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ACCESS TO AND USE OF ICT INFRASTRUCTURE IN TEACHING AND LEARNING: A COMPARATIVE STUDY OF RURAL AND URBAN PUBLIC JUNIOR HIGH SCHOOLS IN THE GA SOUTH MUNICIPALITY

BY

JACOB SEY

(10171810)

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DECLARATION

I, **JACOB SEY**, do hereby declare that except for references to other people's work which have been duly acknowledged, this dissertation "**Access to and Use of ICT Infrastructure in Teaching and Learning: A Comparative Study of Rural and Urban Public Junior High Schools in the Ga South Municipality**" is the result of my own research efforts carried out in the Institute of Statistical Social and Economic Research (ISSER) under the supervision of **DR. ELIZABETH ASANTE**, and that this dissertation has neither in whole nor in part been presented anywhere for the award of a degree.

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JACOB SEY DATE

(STUDENT)

…… …….

DR. ELIZABETH A. ASANTE DATE

(SUPERVISOR)

DEDICATION

I dedicate this dissertation to the Almighty God, the author of my life.

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ABSTRACT

Ghana is committed to transforming teaching and learning at all levels of education through the introduction of Information and Communication Technologies (ICT). However, the successful introduction of ICT into basic education depends largely on the availability of ICT infrastructure and the capacity of teachers and students to use them. Using rural and urban public Junior High Schools (JHS) in the Ga South Municipality as a case study, this study investigates the availability and use of ICT infrastructure among students and teachers of rural and urban schools.

It was found that access to ICT infrastructure by teachers and students was inadequate. Nonetheless, there were differences in access to ICT infrastructure between students and teachers of rural and urban schools. Students of urban schools had more access to ICT infrastructure and therefore used it for studies than their rural counterparts. Also, the use of ICT infrastructure in the classroom had more positive impacts on the learning motivations of students of urban schools than those of rural schools. Teachers of urban schools were also more likely to have access to ICT infrastructure than those of rural schools. There was, however, no significant difference between rural and urban teachers in their confidence in the use of ICT infrastructure for teaching.

Since ICT infrastructure had positive motivations for teaching and learning activities in basic schools, it is recommended that the Ministry of Education provides all basic schools across the country with ICT infrastructure. Also, efforts should be made to build the capacity of all teachers in order to facilitate the efficient introduction of ICT in education. The Ghana Investment Fund for Electronic Communication (GIFEC) should be given enough funds to carry out its mandate of ensuring universal access to ICT by unserved and underserved communities in Ghana.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACT	:	American College Test
ADP	:	Accelerated Development Plan
AISI	:	African Information Society Initiative
BECTA	:	British Educational Communication and Technology Agency
FEWACCI:		Federation of West African Chambers of Commerce and Industry
ECA	:	Economic Commission of Africa
FCUBE	:	Free Compulsory Universal Basic Education
FAO	:	Food and Agricultural Organisation
GETFund	:	Ghana Education Trust Fund
GSCE	:	General Certificate of Secondary Education
HST	:	High School Test
ICT	:	Information and Communication Technology
ICT4AD	:	Information and Communication Technology for Accelerated Development
ICTPDP	:	Information and Communication Technologies Professional Development Programme
JHS	:	Junior High School
JSS	:	Junior Secondary School
MDGs	:	Millennium Development Goals
MoE	:	Ministry of Education
NDPC	:	National Development Planning Commission
NEPAD	:	New Partnership for Africa's Development.
R.M.E.	:	Religious and Moral Education
TUCE	:	Test of Understanding College Economics
UNESCO:		United Nations Educational, Scientific and Cultural Organisation
UNO	:	United Nations Organization
WSIS	:	World Summit on Information Society

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Ghana is committed to modernizing and transforming the delivery of education at all levels through the use of Information and Communication Technologies (ICT). This commitment is demonstrated by the adoption of the ICT in Education Policy in 2008 which sought to introduce ICTs into teaching and learning in all tertiary, secondary and basic schools across the country. Using the Ga South Municipality as a case study, this study investigates access to and use of ICT infrastructure in teaching and learning in urban and rural schools.

1.2 Research Context

Many studies highlight the various ways in which ICT may support teaching and learning. The benefits that ICT brings into teaching and learning include creating new opportunities for effective knowledge assimilation by students, making education cheaper and easier, bringing about better learning outcomes, and presenting multiple teaching and learning opportunities (Caves et al, 2009; UNESCO, 2007; Beda et al, 2009; Johannessen, 2009). The significance of ICT in improving the quality of and access to education has been recognized at the international, regional and national levels.

In the year 2000, leaders who attended the United Nations' Millennium Summit adopted the Millennium Declaration out of which the Millennium Development Goals (MDGs) were derived (NDPC, 2012). The second of these goals, seeks to make basic education accessible to all boys and girls by 2015.The goal also aims at improving the

quality of basic education in general. In the context of improving the quality of and access to education, the role of ICTs cannot be undervalued.

In the same year, the World Education Forum was held in Dakar, Senegal. Participants in the forum adopted the Dakar Framework for Action in which countries were tasked to create an environment to "enable all individuals to realize their rights to learn and to fulfill their responsibility to contribute to the development of their society" (UNESCO, 2000:15). Countries were also encouraged to tap the potential of Information and Communication Technologies to improve access to education by remote and disadvantaged communities, enhance data collection, support capacity building of teachers and provide opportunities to communicate effectively and efficiently across classrooms and cultures (UNESCO, 2000).

In 2003, 179 countries attended the World Summit on Information Society (WSIS) in Geneva to discuss ways of making ICT accessible to everybody in the world. The WSIS aimed to bridge the digital divide between and within countries and establish an all-inclusive information society (Barry, 2006). The second phase of the WSIS held in Tunis sought to put into action the plans drawn-up and adopted during the first phase. Regarding education, the WSIS prioritized the provision of internet connectivity to all Universities, Secondary and Primary schools. It also sought to develop specific training programs in the use of ICT in order to meet the educational needs of information professionals (Barry, 2006).

Africa also shares with the rest of the world the urgency to integrate ICTs into all sectors of her economy to facilitate socio-economic development. The African Information Society Initiative (AISI) was introduced in 1996 to build an information society in which all citizens, regardless of age, gender, location and sector, would have access to knowledge through the use of computers and other communication

media (Economic Commission Africa, 2008). The AISI was the first comprehensive strategy by African governments to usher their countries into the Information Age (Economic Commission of Africa, 2008). Under the AISI, many ICT initiatives were pursued with assistance from international organizations.

The formation of the New Africa's Partnership for Development (NEPAD) marked another step in the development of Information and Communication Technology on the African continent. The NEPAD e-School Initiative was launched to introduce ICT in Primary and Secondary schools. The overall objective of the NEPAD e-School Initiative was to equip primary and secondary school students with ICT skills and knowledge to help them participate fully in the information society. Also, the NEPAD e-School Initiative was committed to building the capacity of teachers and students to facilitate the use of ICT infrastructure in the teaching and learning process. As part of the implementation of the NEPAD e-School Initiative, demonstration projects were undertaken in a number of Primary and Secondary schools in twenty countries including Ghana, Kenya, Senegal and Burkina Faso. After this phase of the NEPAD e-School Initiative, a conference was held in Ghana in March 2012 to discuss a new Public Private Partnership (PPP) model to push forward its agenda of introducing ICTs in education.

Efforts at promoting access to and quality of education through ICT at the global and continental levels have shaped Ghana's development policies in recent times. In 2003, the Information and Communication Technology for Accelerated Development policy (ICT4AD) was formulated. The policy seeks to use ICT to transform the Ghanaian economy into information and a knowledge-based one (Republic of Ghana, 2003). In order to facilitate a multi-sectoral application of ICT, the policy mandates all sectors

of the Ghanaian economy to draw-up their own ICT policy frameworks that are consistent with the aims and aspirations of the national ICT policy.

The Ministry of Education thus comes out with the ICT in Education Policy framework document in 2008 to provide a clear purpose and basis for the effective integration of ICT into the education sector (Ministry of Education, 2008). The main goal of the ICT in Education policy is to ensure that graduates from Ghanaian educational institutions have the capacity to use ICT tools confidently and innovatively to develop the requisite skills needed to function effectively in the global knowledge economy by 2015 (Ibid). The specific goals of the policy are to:

1. Facilitate the deployment, utilization and exploitation of ICT within the educational system to improve on educational access and delivery to support teaching and learning from the primary level upwards.

2. Modernize the educational system to improve the quality of education and training at all levels of the educational system and expand access to education, training and research resources and facilities.

3. Orient all levels of the country's educational system to the teaching and learning of science and technology in order to accelerate the acculturation of science and technology in society and produce a critical mass of requisite human resources and a well-informed citizenry.

4. Achieve universal basic education and improve the level of basic and computer literacy in the country.

5. Ensure a population in which all citizens are at least functionally literate and productive.

6. Expand and increase access to secondary and tertiary education.

7. Strengthen science education at all levels and in all aspects of the educational system, especially at the basic and secondary levels.

The policy is grounded in the belief that several elements strengthen the successful integration of ICT in education. These elements include: teaching and learning, management and administration, communication and access to information. Besides, four other elements are considered very important in planning ICT integration in education. They are equity, access to ICT infrastructure, capacity building and norms on the use of ICT infrastructure. The Ministry of Education and its agencies are responsible for the implementation of the policy. However, the Ministry may partner with other ministries, local and international organizations in implementing the policy.

In line with the ICT in Education policy objectives, a number of initiatives, including the NEPAD e-School Initiative was pursued. Under the NEPAD e-School Initiative, beneficiary schools were provided with computers, computer laboratories and internet connectivity. Nevertheless, schools had to pay subscription fees for the internet connectivity. Unfortunately, most of the schools were unable to afford the fees resulting in the termination of internet services (Frempong, 2010). In its recent meeting held in Accra, members of NEPAD agreed that under the e-School Initiative, each school would have access to at least 50, 100 or 200 computers, tablets, projectors, scanners and printers (Federation of West African Chambers of Commerce and Industry, 2012).

More recently, the Ministry of Education partnered with the Ministry of Environment, Science and Technology, the Ministry of Communication, the GETFund and RLG Communications Limited under the Better Ghana ICT Project to provide schools in the country with free laptop computers.

