0%)	10(100%)
Printers/Projectors	9(90.0%)	1(10.0%)	0.0(0%)	10(100%)
Television set	10(100%)	0.0(0%)	10(100%)	0.0(0%)
SHS website	0.0(0%)	10(100%)	0.0(0%)	10(100%)

Source: Field data 2011

The data in Table 13 indicates that television sets representing 10(100.0%) were available in both schools while websites were not available. Digital cameras 9(90.0%), printers/projectors 9(90.0%), line phones 10(100.0%) and computer laboratory 9(90.0%) were available in Methodist Senior High School but they were not available in Istiqarma Senior High School. The same number of respondents representing 10(100.0%) reported that computer network were not available in both schools.

The analysis further shows that 10(100.0%) respondents from both schools reported that Municipal ICT centres were not available in the

municipality. On the other hand, computer laboratory, digital cameras, line phones and printers/projectors were not available in Istiqarma Senior High School. Barnett (2000) observed that there is significant pressure in schools today to change due to economic, social, and political transformations, and in these, entirely he says, they need new skills and approaches to learning.

It is important not only to examine what teachers do with computers but also to consider how teachers learn those skills. When the ICT infrastructure and trained ICT teachers are provided, technology gap will be reduced to its bearers minimum.

Research Question Two

What curriculum change has policy makers made to ensure technology integration in the teaching and learning processes?

Integrating IT in education calls for change in the curriculum and this must come from policy makers. Teachers were therefore asked specific curriculum change they have observed. The analysis of their responses is tabulated in Table 14.

The responses of teachers in Table 14 indicate whether ICT has been integrated into teaching and learning in the Senior High School's curriculum.

Table 14: Rating of Curriculum Change for Technology Integration in Teaching and Learning

Technology integration	Methodist SHS		Istiqarma SHS	
	Agree	Disagree	Agree	Disagree
Integrate ICT	3(30.0%)	7(70.0%)	1(10.0%)	9(90.0%)
ICT is compulsory in SHS	8(80.0%)	2(20.0%)	6(60.0%)	4(40.0%)
ICT is an elective subject	0(0.0%)	10(100.0%)	0(0.0.0%)	10(100.0%)
Trained ICT Teachers	5(50.0%)	5(50.0%)	0(0.0%)	10(100.0)
IT in-service training	2(20.0%)	8(80.0%)	1(10.0%)	9(90.0%)

Source: Field data, 2011

Information in Table 14 reveals that 10(100.0%) respondents of teachers from both schools disagreed that ICT is elective subject in their schools. Eight respondents from Methodist Senior high representing 80.0% agreed that ICT is compulsory while 60.0% respondents from Istiqarma Senior High School agreed that ICT is compulsory. Nine representing (90.0%) of the respondents from Istiqarma Senior High School disagreed that in-service training for teachers in information technology has not been going on in their school.

Technology integration brings changes to teachers' instructional roles in the classroom. The teacher's roles in a technology-infused classroom often shift to that of a facilitator or coach rather than a lecturer (Henriquez & Riconscente, 1998). It was noted from this study that respondents affirmed that technology has not yet been integrated in the school curriculum. BECTA

(2001) also point it out that the use of ICT in the classroom has the potential to enhance learners' academic achievement when effectively integrated into the curriculum.

Research Question Three

What are the reactions of teachers in the use of information Communication technology in teaching and learning processes?

The study went further to examine the reactions of teachers towards the use of Information Communication Technology (ICT) in teaching and learning. The data collected in this regard is presented in Table 15

Table 15: Reactions of Teachers in the use of ICT

Reactions of teachers	Methodist SHS		Istiqarma SHS	
	Agree	Disagree	Agree	Disagree
Teachers interested in ICT	6(80.0%)	4(20.0%)	6(60.0%)	4(40.0%)
Computers are used to assessing students	8(80.0%)	2(20.0.0%)	3(30.0%)	7(70.0%)
Computer skills are difficult	2(20.0%)	8(80.0%)	4(40.0%)	6(60.0%)
Laptops & projectors are used for presentations	3(30.0%)	7(70.0%)	1(10.0%)	9(90.0%)
computers used for research	10(50.0%)	0(0.0.0%)	10(100.0%)	0(0.0%)

Source: Field data, 2011

Considering the assertion that teachers have interest in computing, the data analyzed in Table 15 reveals that 6(60.0%) respondents agreed while 4(40.0%) respondents disagreed. For the two statements, computers are used for research purposes all the respondents representing 100.0% from the two schools agreed. Eight representing 80.0% of the respondents from Methodist Senior High school disagreed that computer skills are difficult while 6(60.0%) respondents from the other school also agreed.