The government's commitment to transforming teaching and learning at all levels of education is demonstrated by the adoption of the ICT in Education policy and other

ICT in education initiatives over the past few years. For ICTs to have the desired impact on teaching and learning, the provision of ICT infrastructure and the capacity of teachers and students to use the infrastructure should be given priority. This study, therefore seeks to find out the extent to which teachers and students of rural and urban public Junior High Schools in the Ga South Municipality have access to ICT infrastructure and use them for teaching and learning purposes.

1.3 Statement of the Problem

Evidence from many studies suggest that the use of ICT in education improves academic outcomes, enhances better attitudes toward schooling and better understanding of abstract concepts (MoE, 2010). As a result, ICTs have been identified as important tools in the delivery of quality education.

Many countries including Ghana have taken serious steps to harness the potential of ICTs in the quest to build a workforce that can participate fully in the information and knowledge society. As a result, the Government of Ghana through the Ministry of Education introduced the ICT in Education policy to ensure that ICT is taught and studied at all the levels of education in Ghana. The ICT in Education policy stresses on the transformation of traditional memory-based learning into education that stimulates thinking and creativity necessary to meet the challenges of the 21st Century (www.cfedonline.org).

The policy is currently at various stages of implementation in all tertiary, secondary and basic schools across the country.

It is worth noting, however, that the provision of ICT infrastructure and the capacity of teachers and students to effectively use them in teaching and learning are crucial to the successful implementation of the policy. Many empirical studies on ICT in

education have concentrated on tertiary and secondary levels. Little is known about the availability and use of ICT infrastructure at the basic level, which lays the foundation of education. Besides, the rural-urban dimension of access and use of ICT infrastructure has not equally been given much attention. Given the paucity of studies on access to and use of ICT infrastructure, especially at the basic level, an empirical research into the state of access and usage of ICT infrastructure in teaching and learning becomes necessary.

This study therefore seeks to expand the frontiers of knowledge on the state of access and use of ICT infrastructure in teaching and learning in rural and urban public Junior High Schools in the Ga South municipality.

1.4 Research Objectives

The main objective of this study is to investigate access to and use of ICT infrastructure in teaching and learning in rural and urban public Junior High Schools (JHS) in the Ga South Municipality. The study specifically seeks to examine:

1. Access to and use of ICT infrastructure by students of rural and urban schools.
2. The impact of ICT infrastructure on the learning motivations of students of rural and urban schools.
3. Access to and use of ICT infrastructure by teachers in rural and urban schools.
4. The impact of ICT infrastructure on the motivations of teachers to deliver education through ICTs.
5. The confidence of teachers in using ICT infrastructure to teach.

1.4.1 Research Questions

The study seeks to answer the following questions:

1. To what extent do students of rural and urban schools have access to ICT infrastructure and use them for learning purposes?
2. Does ICT infrastructure have any impact on students' learning motivations?
3. To what extent do teachers in rural and urban areas have access to ICT infrastructure and use them for teaching?
4. Does access to and use of ICT infrastructure have any impact on teachers' motivations to deliver education through ICTs in anyway?
5. Are teachers confident of the use of ICT infrastructure for teaching?

1.5 Hypotheses

H_o: There is no significant difference in the use of computers between students of rural and urban schools.

H_o: There is no significant difference in learning motivation between students of rural and urban schools.

$\mathbf{H_o}$: There is no difference in confidence between teachers in urban and rural schools in the use of ICT infrastructure for teaching.

1.6 Significance of the Study

Little has been done to find out the level of access and use of ICT infrastructure in basic schools in Ghana since the ICT in Education policy came into being. Rather, the focus has been on secondary and tertiary levels. By doing a comparative study of Rural and urban public Junior High Schools in the Ga South Municipality, this study contributes to the discourse on educational technology by investigating access and use of ICT infrastructure by students and teachers. The findings and recommendations of this study will be useful to policy makers and educational planners in fashioning out future ICT in education strategies. Finally, areas that this study is unable to explore

will give rise to further research in Ghana as the country continues to push forward the agenda of transforming traditional teaching and learning methods with ICT.

1.7 Organization of the Study

The study is organized into five chapters. Chapter one comprises the introduction, research context, problem statement, objectives, hypotheses, significance and organization of the study. Chapter two of the study deals with the review of relevant literature on the topic. The third chapter covers the research methodology and the educational profile of the study area. In Chapter Four, the findings of the study are presented and analyzed. The last chapter provides a summary of findings, conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

It is widely acknowledged that Information and Communication Technologies can transform teaching and learning at all levels of instruction. The belief in the transformational capabilities of ICT in education has been the major reason behind investments in ICT infrastructure in schools by most countries. Ghana's commitment to introducing ICT in education manifests in the formulation of the Ghana ICT for Accelerated Development and the ICT in Education policy of 2003 and 2008 respectively. Essential to the success of these policy initiatives towards integrating ICT into education is access to ICT infrastructure and the capacity of teachers and students to use them. In investigating access to and use of ICT infrastructure by rural and urban schools in the Ga South municipality, it is important to review past studies which relate to this study. This chapter begins with the operationalization of key concepts used in the study. In order to put the study in context, Ghana's basic education and ICT policies are reviewed. This is then followed by a review of relevant studies under the following themes:

1. The role of ICT in education
2. Measuring ICT impact on education
3. Teachers' confidence in using ICT for teaching purposes
4. Rural- urban divide and access to ICT infrastructure and
5. Conceptual framework

2.2 Definition of Key Terms

The key terms worth defining in this study include Information and Communication Technology (ICT) infrastructure, access, teaching and learning and rural and urban schools.

2.2.1 ICT Infrastructure

The term ICT infrastructure as used in this study refers to all sorts of new technologies that could be used to facilitate teaching and learning. These technologies include computers and their peripherals, the internet, projectors and interactive whiteboards. ICT infrastructure also includes a designated computer laboratory where these tools could be kept safely for teaching and learning.

2.2.2 Access

Access refers to the availability of ICT infrastructure to teachers and students for teaching and learning purposes. In this study, access is measured by the existence of a computer laboratory, the number of functioning computers available for teaching and learning, the number of computers connected to the internet and connection to electricity.

2.2.3 Teaching and Learning

Teaching and learning involve the transfer of knowledge in the classroom from the teacher to students. In recent times, some scholars have criticized the approach to teaching and learning where the teacher supplies knowledge to students. They rather advocate for an approach in which the teacher facilitates the teaching and learning process and helps students construct their own knowledge to solve problems. In this study, both approaches are seen as playing major roles in facilitating teaching and learning through ICT.

2.2.4 Rural and Urban Schools

In Ghana, urban areas are formally defined as settlements with a population of 5000 or more (Owusu, 2005). However, the definition of rural and urban schools in this study is based on the Ga South Municipal Education Directorate's classification of schools as rural or urban. Schools were selected for the study based on this classification.

2.3 Synopsis of Basic Education Policies in Ghana

Numerous education policy initiatives have been pursued by Ghana since the post-colonial era to help identify an educational system that responds to national aspirations (Kwapong, 2010). This segment traces the various basic education policies that were introduced after independence to enhance access to and the quality of basic education in Ghana.

In 1951, the transitional government of Dr. Kwame Nkrumah and The Convention People's Party (CPP) sought to bridge inequalities in access to education and provide universal basic education for all Ghanaians. In respect of this, the Accelerated Development Plan (ADP) of Education was formulated to revise the existing educational structure which required learners to spend six years in primary, four years in middle school, five years in Secondary School and two years in Sixth-form (Little, 2010). The provision of universal basic education under the ADP consisted of the expansion of infrastructure and the introduction of the Education Act of 1961 which made Primary and Middle Schools free and compulsory. This enhanced access to basic education to a large extent as enrolment doubled between 1960/61 and 1964/65 (Oduro, 2000). The concentration on the expansion of educational access by the ADP led to the shortage of qualified teachers for primary and middle schools throughout the country. To deal with this problem, the government embarked on an emergency

training of pupil teachers to supplement the existing teaching force (Little, 2010). Teacher Training Colleges were also established throughout the country to train teachers to handle various subjects at the basic level. The massive expansion of basic education also led to the growth of unemployment among primary and secondary school-leavers (Foster, 1965). It is important to note that the Education Act under the ADP did not make basic education completely free as it made parents pay for textbooks and other essential materials that were required to enhance the quality of teaching learning (Poku, Aawaar & Worae, 2013; Oduro, 2000). These problems notwithstanding, Ghana's education system was regarded as one of the most developed in Africa by 1965 (Palmer, 2005, quoted in Baku et al, 2013).

In order to improve upon the groundwork laid by Dr. Kwame Nkrumah, the National Liberation Council (NLC) constituted an Education Committee, which was chaired by Professor Kwapong, to review the existing education system and advocate ways of addressing what were seen as "fallen standards" (Nii Moi & Casely-Hayford, 2008) of education inherited from the Nkrumah regime. The Committee recommended that students take a Common Entrance Examination (CEE) after eight years of Elementary School and be admitted to Senior Secondary Schools if they performed well. Those who were not selected went through a two-year continuation classes in prevocational skills. The policy, however, contributed to the emergence of private schools where children of the bourgeois class attended and passed the Common Entrance Examination and gained admission into the best Secondary Schools (Little, 2010; Djangmah, 2011). Products of most public Elementary Schools therefore ended up in Continuation Schools. Attempts by the policy to raise the standards of education ended up creating a situation where children of the rich had better access to Secondary education than children of the poor (Little, 2010).

The Dzobo Committee of 1973 was commissioned to investigate the failures of previous education reforms and come out with recommendations that would make the Ghanaian educational system relevant to national development needs. The report recommended a replacement of the Middle School system by the Junior Secondary School (JSS) concept. Learners were required to spend six years in Primary, three years in Junior Secondary and four years in Senior Secondary School (Little, 2010). The Ghana Teaching Service, now Ghana Education Service (GES), was established as an agency of the Ministry of Education to facilitate the implementation of the new reforms.

The economic situation in Ghana between the late 1970s and the early 1980s badly affected the education sector (Poku et al, 2013) as the Gross Enrolment Rate (GER) declined to 70% in 1986 (Oduro, 2000). The economic hardships at the time coupled with the harsh treatment of the military regime of 1981 forced many highly qualified teachers out of the country to seek better conditions of service elsewhere (Poku et al, 2013). Other problems that befell the education sector within this period included lack of textbooks and curriculum materials, inadequate supply of furniture and deterioration of school buildings (Agyemang, Baku & Gbadamosi, 2000). It was the crisis witnin the education sector that made the Provisional National Defence Council (PNDC), under the chairmanship of Jerry John Rawlings, to introduce the 1987 education reforms. The reforms set out to achieve many objectives at all the levels of education throughout the country. However, In this study, only issues related to basic education in the reforms are dealt with.

The 1987 reforms were based on the Dzobo report of 1974. The reforms reduced basic education from ten years (six years of Primary School and four years of Middle School) to nine years (six years of Primary school and three years of Junior Secondary

School) in order to cut down cost on the part of the state and individuals (Oduro, 2000). All final year Junior Secondary students were mandated to sit the Basic Education Certificate Examination (BECE) to enable them gain admission into Senior Secondary Schools, Vocational Institutes or Technical Schools (Ansu-Kyeremeh et al, 2002). In terms of content, the reforms sought to equip JSS graduates with practical skills especially in the area of Science and Technology and agriculture. As a result, subjects such as Agricultural science, Pre-technical skills and Pre-vocational skills were introduced into the JSS curricula and made internally and externally examinable. Also, the number of weeks students attended school was increased from 36 to 40 weeks per annum (Oduro, 2000). Untrained teachers were either retrained or replaced with qualified ones in order to increase the number of professional teachers at the basic level (Ibid). The implementation of the 1987 reforms continued after the National Democratic Congress was voted to power in 1992 and 1996. In 1995, access to basic education and school enrolment were improved through the introduction of the Free Compulsory Universal Basic Education (FCUBE). The FCUBE sought to reduce the cost of basic education, improve school supervision and management, increase the number of schools and improve the quality of infrastructure (ISSER, 2013). According to Little (2010), the FCUBE intended to address four weaknesses of the erstwhile educational system. Areas to be tackled included the expansion of access to education for girls and disadvantaged people, reduction in the rate of repetition and dropout and increment in the pass rate for admission into secondary schools to 80% by 2005. Improvement of the curriculum was also targeted to make education relevant to national development.

Even though the 1987 education reforms of the PNDC and NDC government promoted access to basic education in the country, it was without problems. Efforts to increase the number of trained teachers in the country resulted in regional disparities

in the supply of trained teachers (Oduro, 2000). Massive expansion of Primary and Junior High Schools did not correspond with infrastructure provision. As a consequence, many basic schools in rural areas lacked good infrastructure. Increasing the number of subjects at the JSS level to 13 also brought considerable pressure on teachers to teach all the subjects in the curriculum (Little, 2010). The challenges that accompanied the reforms, no doubt, had a negative effect on the quality of teaching and learning at the JSS level and beyond. In 2000, the National Democratic Congress lost power to the New Patriotic Party (NPP) under the leadership of John Agyekum Kuffour.

The NPP which assumed office in 2001 constituted a committee in 2002 to review the previous education system. The committee focused on the assessment of the education structure, delivery, challenges and the application of Information and Communication Technologies (Kwapong, 2010). Based on the committee's recommendations, the government issued a White Paper on education reforms in 2007. The White Paper proposed eleven years of basic education to comprise two years of Kindergarten, six years of primary and three years of Junior High School (ISSER, 2013; Kwapong, 2010; Little, 2010). In order to expand access, increase enrolment and retention, basic education was made free and mandatory for all children of school-going age (ISSER, 2013). The implementation of the capitation grant and the school feeding program were strategies pursued towards fulfilling the government's duty of providing Free Compulsory Universal Basic Education as a right as enshrined in Article 38 of the 1992 Constitution of Ghana.

All the post-independence basic education policies in Ghana were concerned with improving access to basic education and enhancing the quality of teaching and learning. Apart from the 2007 education reforms, none of the policies gave serious

attention to the incorporation of Information and Communication Technologies (ICT) in teaching and learning at the basic level. ICT introduction in education as a key priority area of the 2007 reforms was based on the belief that ICTs play a major role in enhancing access to education to a wider section of the population as well as in facilitating educational delivery and training at all levels (Ministry of Education, 2008). Since 2008, ICT was introduced into the curricula of Primary and Junior High Schools and teachers were encouraged to use it for teaching. The success of this initiative largely depends on the availability of and access to ICT infrastructure. The next section focuses on the review of the policy framework of ICT introduction in education in Ghana.

2.4 Policy Framework for ICT in Education in Ghana.

Ghana has not reneged in her efforts to equip her citizens with ICT skills to be able to operate effectively in a world that is increasingly being transformed into a knowledge-based one. ICT introduction in all sectors of the economy, including education, has therefore become a public policy priority. Efforts to introduce ICT in schools derive from the national ICT for Accelerated Development policy of 2003 and the ICT in Education policy of 2008.

2.4.1 Ghana ICT for Accelerated Development (GICT4AD) Policy

The Ghana ICT for Accelerated Development was the outcome of a three-phase course of action to develop ICT-led socio-economic policies aimed at ushering Ghana into a knowledge-based information society in the shortest possible time (Kwapong, 2010). Some of the concerns the policy sets out to address include:

1. The transformation of the country into a competitive ICT-led Foreign Direct Investment within the West African sub-region.

2. The transformation of the education system at all levels to impart the needed skills required to usher Ghana into the information and knowledge- based society.
3. The development of human resource capacity in ICT skills to be able to harness the full benefits of the information age.
4. The Enhancement of efficiency of administration service delivery through ICT.

The policy mandates all sectors of the economy to draw-up their own ICT policy frameworks that are consistent with the aims and aspirations of the national ICT policy in order to facilitate a multi-sectoral application of ICT. In this regard, the Ministry of Education in 2008 comes up with the ICT in Education policy which outlines the plans and strategies for integrating ICT in education at all levels.

2.4.2 ICT in Education Policy

The overall vision of the ICT in Education policy is to use ICTs to support the Ministry of Education's policies, objectives and strategies to facilitate equitable access to education, quality of teaching, educational administration, science and technology and labor market demands (Ministry of Education, 2008). The specific objectives of the policy are to:

1. Facilitate the deployment, utilization and development of ICT within the educational system to improve educational access and delivery to support teaching and learning from the primary level upwards.

2. Transform the education system in order to improve the quality of teaching and training at all levels of the educational system and expanding access to education, training and research resources.

3. Orient all levels of the country's educational system to the teaching and learning of science and technology in order to accelerate the assimilation of science and technology in society.

4. Achieve universal basic education and improve the quality of basic education and computer literacy in the nation.

5. Ensure that all citizens are at least functionally literate and productive.

6. Expand and increase access to secondary and tertiary education.

7. Strengthen science education at all levels of the educational system, especially at the basic and secondary levels.

Four key factors underlie the strategies for achieving the specific objectives outlined in the policy. They are equity in the allocation of resources, affordable and continuous access to ICT infrastructure, capacity building of users and the development of norms and standards with regard to ICT use.

Additionally, the policy has seven thematic areas. These areas outline the guiding principles and strategies to be put in place to accomplish the goal of integrating ICT in education. The first thematic area seeks to enhance education management by building the capacity of the Ministry of Education and all its agencies. By doing so, ICT can be effectively used to generate data for informed decision making. The second thematic area concerns building the ICT capacity of all persons involved in education delivery, especially teachers, to facilitate the incorporation of ICT into teaching and learning at all the levels of education in Ghana. The third thematic area is concerned with infrastructure provision, e-readiness and equitable access to ICT in all schools. Other areas of concern are content development, ICT integration into the curriculum, technical support, maintenance and sustainability of ICT infrastructure.

The topmost priority of the policy is to support and build the capacity of staffs of the Ministry of Education and its agencies. Colleges of Education are the next in the prioritization scale as they train teachers for basic schools. Building their capacity in ICT will go a long way to facilitate the implementation of the policy at the basic level.

Table 2.1 Prioritization scale of ICT in education in Ghana

SCALE	SUB-SCALE	TARGET
1	*1A*	Ministry of Education and Agencies
	1B	Colleges of Education
	1C	Teacher Universities with ICT
2	*2A*	Other Universities/ Polytechnics (ICT)
	2B	Other Universities and Polytechnics (General)
	3C	Second-cycle schools (SHS, Technical & Vocational Institutions.
3		Junior High School
4		Primary School
5		Pre-School
6		Community Information Centres (Outside the remit of education

Source: Ministry of Education (2008).

Implementation of the policy consists of three phases. The initial phase is to enhance the preparation of educational institutions to use ICT for teaching, learning and administrative roles. The second phase is to encourage community support for ICT infrastructure in educational institutions as well as introducing curriculum guidelines for ICT integration. The final stage entails the integration of ICT into teaching, learning, education management and governance.

Translating the objectives and strategies of the policy into action requires government support and institutional collaboration. Overall, the Ministry of Education is responsible for the implementation of the ICT in Education Policy. However, the ministry's ability to shoulder this responsibility is constrained by inadequate funds. Therefore, partnering with other agencies and development partners, both local and international, is essential in the successful implementation of the policy.

Indicators and targets are to be developed at the national and regional levels to effectively measure the successes or otherwise of the policy implementation. Annual reviews as well as three years evaluations are to be conducted to help in the implementation process.

2.5 The Role of ICTs in Education

ICTs are rapidly transforming the world into an information society. This transformation requires that the education sector be able to harness the full potential of ICTs to improve the quality of teaching and learning. It is therefore not surprising that the use of ICTs is on the rise in many educational institutions because they serve numerous purposes in teaching and learning.

Fan and Ho (2012) identify three main uses of ICT in education. The primary role of ICT is to improve teaching and learning using application software. The second purpose is to facilitate administrative roles such as grading and keeping records in schools for tracking students' learning history and performance. The third role of ICT in education is to build information literacy of students.