Furthermore, 7(70.0%) of the respondents from Istiqarma Senior High School disagreed that computers were use for students' assessments. Instead of focusing on isolated, skills-based uses of technology, schools should promote the use of various technologies for sophisticated problem-solving and information-retrieving purposes (Means & Olson, 1995). In short, both the teachers and the students have interest in computer studies.

Research Question Four

What are the information communication technology tools in use by the two second cycle schools?

For ICT to be used in teaching and learning, ICT must be available. It is therefore important to find out which ICT tools are found in the schools. The result of the analysis from the data collected covering ICT tools in use by Methodist Senior High School is presented in Table 16.

Table 16: Available Tools in use at Methodist Senior High School

Methodist SHS			
ICT tools	In use	Q'ty.	Out of use.
Projectors	√	2	-
Printers	√	3	-
Desktop computers	√	55	5
Television set	√	2	-
Digital cameras	√	2	-
Scanners	√	2	1
Laptop computers	√	2	1
Line phone	√	5	2

Source: Field data, 2011

The report presented in Table 15 shows ICT tools that were available for use with their quantity and those which are out of use at the Methodist Senior High School. The researcher upon visiting the two schools came out with the available tools that are currently in use by the two schools. At the Methodist Senior high School he found out that two (2) projectors were at the computer laboratory and they were in use for lesson presentation by the teachers. Three (3) printers, one for examinations and the other two for office duties. Fifty-five desktop computers with five unusable ones for teaching and

other office duties. Besides, five (5) line phones were available for use but only three of them were in good condition.

On the other hand, the researcher found that Istiqarma Senior High had no or very little access to these ICT tools. Only few of the teachers had computer laptops as compared to their counterpart from Methodist Senior High School. Technology skills are now a prerequisite for most jobs, hence lack of access to technology for those with limited education could render their skills obsolete.

According to Tenbusch (1998), "If school districts do not do a better job of allocating resources for professional development--instead of putting all the budget into technology acquisition--schools will be left with the tools but not the talent to prepare youngsters for a technological world" (p. 2). The computer skills gained will allow students to command higher wages and contribute to the economic advancement of the nation, preventing the social and economic problems unemployment creates.

Research Question Five

What are the problems militating against the integration of technology in the schools curricula?

Integration of IT into the school curricular comes with a lot of problems. It is worthwhile to identify the problems identified by the respondents. The findings are analyzed in Table 16.

Table 17: Problems Revealed by the Respondent Teachers

Problems of the schools	Methodist SHS		Istiqarma SHS	
	Agree	Disagree	Agree	Disagree
Lack of support	9(90.0%)	1(10.0%)	9(90.0%)	1(10.0%)
Lack of interest	5(50.0%)	5(50.0%)	3(30.0%)	7(70.0%)
Lack of maintenance	6(60.0%)	4(40.0%)	5(50.0%)	5(50.0%)
In adequate resources	6(60.0%)	4(40.0%)	8(80.0%)	2(20.0%)
Lack of ICT personnel	8(80.0%)	2(20.0%)	7(70.0%)	3(30.0%)
Lack of ICT materials	4(40.0%)	6(60.0%)	8(80.0%)	2(20.0%)
Cost of ICT tools	9(90.0%)	1(10.0%)	9(90.0%)	1(10.0%)
Attitude of teachers	2(20.0%)	8(80.0%)	2(20.0%)	8(80.0%)

Source: Field data, 2011

The information in Table 17 reveals that 9(90.0%) respondent teachers from both school agreed that cost of ICT tools/equipments militate against the integration of technology in the schools curricula. On the other hand, the same number of respondents from both school indicated that lack of support militate against the integration of ICT in teaching and learning as 9(90.0%) agreed. Furthermore, 8(80.0%) of the respondents from both schools disagreed that attitudes of the teachers hinders the integration of ICT into the schools' curricula.

Moreover, 8(80.0%) of the respondents from Methodist Senior High School agreed that lack of ICT personnel hinders integrating of ICT in

teaching and learning processes while 7(70.0%) from Istiqarma Senior High School had the same opinion. It is evident, as many other authors such as Facer, (2004) have highlighted that lack of technical knowledge and a successfully implemented habit and good practice in the use of ICT into teaching and learning processes would become one of the main objectives when trying to elicit from teachers a positive attitude towards the use of technology.