The rationale for ICT investments in education is based on the assertion that traditional teaching and learning methods in which knowledge is imposed on learners have not provided enough opportunities for learners to create their own knowledge

and develop critical minds. Osin (1998) thus argues that the use of computers in classrooms provide key ingredients in teaching and learning that were lacking in all previous tools that raised high expectations when introduced in the educational system. Previous tools such as the blackboard only presented information to students. Computers have resulted in what he calls 'individualized interactivity', providing the opportunity for information to be given to students as well as adopting presentations to students' needs and preferences.

Beda et al (2009) assert that the world has evolved into a technological one in which computers play a dominant role in the way knowledge is transmitted. Computers could be used to present multiple teaching and learning opportunities for agents in the learning process to change their styles. According to Smeets (2005), ICTs provide many information resources for people to have access to. Also ICTs are capable of making complex processes easier for learners to understand through simulations.

UNESCO (2007) is of the view that adopting ICT into the educational systems has the potential of increasing the quality of education delivery as well as facilitating greater access to information and services by marginalized groups and communities. Therefore when used effectively, ICTs could:

1. Make education easier, cheaper to access and free of the limitation of distance.
2. Result in better academic performance due to changes in teaching and learning.

Johannessen (2009) posits that ICTs could be used to provide visualization and variation in many disciplines. He also notices that some students have prior knowledge of ICT skills from the home and that the education sector has a role to play

in furthering those skills. When ICTs are treated as integral part of teaching and learning, learners from low socio-economic backgrounds could be equipped with skills for work and life.

The above discussions make a case for the integration of ICTs in education. These discussions have also influenced the inclusion of ICTs in measuring the quality of education in Europe and other parts of the world (European Commission, 2000).

2.6 Measuring ICT Impact on Education

The literature on the role of ICT in education reveals that ICT have the potential of enhancing teaching and learning if appropriately used. This revelation is a major driver of national policies, strategies and investments in ICT in the education sector in many countries. In the past few years, researchers in the field of educational technology have spent time assessing the impact of ICT in education. Some researchers focused on cognitive measurements while others resorted to motivation as a ways of measuring ICT impact on education.

2.6.1 Cognitive Measurement

Cognitive measurement of the impact of ICTs on education examines the relationship between the use of ICTs in teaching and learning and academic performance. In some studies, real impacts of ICT on performance were found. In other studies, ICTs had had no significant impact on performance.

The ImpaCT2 study carried out in the United Kingdom is touted as one of the most comprehensive investigations into the impact of ICT on academic performance. The ImpaCT2 study examined the impact of ICTs on performance at the General Certificate of Secondary Education (GSCE) at Key Stages 2, 3 and 4 (Harrison, et al, 2003). At Key Stage 2, the results indicated a strong relationship between ICT use and

National Test for English. The results at Key Stage 2 also revealed that the association between ICT use and performance, though positive, was not statistically significant. The results at Key Stage 3 revealed a strong positive association between the use of ICTs and performance in National Test for Science. There was also a statistically significant positive association between the use of ICTs and Science and Design Technology at Key Stage 4. On the basis of these results, it was estimated that ICT could be used to improve performance in English at Key Stage 2, Science at Key Stage 3 and Design Technology at Key Stage 4 (Harrison et al, 2003).

Schacter (1999) examined the impact of educational technology on Fourth and Eighth Grades students' achievement using meta-analysis in West Virginia of the United States of America. The analysis showed that students who had access to ICT resources performed well in research constructed tests, standardized tests and national tests.

Makridou-Bousiou (2006) also did a study on the effectiveness of using technology to teach economics in High Schools in Thessaloniki, Greece. About 65 students were randomly selected. Out of the 65 students, 45 were in the experimental group and 20 in the controlled group. The experimental group was taught through the creation of web pages for study purposes only. The controlled group was taught without the use of technology. A common test was then conducted for both the experimental and the control groups. The test result showed that students taught by technology scored 14.43 on the average and those taught by traditional methods had an average score of 13.4. It was therefore concluded that there was no statistically significant difference between students taught by technology and those taught by traditional methods.

Fried (2006) in a study to examine the relationship between laptop use in the classroom and learning outcomes among psychology students at Winona State

University in the United State of America found a negative relationship. Respondents reported that laptop use in class diverted their attention. Using linear regression, the American College Test (ACT), the High School Test (HST), school attendance and rate of laptop use in class of participating students were included in the equation as independent variables predicting academic performance. With the exception of laptop use, all the independent variables were significant and related positively to academic performance. In terms of laptop use, the regression produced a beta (β) co-efficient of -0.17, indicating that the more students used laptops, the less their performance. Corresponding 't' and 'p' values validating the relationship between laptop use and performance were -2.286 and 0.24 respectively.

It is important to stress that cognitive measurement of ICT impact on education overemphasizes students' achievement. It pays little attention to teachers who are also very important agents in the teaching and learning process. Also, cognitive measurement of the impact of ICT on education does not give much insight into the rural-urban dimensions of the impact of ICT usage on students and teachers in the teaching and learning process.

2.6.2 Motivational Measurement

Unlike cognitive measurement of the impact of ICTs on education, motivational measurement pays attention to reasons why teachers and students use ICTs and whether or not ICTs help them in doing their work better.

2.6.2.1 ICT and Learning Motivations.

Nisar et al (2011) investigated the impact of ICT in the education sector in Pakistan. They used convenient sampling to draw 429 respondents from 5 colleges and universities for the study. Students agreed that ICT provided them with vast knowledge through the internet and digital libraries. They also found that the

availability and usage of ICT was very important to improving the efficiency of students.

In Hong Kong, Sze (2005) found that the use of ICT for teaching and learning had positive motivational effects on students of Cotton Spinners Association Secondary School. Students reported that the use of ICTs in teaching made lessons more fun and interesting. Teachers also reported that students experienced positive motivations for class assignments when multimedia was used. Nevertheless, the positive motivational effect of ICT was found to be higher on males than females.

Contrary to the findings of Sze (2005), Sarfo et al (2011) in a study of students' attitudes and motivations towards the ICT for Accelerated Development policy in Ghana among rural and urban schools, found that female and male students' attitudes toward the policy were similar. The study also revealed that female and male students had similar attitudes and motivations toward the use of ICT in the classroom for teaching and learning.

Passey et al (2004) reported that the use of ICT in Primary and Secondary schools in England was having positive motivations on students' attitude towards learning. Students stated that they enjoyed learning whenever ICTs were used. Students also used the internet to communicate with their teachers on topics related to their home works when they were off campus. Teachers confirmed that students were eager to do their homeworks when they could use a word processing application. It was noticed that ICTs had positive motivational impacts on boys than girls. On the contrary, Beacham and McIntosh (2012) concluded from their study of student teachers in one of the Universities in Scotland that there were no differences between males and females in terms of their attitudes, confidence and motivation toward the use of ICT infrastructure.

Deaney et al (2003) conducted a study in six English Secondary schools to find out students' views on the contribution of ICT infrastructure to teaching and learning. Students reported that ICT infrastructure facilitated more efficiently and reliably the way they carried out their work. Students also reported that ICT infrastructure made lessons more fun, enjoyable and removed difficulties associated with the manual way of doing things. However, students claimed their satisfaction with ICT infrastructure reduced because ICT infrastructure automated tasks and alienated them from actively participating in those tasks. Inadequate competence in using ICT infrastructure also reduced students' satisfaction with ICTs.

2.6.2.2 ICT and Teaching Motivation

In 1999, the Ministry of Education in New Zealand implemented the Information and Communication Technologies Professional Development Programme (ICTPDP) to increase teachers' confidence and skills in using ICTs to support teaching and learning. It was found at the beginning of the programme that many teachers were not confident of the use of ICTs for teaching. About 44% of teachers reported that they were not confident of the use of ICTs for teaching. After the program, however, the number of teachers who were not confident dropped from 44% to 3% while the number of teachers who were confident rose to 77%.

In Tanzania, Mwalongo (2011) found that the use of ICT infrastructure for teaching was motivated by access to the infrastructure. Computers and Televisions were mostly employed by teachers because they had access to them. Due to the availability of computers, teachers were found using applications such as word processing and spreadsheets for teaching and administrative purposes. Teachers who did not use such applications attributed it to lack of access to computers when needed.

Teachers' motivation to use ICT infrastructure in teaching is more likely to be affected by the availability of ICT resources. In a review of literature on the barriers to successful ICT integration into teaching and learning, Bingimlas (2009) found that lack of access to ICT infrastructure discouraged teachers from using ICT for teaching. He noted that ICT infrastructure was not readily available in most schools and the limited ones were often shared among teachers for their teaching purposes. This resulted into the situation where teachers had to book appointments in advance for ICT infrastructure before they could use them.

Hennessy et al (2010) also identified many challenges to teachers' motivation to integrate ICT into the educational process in Sub-Saharan Africa. Among the challenges identified were lack of reliable access to electricity, limited technology infrastructure and unavailability of software. However, they argued that access to physical infrastructure alone did not motivate teachers to use them for teaching. What they noted was important to teachers' motivation for using ICT infrastructure to deliver lessons was the availability of time for teachers to successfully plan towards using ICT in their lessons.

2.7 Teachers' Confidence in the Use of ICT Infrastructure

The successful introduction of ICTs in education very much depends on the capacity of teachers to use ICT infrastructure for teaching. If teachers have ICT skills and perceive themselves as confident, they will use ICT infrastructure regularly in their teaching activities.

In order to determine teachers' confidence of using ICT for teaching, Barkar & Mohamed (2008) studied final year teacher trainees of the Universiti Putra Malaysia, Malaysia. They concluded that teacher trainees were quite confident of using ICT for teaching. The study, however, revealed that teacher trainees in vocational education

were more confident of using ICT infrastructure for teaching than other students. It was also found that male trainees were more confident than their female counterparts of the use of ICT infrastructure for teaching. Teacher trainees with teaching experiences were also found to be more confident of using ICT for teaching than those without prior experience.

In an assessment of the ICT situation in Secondary Schools in the Lower Manya Krobo District in the Eastern Region of Ghana, Teye (2012) reported that many factors influenced teacher' confidence in using ICT infrastructure for teaching. The factors that influence teachers' motivation and confidence in using ICT for teaching were lack of knowledge about computers, fear of using computers, lack of training and insufficient time to use computers to plan lessons.

A survey conducted by the European Schoolnet in 2013 across thirty European countries on students, teachers and head teachers showed that teachers who perceived themselves as confident of the use of ICT used them regularly for teaching than non-confident teachers. The survey also revealed that in schools where access to ICT infrastructure was low, teachers who were confident used the infrastructure more regularly for teaching purposes than teachers who taught in schools with high access to ICT infrastructure but were less confident.

2.8 Rural -Urban Divide and Access to ICT Infrastructure

There is no universally acceptable definition of what constitutes a rural or an urban area. Classification of towns as rural or urban depends on the country where these towns exist. In Ghana, an urban area is officially defined as a settlement with a population of 5000 or more (Owusu, 2005). Settlements with a population less than 5000 are thus classified as rural. Apart from population, other factors such as

markets, education, health, roads, income levels, type of employment, among others are used to differentiate rural from urban areas.

Rural-urban divide therefore refers to the disproportionate access to education, potable water, technology, employment, wages and consumption by rural and urban areas with the latter having the upper hand. Many studies lend support to the fact that some disparities exist between rural and urban areas in terms of the socio-economic characteristics named above (McCracken and Barcinas, 1991; GNECC, 2008; Hnatkovska and Amartya, 2012). In this study, the discussion on rural-urban divide is restricted to access to education and ICT infrastructure.

Schools' access to ICT infrastructure may depend on the location of the school. A survey conducted by the European Commission (2006) across twenty-seven countries in Europe found that schools in urban and metropolitan areas had better access to computers and internet connection than their rural counterparts. The research however revealed no disparities between rural and urban schools in terms of ICT infrastructure for teaching and learning.

In the Rivers State of Nigeria, Primary schools in rural and urban areas vary in terms of access to computers (Akuoma, 2012). Computers are more accessible to teachers and students of urban schools than rural schools. Teachers in urban schools are also more likely to be computer literates than their rural-counterparts. The situation in Nigeria is not different from that of Ghana. Although Ghana has made tremendous progress in ICT development, there is still great disparity between rural and urban communities in terms of access to ICT infrastructure (Mangesi, 2007).

Lack of access to ICT infrastructure by rural schools is more likely to affect students' motivations and attitudes towards the integration of ICT in the classroom. In a study of rural and urban Senior High Schools in Ghana, Sarfo et al (2011) observed that

there was a statistically significant relationship between location of schools and attitudes toward the ICT for Accelerated Development policy. Students of urban schools had positive attitudes towards the policy than those in rural schools.

Other studies however suggest that the differences between rural and urban areas in terms of education are closing. Access to primary education between rural and urban areas in India is 87% and 89% respectively (Banerji, 2009). A related study by Amartya and Hnatkovska (2012) in India confirmed that the gap between rural and urban schools in terms of educational attainment had shrunk considerably between the period of 1983 and 2010.

2.9 Conceptual Framework.

It is possible to investigate access to and use of ICT infrastructure in teaching and learning at the Junior High level in the Ga South Municipality. In doing so, it is important to explain the concepts in the study and show how these concepts relate to one another.

2.9.1 ICT Infrastructure

ICT Infrastructure as defined earlier refers to modern technologies such as computers, the internet, computer laboratory, computer software, projectors, modems, etc. The availability of these infrastructures is very essential to the successful integration of ICT into teaching and learning. Teachers and students must have access to ICT infrastructure in order to take advantage of its potentials to enhance the quality of education. Mwalongo (2011) for instance reported that the use of ICT for teaching was motivated by access to ICT infrastructure. In a study of ICT usage among teachers of Senior High Schools in the Lower Manya Krobo District of the Eastern Region of Ghana, Teye (2012) observed that inadequate access to ICT infrastructure and lack of ICT skills by teachers prevented most of them from using the

infrastructure for teaching. These studies lend support to the fact that access to or the lack of access to ICT infrastructure could affect the attitudes, motivations and confidence in the use of ICT infrastructure by students and teachers (Sarfo et al, 2011).

2.9.2 ICT Services

ICT infrastructure creates services such as typing, browsing, researching, calculation and others that could be used by teachers and students to boost teaching and learning. Capacity building of teachers and students in ICT skills is a necessary condition for maximizing the educational benefits of ICT services.

2.9.3 Urban and Rural Schools

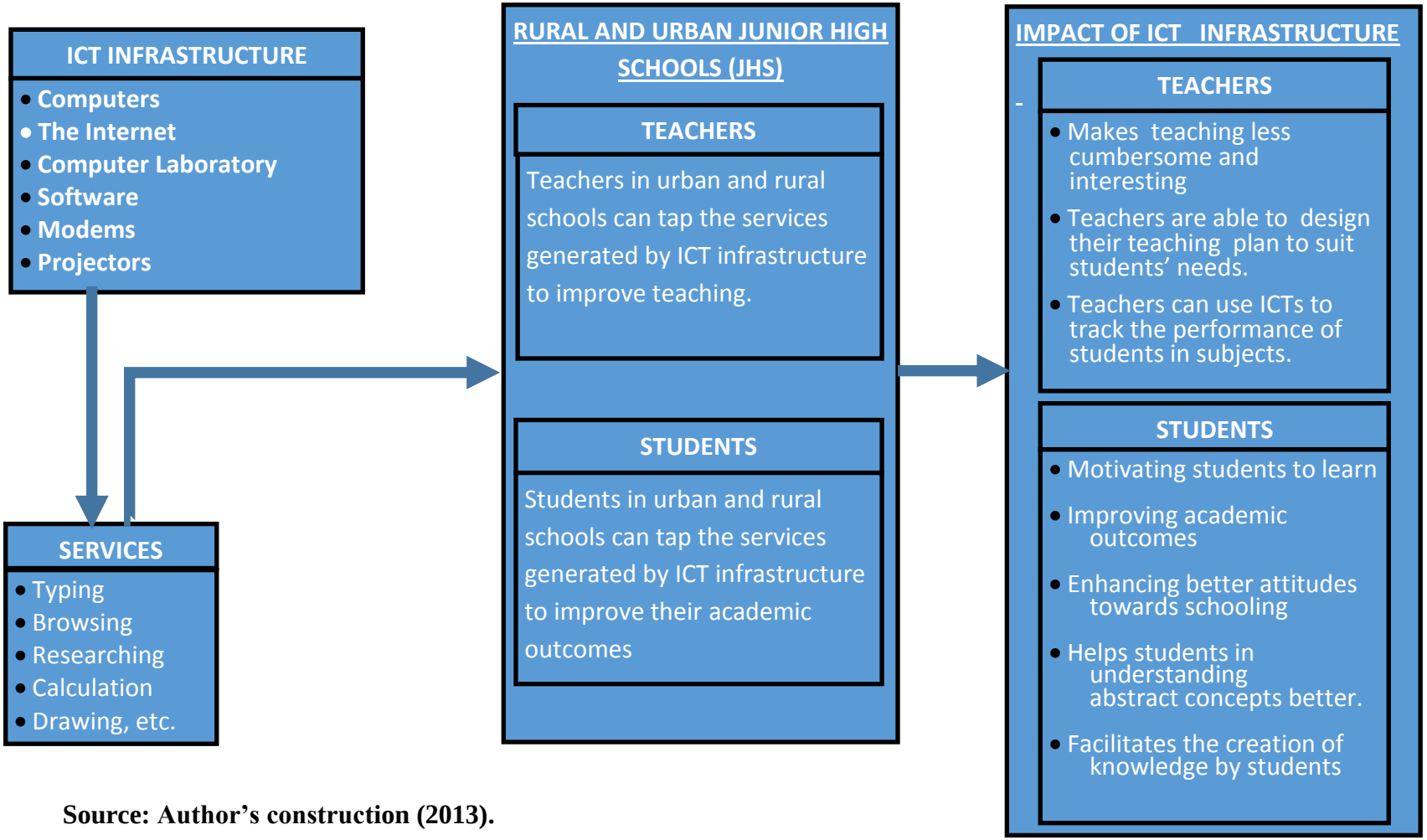
Teachers and students of rural and urban schools are open to the use ICT infrastructure in transforming the quality of education. However, schools in urban and metropolitan areas are said to have better access to computers and the internet than their rural counterparts (EC, 2006; Akouma, 2012; McCracken and Barcinas, 1991; GNECC, 2008). This bias in the distribution ICT infrastructure may give urban schools advantage over rural ones in the exploitation ICT infrastructure for educational improvement.

2.9.4 Impacts

Impacts refer to the improvements that the use of ICT infrastructure brings to both teachers and students of rural and urban schools. On the side of teachers, ICT infrastructure may enable them design their teaching plans to suit the needs of students. ICT infrastructure also helps teachers track the performance of their students from time to time. On the side of students, ICT infrastructure motivates them to learn, enhances better attitudes toward schooling, enables the understanding of abstract concepts, and helps in self-creation of knowledge at their own pace.

Two major ways of measuring ICT impact on education have been identified. They include cognitive and motivational measurements. In this study, the motivational measurement of ICT impact is used because it enables a comprehensive measurement of ICT impact from the perspectives of students and teachers. It also evaluates the changes in attitudes and behavior toward teaching and learning through the use of ICT infrastructure.

Figure 2.0 Schematic presentation of conceptual framework



Source: Author's construction (2013).

2.10 Conclusion

The transformation of the world to an "Information Age" calls for the introduction of ICT in education. Arguments for ICT integration into education point to the fact that ICTs have the capacity to improve teaching and learning if appropriately used. However, a review of empirical studies on ICT impact on education reveals that successful integration of ICT in education depends on the availability of ICT infrastructure and the capacity of teachers and students to use them for educational purposes. Many of the studies on ICT in education have focused on tertiary institutions and secondary schools. Arguably, little has been done in basic schools which are the basis of education. Besides, many of the studies were carried out in contexts that are characteristically different from that of Ghana and in particular the Ga South municipality. This study seeks to add to the body of existing literature in educational technology by comparing access to and use of ICT infrastructure in teaching and learning in rural and urban public Junior High Schools in the Ga South municipality.