It is confirmed that learning towards bridging the digital divide gap focused predominantly on issue of access and the subsequent availability of adequate resources and infrastructure. Availability of technological resources enhances effective teaching and learning (Austin et al., 2003).

Testing of Hypothesis

In order to test for the performance of the knowledge and skills levels in computing of schools with computer facilities and schools without computer facilities two hypotheses were formulated and tested.

Hypothesis 1: There is no statistically significant difference in knowledge level in computing between the students in schools with Computers and students in schools without computers.

The table 18 shows the group statistics of knowledge level of students from the two schools. Independent sample t-test was used.

Table 18: Differences in the Knowledge Level of Students.

Item	Mean	Standard deviation	t	df	p-value
Have ICT	8.79	.918	3.139	36	.004
Have no ICT	7.26	1.91	25.888		

Looking at the group statistics in Table 18, it shows that there was a statistically significant difference in knowledge levels of students of Wenchi Senior High School in computing (Mean = 8.79, Std = 0.918), and Istiqarma Senior High School that did not have computers, (Mean =7.26, Std = 1.91, $t(25.888) = 3.13$, $P = 0.004$ respectively. The school which has computers has mean of 8.79 in the knowledge level in computing with standard deviation of 0.918 while their counterpart had a mean mark of 7.26 with standard deviation of 1.91. From the results, students from Wenchi Senior High with computers had a better mean score as compared to students of the Istiqarma Senior High school. On the strength of this, the research hypothesis was accepted.

This implies there is difference in knowledge level among the students with computers and students without computer. As the P-value = .004 of the test is less than .05, it clearly shows that there is significant difference in knowledge level of the two schools compared. This could come about as a result of exposure of students to computers and constant use of the computers in their school.

Hypothesis 2: There is no statistically significant difference in skill level

in computing of students in schools with Computers and students in schools without computers.

The table 19 displays the group statistics of skill level of students from the two schools. Independent sample t-test was used.

Table 19: Differences in Skills Level of the Students

Item	Mean	Standard deviation	t	df	p-value
Have ICT	19	1.756	12.561	36	.000
Have no ICT	10.71	2.349	33.347		

The results of the test presented in Table 19, indicates that there is a statistically significant difference in skill levels in computing between the students of Wenchi Senior High School, (Mean = 19.16, Std = 1.756), and the students of Istiqarma Senior High School (M =10.71, Std = 2.349, $t(33.347) = 12.561$, $P = .000$). Considering the mean score, the school with computers had mean of 19 with standard deviation of 1.756 while those without computers in their school had mean of 10.71 with a standard deviation of 2.349. From the results, difference in skills among the haves and have nots in terms of computers is statistically significant. In this case the null hypothesis failed to be rejected.

So far, the results indicate that the students from the school with computers performed better as compared to those from school without computers. This could be that they have had hands-on practice in some basic computing skills regularly.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study sought to understand the effort of the government and policy makers in bridging the technology gap that exist in second cycle schools and computer usage by teachers and students. With this, the background of the study, statement of the problem, the purpose of the study, significance of the study as well as literature review was look at.

Random sampling was used to get the respondents involved in the study. The hypothesis formulated was tested on the students whiles the teachers were also interviewed. The instrument for the study was an experimental design where questionnaires and semi structured interview were used. The data obtained was analyzed using Statistical Package for Social Sciences (SPSS).

Main Findings

1. The study showed that there is statistically significant difference in knowledge levels in computing between the students with computers and students without computers.

2. The study also revealed that there is statistically significant difference in skill levels in computing between students with computer tools and students without computers.
3. It was noticed that technology gap actually exist in the two school where the study was conducted.
4. It was observed that none of the schools had Local Area Network to communicate and share other resources internally.
5. Once again, the study revealed that the two schools had no website
6. Moreover, internet connectivity was not in any of the two schools. Though Methodist Senior High School had most of the modern ICT tools but they were not connected to the net due to high cost of internet services.
7. The students from Methodist Senior High School exhibited sense of readiness, confidence during the pretest-posttest exercises and it could be that some of them always use computers.

Conclusions

It was noted from the study that technology gap exist in most of the second cycle schools. The schools did not have access to internet facilities and the ICT infrastructures are not equally distributed to the schools as some have access while others do not. From the study, it was evident that the students who have access to computers performed better than their counterparts without computers.