CHAPTER THREE

RESEARCH METHODOLOGY AND PROFILE OF THE STUDY AREA

3.1 Introduction

This chapter is presented in two sections. The first section details the methodological approach adopted to achieve the objectives of the research. The second section outlines a brief educational profile of the Ga South Municipality.

Section I: Research Methodology

This section presents the method, methodology and data analysis technique employed in the study. It also discusses the ethical considerations that were observed in the research.

3.2 Method

The approach to this study was a combination of qualitative and quantitative research methods. This was based on the belief that the inherent biases of one method are counterbalanced by the strengths of the other to support the validity of the research findings and the recommendations put forward (Gray, 2009).

The use of qualitative research technique facilitated an in-depth investigation of the impact of ICT infrastructure access and use on students' motivation to learn and teachers' motivation to deliver education through ICTs. This approach also facilitated a thorough investigation of the topic under study from the perspective of school administrators and their responses cross-checked with that of their teachers and students to determine the consistency in the data collected.

Quantitative approach on the other hand enabled the use of the Student's t-test to test for statistical significance in the differences in computer usage by students of rural and urban schools and the impact of computer usage on students' learning motivations

3.3 Methodology and Data Collection

The methodology comprised of the sampling technique, method of data collection and data analysis techniques.

3.3.1 Sampling Technique

The study targeted public Junior High School (JHS) students, teachers and school administrators of rural and urban areas across the nine educational circuits in the Ga South Municipality. In order to ensure a representative sample, six schools were randomly selected from the nine educational circuits – three each from rural and urban areas. The names of all the nine educational circuits were written on pieces of papers and grouped into rural and urban categories. The papers were folded and six colleagues of the 2012/2013 M.A. Development Studies class (three each) were asked to choose three of the folded papers from each category at random. After selecting the circuits, the same process was repeated to choose one school each from the selected circuits. This was how the selection of circuits and schools presented in Table 3.1 was carried out.

Table 3.1 Selected educational circuits and schools

No	Area	Circuits	Selected schools
1	RURAL	Obom	Obom Kojoman M/A JHS
2		Ashalaja	Ashalaja M/A Basic JHS
3		Nsuobri	Nsuobri D/A JHS
4	URBAN	Weija	Oblogo M/A "2" JHS
5		Gbawe	Gbawe Islamic School Complex
6		Anyaa	Anyaa M/A JHS

Source: Field data (2013).

The sample size for the study was 181. This included 140 randomly selected students: 70 each from rural and urban schools. The number of students selected from a school was based on the population of that school in the category of rural and urban. The population of each school was divided by the total number of students in each category and multiplied by 70 to arrive at the sample for each school in the last column of Table 3.2.

Table 3.2 Sample size determination of students

Category		Name of School	Population	Sample size calculation
Rural	1	**Obom Kojoman M/A JHS**	160	$^{160}/_{428}$ *70 = **26**
	2	**Ashalaja M/A JHS**	142	$^{142}/_{428}$ *70 = **23**
	3	**Nsuobri M/A JHS**	126	$^{126}/_{428}$ *70 = **21**
Sub total			***428***	***70***
Urban	4	**Anyaa M/A JHS**	227	$^{227}/_{564}$ * 70 = **28**
	5	**Gbawe Islamic School Complex**	160	$^{160}/_{564}$ * 70 = **20**
	6	**Oblogo M/A "2" JHS**	177	$^{177}/_{564}$ * 70 = **22**
Sub total			***564***	***70***
Grand Total			**992`**	**140**

Source: Field data (2013).

The researcher then wrote 'Yes' on pieces of papers according to the number of students to be selected in each school and 'No' on the rest. The papers were folded, put into a bottle and shaken vigorously to make sure that they mixed properly. Each student was asked to pick one of the folded papers once. Students who picked 'Yes' were selected for interview and those who picked 'No' were not.

Purposive sampling technique was then used to select 36 teachers and 5 school administrators from selected schools for the study. Table 3.3 gives a breakdown of the sample sizes of the three categories of respondents.

Table 3.3 Sample distribution and size of study population

No	Schools	Categories of respondents	Sample
1	Obom Kojoman M/A JHS	Students	26
		Teachers	7
		School administrator	1
2	Ashalaja M/A JHS	Students	23
		Teachers	8
		School administrator	1
3	Nsuobri M/A JHS	Students	21
		Teachers	3
		School administrator	1
4	Anyaa M/A JHS	Students	28
		Teachers	8
		School administrator	0
5	Gbawe Islamic School Complex	Students	20
		Teachers	5
		School administrators	1
6	Oblogo M/A "2" JHS	Students	22
		Teachers	5
		School administrators	1
	Total		**181**

Source: Field data (2013).

3.3.2 Data Collection Tool

The main tool for primary data collection was semi-structured interview. Three sets of questionnaires were employed on the three categories of respondents – students, teachers and school administrators. The questionnaires for students comprised of three main sections. The first section gathered information on the socio-demographic characteristics of students. The second and the third part of the questionnaires elicited responses on the state of access and use of ICT infrastructure as well as the impact of ICT infrastructure on students' learning motivations. The questionnaires for teachers were in four sections. The first section collected data on the socio-demographic background of teachers. The second section obtained responses on teachers' access to and use of ICT infrastructure. The third part collected information on the impact of ICT

infrastructure on teachers' motivation to teach through ICTs. The last section obtained information on teachers' confidence in using ICT infrastructure for instruction.

The questionnaires for school administrators collected data on their socio-demograhic background and their knowledge as school authorities on the availability and use of ICT infrastructure by students and teachers of their schools.

Semi-structured interview as a tool of data collection was chosen because it suited the mixed approach that was adopted for this study. The tool facilitated the combination of qualitative and quantitative research methods. The tool also introduced orderliness in the way the questions were answered. Respondents in each category answered the same questions in the same order. This served as a common model for comparing students and teachers in rural and urban schools in their access to and use of ICT infrastructure for teaching and learning.

3.3.3 Pre-testing of Questionnaires

The semi-structured interview questionnaires were pre-tested, through a pilot study, on students, teachers and school administrators of schools in selected educational circuits who were not included in the sample. This was because students, teachers and school administrators of piloted schools had similar characteristics as those in selected schools. Two schools were used for the pilot study. They were Denchira M/A Basic School of the Ashalaja circuit and Oblogo D/A "1" Junior High School of the Weija circuit. These schools represented rural and urban schools respectively. The pilot study tested respondents' understanding of the questions. The pilot study also helped in testing the consistency of the questions with data analysis techniques. After the pilot study, some of the questions were refined and the order of questions restructured.

3.3.4 Administration of Data Collection Tool

The questionnaires were given to teachers and school administrators to complete on their own. This practice was found to be consistent with the assertion of Kumerkpor (2002) that self-administered questionnaires are good for respondents whose literacy rates and educational levels are high and can complete the questionnaires on their own without the help of others. Students of selected schools were however guided by the researcher on how to complete the questionnaires. Filling the questionnaires in the presence of the researcher aided him to address all questions that respondents raised in the course of completing the questionnaires. The researcher also ensured that all questions were answered correctly and orderly.

3.3.5 Data Analysis Technique

It has been indicated earlier in this chapter that the study made use of qualitative and quantitative approaches. Qualitative data was analyzed using the content analysis technique which involved coding and categorizing texts under thematic areas based on the objectives of the study. Stata statistical software was used to generate frequency tables, graphs, charts and cross tabulations to describe qualitative data. The Student's t-test was used to test for mean differences between students of rural and urban schools in terms of weekly computer usage and ICT impact on learning motivation. Also, the Chi square statistic was employed to test for differences in scores between teachers of rural and urban schools on confidence in using ICT infrastructure for teaching.

3.4 Ethical Considerations

Ethics guiding the conduct of research were duly observed in this study. Respondents' consent was sought before the researcher proceeded with the interviews. Respondents were guaranteed anonymity and confidentiality regarding the information that they provided. As a result, all respondents who agreed to participate in the research did so

willingly devoid of any deceit. References to other people's work were also made to avoid plagiarism.

3.5 Limitations of the Study Approach

Due to time and resource constraints, it was not possible for students, teachers and school administrators of schools in all the nine educational circuits in the municipality to be represented in the sample. Six schools: three each from rural and urban areas were therefore randomly selected for the study. The effect of this limitation on data quality and validity was minimized by adopting simple random sampling technique to ensure that all schools in the selected circuits had a chance of being included in the sample.

Section II

3.6 Brief Educational Profile of the Ga South Municipality

The profile of the Ga South Municipality in this study is limited to the educational sector because it occupies a central position in this research. Most of the information presented in this section is taken from the Municipality's Medium Term Development Plan (GSMTDP) (2010) and Composite Budgets of the 2012 and 2013 fiscal years.

The education sector of Ga South is characterized by the private sector delivering education alongside the public sector. There are currently 84 and 90 public Junior High and Primary schools respectively in the municipality (Republic of Ghana, 2013). There are also 523 private Primary schools and 251 private Junior High Schools as well as 3 public and 14 private Senior High Schools (ibid). The total number of students attending basic schools in the municipality is 75,178 (Ghana Education Service, 2012). The pupil-to-teacher ratio for public basic schools is 1: 29 (Ministry of Education, 2011).

The monitoring and supervision of teaching and learning in the Municipality is the responsibility of the Municipal Education Directorate (Republic of Ghana, 2013). The

entire municipality is divided into 9 educational circuits: Bortianor, NgleshieAmanfro, Weija, Nsuobri, Gbawe, Kofi Kwei, Obom and Ashalaja (Ghana Education Service, 2012). Out of the nine circuits, five are located in urban and peri-urban areas. The others are in rural areas. Each educational circuit consists of a number of basic schools. All the schools in each educational circuit are under the monitoring of a Circuit Supervisor (CS) who is in turn accountable to the Municipal Education Directorate.

School performance at the basic level has been moderate. For instance in 2010, the Municipal Education Directorate presented 6,498 candidates for Basic Education Certificate Examination. Out of this number, 79% of the candidates passed, and the municipality was ranked 7th among all the 147 Districts/Municipalities/Metropolises that took part in the examination in the country (Republic of Ghana, 2012: 10). Despite this impressive performance, the share of public basic schools is not known.

3.7 Conclusion

The study adopted a combination of qualitative and quantitative approaches. Simple random sampling was used to select six schools from the nine educational circuits across rural and urban areas in the municipality. Simple random sampling technique was used to draw 140 students from selected schools. Purposive sampling was, however, used to select 36 teachers and 5 school administrators, bringing the total sample size to 181. Semi-structured interview as a tool of data collection was used to gather information from respondents.The tool facilitated the use of qualitative and quantitative data analysis techniques. Descriptive statistics such as frequency tables, cross-tabulations and graphs were used to summarize and describe qualitative data. The Student's t test was used to test for differences in means between students of rural and urban schools regarding ICT usage and ICT impact on learning motivation while the

Chi square statistic was employed to examine the differences in confidence in the use of ICT infrastructure for teaching between rural and urban school teachers.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter is sectioned into two parts. The first section presents the findings of the research while the second part discusses the findings of the study.

Section I

Presentation of Findings

This section presents data on the socio-demographic characteristics of respondents; access to and use of ICT infrastructure by students; the impact of ICT infrastructure on students' learning motivation; access to and use of ICT infrastructure by teachers; the impact of ICT infrastructure on teachers' motivation to teach using ICTs and teachers' confidence in using ICT infrastructure for teaching purposes.

4.2. Socio-Demographic Characteristics of Respondents

Data was collected from three categories of respondents; namely students, teachers and school administrators of randomly selected public Junior High Schools (JHS) in the Ga South Municipality.

4.2.1 Students

Data collected on the characteristics of students included gender, class and age. Males and females constituted 50.71% and 49.29% respectively. About 44.29% of the total number of students interviewed was in JHS 1 and 55.71% in JHS2. Students in JHS 3 could not be captured in the study because they had finished their final examination and left the schools at the time of data collection. The majority (60.72%) of students were between the ages of 11 and 15 years. Approximately 37.14% of students were between the ages of 16 and 20 years. Students between the ages of 21 and 24 were 2.14%.

Table 4.1 Characteristics of students

Characteristics		Frequency	Percentage
Sex	*Male*	71	50.71
	Female	69	49.29
Total		**140**	**100**
Class	*JHS 1*	62	44.29
	JHS 2	78	55.71
Total		**140**	**100**
Age	*11 -15*	85	60.72
	16 - 20	52	37.14
	21 – 24	3	2.14
Total		**140**	**100**

Source: Field data (2013).

4.2.2 Teachers

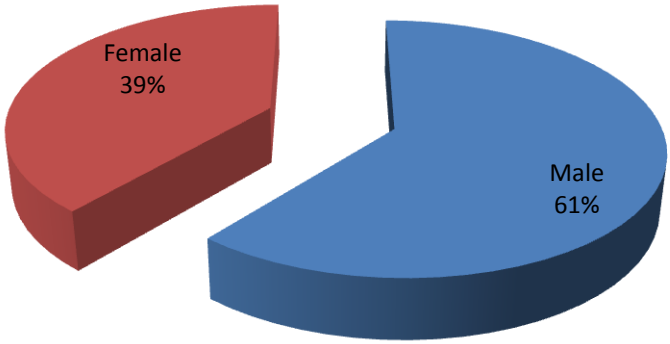
The data collected on the background of teachers included their gender, ages, educational background, subjects taught and teaching experiences. Teachers' ages were grouped into seven categories with a five-year interval starting from 21 years. The majority (33.33%) of teachers were between the ages of 26 and 30 years. Teachers between the ages of 36 and 40 years constituted 13.8%. Also, 13.8% of teachers sampled were between 51 and 55 years. Only few (5.56%) teachers were between the ages of 46 and 50 years. Nevertheless, teachers between the ages of 21 and 25 years, 31 and 35 years and 41 and 45 years all constituted 11.11% each of the total number of teachers interviewed.

Table 4.2 Ages of teachers

Age group	Frequency	Percentage
21 – 25	4	11.11
26 – 30	12	33.33
31 – 35	4	11.11
36 – 40	5	13.89
41 – 45	4	11.11
46 – 50	2	5.56
51 – 55	5	13.89
Total	**36**	**100**

Source: Field data (2013).

Figure 4.1 Sex of teachers



Source: Field data (2013).

Teachers had varied educational backgrounds. Approximately 44.44% of teachers had Degrees including Bachelor of Arts, Bachelor of Education and Bachelor of Science. Also, 27.78% of teachers were Diploma in Basic Education (DBE) holders. The percentage of teachers holding Master's degree was 5.56%. Another 5.5% of teachers were Higher National Diploma (HND) holders. The remaining 16.67% of teachers were Certificate "A" holders.

Table 4.3 Educational characteristics of teachers

Certificate	Frequency	Percentage
Certificate "A"	16	16.67
Diploma in Basic Education	10	27.78
Degree	16	44.44
High National Diploma	2	5.56
Master's	2	5.56
Total	**36**	**100**

Source: Field data (2013).

Table 4.4 Subjects taught by teachers

Subject	Frequency	Percentage
Mathematics	8	22.22
English Language	10	27.78
Integrated Science	7	19.44
Social Studies	9	25
ICT	8	22.22
Basic Design and Technology	9	14.44
Ghanaian Language	6	16.67
French	3	8.33
R.M.E	4	11.11
Total	**64**	**167**

Source: Field data (2013).

Table 4.4 above presents the subjects taught by teacher in sampled schools.The majority (27.78%) of teachers taught English Language. The number of teachers handling Social Studies constituted 25% of the total number of teachers interviewed. Approximately 22% of teachers taught ICT while another 22% taught Mathematics. Also 19.44% and 16.67% of teachers handled Integrated Science and Ghanaian Language respectively. Other subjects taught were French (8.33%) and R.M.E.

(11.11%). It is however important to note that the frequencies did not cumulate to 36 (The number of teachers interviewed) because some teachers handled more than one subject. This caused the total percentage to rise to 167% instead of 100%.

4.2.3 School Administrators

Background information of school administrators' comprised of gender, number of years in school administration position and educational qualifications.

Table 4.5 Characteristics of school administrators

Characteristic		Frequency	Percentage
Sex	Male	4	80
	Female	1	20
Age	40 -45	3	60
	46 -50	1	20
	51-55	1	20
Educational Background	Certificate "A"	1	20
	Diploma in Basic Education	1	20
	Degree	2	40
	Master's Degree	1	20
Number of years in school administration position	1 – 4	1	20
	6 –10	3	60
	11-15	1	20

Source: Field data (2013).

About 80% and 20% of school administrators were males and females respectively. Approximately 60% of school administrators were between the ages of 40 and 45 years. School administrators between the ages of 46 and 50 years constituted 20%. Regarding educational qualification, 40% of school administrators were Degree holders. About 20% of teachers were Certificate "A" holders, 20% Master's degree holders and 20% Diploma in Basic Education holders. Also, 60% of school administrators have been

managing schools between 6 and 10 years. Nevertheless, 20% of school administrators had between 1 and 4 years experience in school administration. Another 20% had been in school administration position for the past 11 to 15 years.

4.3 Students' Access to ICT Infrastructure

The study found that the computer was the commonest ICT infrastructure used in the sampled schools. Other ICT infrastructure such as projectors, digital cameras, modems, interactive whiteboards and printers were virtually unavailable. Only one school in the rural area, Obom Kojoman M/A JHS, had 20 computers and a computer laboratory. The other two, Nsuobri M/A JHS and Ashalaja M/A JHS, had no computers. Nevertheless, all sampled schools in urban areas had computers. Although all urban schools had computers, none had a computer laboratory. Schools that did not have a computer laboratory kept their computers either in the Staff Common Room or the headmaster's office.

Table 4.6 Access to computers and computer laboratory

School Category		**Name of School**	**Number of working computers**	**Computer to student ratio per class**		**Does your school have a computer laboratory ?**
				JHS 1	***JHS2***	
Rural	1	Obom Kojoman M/A JHS	20	1: 4	1:3	Yes
	2	Nsuobri M/A JHS	0	-	-	No
	3	Ashalaja M/A JHS	0	-	-	No
Urban	4	Anyaa M/A JHS	18	1: 4	1: 3	No
	5	Gbawe Islamic School Complex	2	1: 12	1: 8	No
	6	Oblogo M/A "2" JHS	16	1: 3	1: 3	No

Source: Field data (2013).

Examination of computer-to-student ratio indicated that Junior High Schools in the Ga South Municipality had inadequate access to computers. In Obom Kojoman JHS, the computer-to-student ratio was 1: 4 and 1: 3 for JHS 1 and JHS 2 respectively. Among the schools that had computers, Gbawe Islamic School Complex had the highest computer-to-student of 1:12 and 1:8 for JHS 1 and JHS 2 respectfully.

In spite of the fact that some schools had access to computers, none had access to the internet. All the schools had access to electricity. School administrators, however, complained of intermittent power supply as a challenge hindering students' and teachers' ability to make efficient use of available computers, adding that some computers had malfunctioned as a result of frequent power failures.

4.4 Use of ICT Infrastructure

It is worth noting that computers were only used in teaching ICT as a subject in all sampled schools. The time available for students to use computers in the classroom during ICT lessons ranged between 30 and 60 minutes per week. However, differences were observed between rural and urban schools in the number of minutes computers were used in the classroom during ICT lessons. About 17.86% of students of urban schools used computers in the classroom for 30 minutes per week. Again, 32.14% of students of urban schools used computers in the classroom for 60 minutes per week. Only 17.14% of students of rural schools used computers in the classroom for 60 minutes per week.

Table 4.7 Use of computers in the classroom

Number of minutes of computer usage in the class per week	School category		Total
	Urban	Rural	
0 minutes	0 0.00%	46 32.86%	46 32.86%
30 minutes	25 17.86%	0 0.00%	25 17.86%
60 minutes	45 32.14%	24 17.14%	69 49.29
Total	70 50.00%	70 50.00%	140 100%

Source: Field data (2013).

4.4.1 Testing Hypothesis 1

The study used the Student's t-test to determine whether the difference in the use of computers in the classroom between rural and urban schools was significant. It was hypothesized that there was no significant difference in the use of computers between students of rural and urban schools. To be able to test this assumption, it is important to state the null and alternate hypotheses as follows:

H_o: There is no significant difference in the use of computers between students of rural and urban schools.