In addition, the respondents agreed that ICT is taught as Core subject in all the second cycle schools in the country and the students do not write any external examinations in ICT. It has also been established by this study that ICT centre for the community with internet facilities, website and Local Area Network were not in most second cycle schools. The schools lacked qualified trained IT teachers for proper integration of ICT in teaching and learning processes.

Recommendations

1. To close the digital gap in second cycle schools for effective use of computers to facilitate teaching and learning in Senior High Schools in Ghana, the government and the Ministry of Education should provide ICT infrastructure including computer laboratories, computers, projectors, internet facilities, laptops etc. Availability of the infrastructures will facilitate smooth integration of ICT in schools curriculum.
2. It would be better if more of the teachers are given the basic computer skills so that most of them would be able to integrate ICT into their lesson. Increasingly, ICT permeates every area of our society and lives. Teachers with basic computer skills will help to equip students with the necessary knowledge and skills to use ICT to support contemporary learning and living.
3. Training of professional ICT teachers for second cycle schools needs to be looked at to ensure successful use of ICT and implementation of new

innovations. Professional Development of Teachers is probably the largest obstacle facing teachers in using technology in their classrooms

4. In order that professional development to be a success; teachers have to be exposed to training frequently. Moreover, internet plays an important role in education. ICT centers in the Municipality with internet access would be of benefit to both teachers and students to have a taste at least once in every week. The Municipal Assembly in conjunction with Ghana Education Service could provide internet access to serve as resource centre for schools and the community as a whole.
5. Furthermore, second cycle schools could also be networked nationwide so that necessary information could be shared to afford the opportunities for the students to personalize learning and to learn both within and out of school.
6. Finally, government, stakeholders, Non Governmental Organizations (NGO) and Philanthropist could join hands in the provision of ICT. Also, curriculum resource that will promote professional development programme that is tied to the school's curriculum goals, designed with built-in evaluation should be introduced into all the schools. This can be sustained by adequate financial and staff support if teachers are to use technology appropriately to promote learning for all students in the classroom.

Suggestion for Further Research

The current study is limited in scope as it was conducted to cover only two Senior High Schools in the Wenchi Municipality. There is therefore the need to replicate this study to cover population groups in larger geographical areas. A study could also be conducted to see the impact of ICT among schools in Ghana.

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APPENDICES

APPENDIX A

STUDENTS' GENERAL KNOWLEDGE QUESTIONNAIRE

Name of school:.....

This questionnaire is part of a study on the effect of digital divide on teaching and learning processes in the Senior High Schools in the Wenchi Municipality in the Brong Ahafo Region.

The success of the study, to a large extent, depends on your personal and honest responses to the questions. Your responses to the questions will be treated as confidential as possible.

Thank you for accepting to be part of this research.

Instruction:

From your own independent and objective point of view, please supply answers to the following questions

1. Which one of the following is not an output device
 - (a) Monitor
 - (b) Printing
 - (c) Projector
 - (d) Mouse
2. The following are storage devices except
 - (a) Compact disc
 - (b) Pen drive

- (c) Printers
 - (d) Hand disk
3. Which of the following serves as input and output device?
- (a) Modem
 - (b) Scanner
 - (c) Tack ball
 - (d) Joystick
4. GUI stands for
- (a) Graphic User Interface
 - (b) Graphic User Instituted
 - (c) Graphic User International
 - (d) Application software
5. The electronic device that interprets and carries out the basic instructions that operate the computer is called.
- (a) Memory
 - (b) C. P .U
 - (c) GUI
 - (d) System unit
6. Word wide collection of networks that links millions of Businesses, government agencies, education institution and individual is referred to as
- (a) Network
 - (b) Internet
 - (c) System software

(d) Mobile user

7. A series of instructions that tells hardware how to perform tasks is known as

(a) User interface

(b) Software

(c) Share ware

(d) Open source

8. An organized data that is meaningful, and useful is termed as

(a) Information

(b) Data

(c) System software

(d) Storage

9. Being a computer literate means.

(a) You have knowledge in typing

(b) You have knowledge and understanding of computers and their uses.

(c) You have knowledge and understanding of starting a computer

(d) You have knowledge and able to play games with the computer

10. The abbreviation GIGO refers to what in computing?

(a) Garbage In garbage out

(b) Garbage In garbage on

(c) Garbage In garbage off

(d) Garbage In garbage of

APPENDIX B

STUDENTS' PRACTICAL QUESTIONNAIRE

Questionnaire to test students' skill levels in Microsoft Word and Microsoft Excel suit.

ICT Practice Test 1

Context

The two tasks in this test each relate to a different scenario, each one requiring you to use one or more applications: Task

Task	Scenario	Applications needed
1	Exercise I	Microsoft Word Processor
2	Exercise II	Microsoft Excel

Marks are awarded for completing the tasks as indicated by the task statement. It may be possible to complete some tasks in a number of different ways; however, it is recommended that you do so in an efficient manner as possible.

Task 1:

You are required to perform the following activities.

- a. Launch Microsoft Application Software

- b. Type “**The Computer Usage**” and **align** it in the **centre** of the page.
- c. Set the title text to **16pt**.
- d. Change the **font colour** to blue.
- e. Type the following statement:

ICT can be used in education to:

- improve administrative efficiency
- disseminate teaching and learning materials to teachers and students
- improve the ICT skills of teachers and students
- allow teachers and students access to sources of information from around the world
- share ideas on education and learning
- collaborate on joint projects
- conduct lessons from a remote location

- f. Set the body text to **14pt**.
- g. **Bold** and **Underline** all the ‘students’ and ‘teachers’
- h. Save it with the name **ICT Practical Test**.

Task 2.

EXERCISE II, RECORDS OF ANDREWS OFORI, FINAL YEAR STUDENT.

You are using spreadsheet to collate his results.

1. Open the spreadsheet file called My Marks on the desktop which is located in the *practical Test* folder.

2. Insert a new row at the top of the spreadsheet and, in Cell A1, enter 'Subject', B1, enter ' First Year, C1 enter, 'Second year, D1, enter 'Third Year and E1 enter, Forth year.
3. Insert a column after Column **D**.
4. In the new column, enter the text 'practical Score'.
5. Centre all the text in Columns **B** to **E**.
6. Enter 'Total Score' in column F1.
7. Highlight A2 to A9 and bold it.
8. Resave the records as *ICT Practical II* on the desktop.
9. Double click on the sheet tab and name that particular sheet 'Final'.
10. Add the data from B2 to B9 and bold and underline the totals at B10.
11. Check to save all the changes before you close the programme

APPENDIX C

STRUCTURED INTERVIEW QUESTIONNAIRE

section A: Background information.

1. Name of school.....
2. Gender: (a) Male [] (b) Female []
3. Age: (a) Below 20 yrs [] (b) 20-30 yrs. [] (c) Above 30 yrs. []
4. Academic Status: (a) BSc. Computer Science [] (b) BEd. Maths. (c) BEd. S. Studies. (d) Others (Please specify).....
5. Computer Usage: (a) Not at all [] (b) 1-3 Hours [] (c) 4-6 Hours [] (d) More than 6 Hours []
6. Internet Access at home by the teachers: Yes [] No []
7. Ownership of computers by the teachers: Owned PC [] Do not have PC.
8. Period of computer ownership: 1-2 yrs. [] 3-5 yrs. [] 5yrs and above []
9. Teaching experience: Below 5yrs. [] 5-10 yrs. [] Above 10yrs [].
10. Access to computers at school by the teachers: Yes [] No []

SECTION B: (Bridging the technology gap)

S/N	Statement	Available	Not Available
1	Computer laboratory		
2	Digital Cameras		
3	Municipal ICT centre		
4	School has networked the computers.		
5	Line Phones		
6	Printers/Projectors		
7	Television Set		
8	School Website		

SECTION C: (The curriculum change to bring about ICT integration)

1	Statement	Agree	Disagree
2	ICT has been integrated in teaching and learning		
3	ICT is compulsory subject		
4	ICT is Elective subject		

5	Trained ICT teachers		
6	ICT in-service training		

SECTION D: (Available tools at school)

1		In use	Quantity	Out of use
2	Printers			
3	Desktop computers			
4	Television Set			
5	Digital Cameras			
6	Laptop computers			
7	Scanners			
8	Line phones			
9	Projectors			

SECTION D: (Problems that militate against integration ICT of ICT in schools curricula

		Agree	Disagree
1	Lack of support		
2	Lack of interest		
3	Lack of maintenance		
4	Inadequate resources		
5	Lack of IT personnel		
6	Lack of IT materials		

7	High cost of IT tools		
9	Attitude of teachers.		