H_a: The difference between students of rural and urban schools in the use of computers is significant.

Table 4.8 Student's t-test of mean use of computers per week

Groups	Mean	Std. Dev.	t	df	t-critical	P
Urban **Rural**	49.29 20.57	14.48 28.69	7.48	138	1.96	0.000
difference	**28.71**					

Source: Field data (2013).

The data in Table 4.8 above showed that the mean usage of computers in the classroom in urban and rural schools was 49.29 and 20.57 minutes respectively per week. The difference between the two means was 28.72minutes, suggesting that students of urban schools were 28.72 minutes more likely to use computers in the classroom than their rural counterparts. Since the computed t (7.48) was greater than the t-critical (1.96) we reject the null hypothesis and accept the alternate hypothesis that there was a significant difference in the use of computers between students of rural and urban schools.

4.4.2 Practicing with Computers in School

Apart from using computers for studies in the classroom, some students were allowed to practice on their own in the laboratory during their free period. However, only students from one school in the rural area reported being given 35 minutes to practice with computers in the laboratory per week. Other schools that had access to computers did not allow their students to practice with computers during their free periods. Students who had the opportunity to practice with computers used them to do what they were taught in class by their teachers. Some students reported:

> "During this time, I use the computer to create folders. I also learn how to use the computer to draw pictures and apply color to them"

> "I use the computer to find out about ICT tools, play games, open Microsoft Office Word 2007, watch movies, etc."

> "I use the computer to open Microsoft Office Word. I also use it to create folders and files. Sometimes I practice how to use the keyboard to type and how to print what I have been able to type"

Some school administrators cited the lack of computer laboratory as one major reason why their students could not practice with computers. It also emerged that students of most schools were unable to practice with computers due to the time allocated for ICT on the time table.

4.5 Impact of ICT Infrastructure on Learning Motivation.

A five point Likert scale was developed to measure the impact of ICT infrastructure on students' learning motivations in eight areas. The scale ranked responses in an ascending order starting from 1 (Never improved) to 5 (Well improved). The impact of ICT infrastructure on students' learning motivations is presented in Table 4.9 below.

Table 4.9 ICT impact on students' learning motivation

Areas	***School category***	**Scale**				
		1 Never improved	*2 Not improved*	*3 Neutral*	*4 Improved*	*5 Well improved*
Willingness to learn	Rural	1.06%	0.00%	0.00%	8.51%	15.96%
	Urban	7.45%	1.06%	4.26%	21.2%	40.43
Attentiveness in class	Rural	1.06%	3.19%	1.06%	10.64%	9.57%
	Urban	6.06%	5.32%	5.32%	32.98%	29.79%
School attendance	Rural	0.00%	0.00%	1.60%	9.57%	14.00%
	Urban	3.19%	3.19%	7.45%	21.28%	39.36%
Using the computer and internet to search for information to do my assignment	Rural	6.38%	4.26%	4.26%	4.26%	6.38
	Urban	4.26%	7.45%	5.32%	23.40	34.04%
Using Microsoft Word processor application to type letters, etc.	Rural	0.00%	2.13%	3.19%	17.02%	3.19%
	Urban	7.45%	8.15%	4.26	19.15%	35.11%
Understanding what is taught in class	Rural	0.00%	0.00%	2.13%	9.57%	13.83%
	Urban	3.19%	3.19%	3.19%	18.09%	46.81%
Helping you to learn without assistance Urban	Rural	1.08%	3.23%	1.08%	7.53%	12.90%
	Urban	6.45%	3.23%	7.53%	33.33%	23.66%

Source: Field data (2013).

The table shows positive impact of ICT on students' learning motivation. In the area of willingness to learn, 40.43% of students of urban schools and 15.96% of students of rural schools stated that their willingness to learn was 'well improved' by ICT infrastructure. About 8.52% and 21.2% of students respectively of rural and urban schools said ICT infrastructure had 'improved' their willingness to learn. However, 4.26% of students of urban schools were neutral about the statement. Furthermore, 7.5% and 1.06% of students respectively in urban and rural schools opined that ICT infrastructure had 'never improved' their willingness to learn.

The study also sought to investigate the extent to which the use of ICT infrastructure in school had impacted students' school attendance. More than half (50.36%) of students of urban (39.36%) and rural (14.00%) stated that the use of computers had 'well improved' their school attendance. Also, 21.28% and 9.57% of students of urban and rural schools respectively were of the view that ICT infrastructure had 'improved' their school attendance. However, 6.06% and 1.06% of students of urban and rural schools respectively stated that ICT infrastructure had 'never improved' their class attendance.

The use of ICT infrastructure had also impacted positively on the ability of students to use the computer and the internet to search for information to do their assignments. The majority (40.42%) of students reported that their ability to use the computer and the internet to search for information had 'well improved'. Out of this, 34.4% were in urban schools and 6.38% in rural schools. Also, 23.40% and 4.26% of students respectively of urban and rural schools were of the view that their ability to search for information using the internet had 'improved' as a result of the use of ICT infrastructure. However, 11.71% and 10.64% of students reported that the use of ICT infrastructure had 'not improved' and 'never improved' respectively their ability to use the internet to search for information to do their assignments.

The results also revealed that 38.3% of students' ability to use Microsoft word processor to type simple sentences and letters was 'well improved' through ICT infrastructure. Out of this number, 35.11% were in urban schools while those in rural schools constituted 3.19%. In addition, 36% of students reported that the use of ICT infrastructure had 'improved' their ability to use Microsoft word processor to type. However, 8.15% and 2.13% of students of urban and rural schools respectively indicated that the use of ICT infrastructure had 'not improved' their ability to use Microsoft word processor. Approximately 3.19% of students of urban schools said the

use of ICT infrastructure had 'never improved' their knowledge in using Microsoft word processor to type.

The use of ICT infrastructure had also impacted students' understanding of what was taught in class. More than half (60.64%) of students of dicated that the use ICT infrastructure had well 'improved' their understanding of what was taught in class. Approximately 27.66% of them also said the use ICT infrastructure had 'improved' their understanding of the topics teachers' taught in the classroom. Nevertheless, 6.38% of students were neutral about the impact of ICT infrastructure on their understanding of what was taught in class.

The impact of ICT infrastructure was also evident in the area of independent learning. About 23.66% and 12.90% of students of urban and rural schools respectively said the use of ICT infrastructure in the school had 'well improved' their ability to learn independently. Also, 33.33% of students of urban schools and 7.53% of students of rural schools indicated that ICT infrastructure had improved their independent learning. Nevertheless, 6.46% and 7.53% were of the opinion that the use of ICT infrastructure had respectively 'not improved' and 'never improved' their ability to learn independently.

4.5.1 Testing Hypothesis 2.

The scores of each student in the eight areas were summed-up to determine his or her overall score on learning motivation. It was then possible to employ the Student t-test to compute the mean motivation score of students of rural and urban schools. The null and alternate hypotheses to be tested are:

H_o: There is no significant difference in learning motivation between students of rural and urban schools.

H_a: There is significant difference in learning motivation between students of rural and urban schools.

Table 4.10 T-test for significance: ICT impact on learning motivation

Groups	Mean	Std. Deviation	t	t-critical	P
Urban	31.93	5.73			
Rural	10.94	15.38	10.70	1.96	0.000
Differences	**20.99**				

Source: Field data (2013).

The mean motivation of ICT infrastructure usage on learning among students of urban and rural schools was 31.93 and 10.94 respectively. The difference between the two means was 20.99. This difference was statistically significant because the computed t (10.70) was greater than the t-critical (1.96). We therefore reject the null hypothesis and conclude that the difference in the impact of ICT infrastructure on learning motivation between students of rural and urban schools was statistically significant.

4.6 Teachers' Access to ICT Infrastructure

The study showed that 52.78% of teachers did not have access to computers. Nevertheless, 47.22% of teachers had access to computers. Out of the 47.22% of teachers who had access to computers, 30.56% were in urban schools and 16.67%% in rural schools. Though none of the schools had access to the internet, some teachers had access to the internet via their wireless modem devices. Roughly 16.67% of teachers had access to internet. Out of the 16.67% of teachers who had access to the internet, 13.89% were in urban schools and 2.78% in rural schools.

Table 4.11 Teachers' access to ICT infrastructure

Do you have Access to a computer in the school?	**School category**		**Total**
	Rural	**Urban**	
Yes	6 16.67%	11 30.56%	17 47.22%
No	13 36.11%	6 16.67	19 52.78
Total	19 52.78%	17 47.22%	36 100%
Do you have access to internet in school?	**School category**		**Total**
	Rural	Urban	
Yes	1 2.78%	5 13.89%	6 16.67
No	18 50.00	12 33.33%	30 83.33%
Total	19 52.78%	17 47.22%	36 100%

Source: Field data (2013).

4.7 Teachers' Use of ICT infrastructure

The study sought to find out the extent to which teachers had access and used ICT infrastructure in their teaching activities. Teachers who had access to computers were asked if they used the computers for teaching. About 35.29% of teachers said they sometimes used computers for teaching. Approximately 29.41% of teachers who sometimes used computers for teaching were in urban schools as compared to only 5.88% in rural schools. However, only 5.88% of teachers of rural schools very often

used computers in teaching. Also, 11.76% of teachers of rural schools often used computers for teaching. However, 11.76% of teachers both of rural and urban schools never used the computer for teaching. Approximately 5.88% of teachers of rural schools rarely used computers for teaching purposes as compared 17.65 of teachers of urban schools.

Table 4.12 Cross-tabulation of computer usage for teaching purposes

School category	Response					Total
	Never use	Rarely use	Sometimes use	Often use	Very often use	
Rural	2	1	1	2	0	6
	11.76%	5.88%	5.88%	11.76%	0.00%	35.29%
	2	3	5	0	1	11
Urban	11.76%	17.65%	29.41%	0.00%	5.88%	64.71%
	4	4	6	2	1	17
Total	23.53%	23.53%	35.29%	11.76%	5.88%	100%

Source: Field data (2013).

Teachers who sometimes, often and very often used computers to teach were asked to throw light on how they used computers in the classroom.

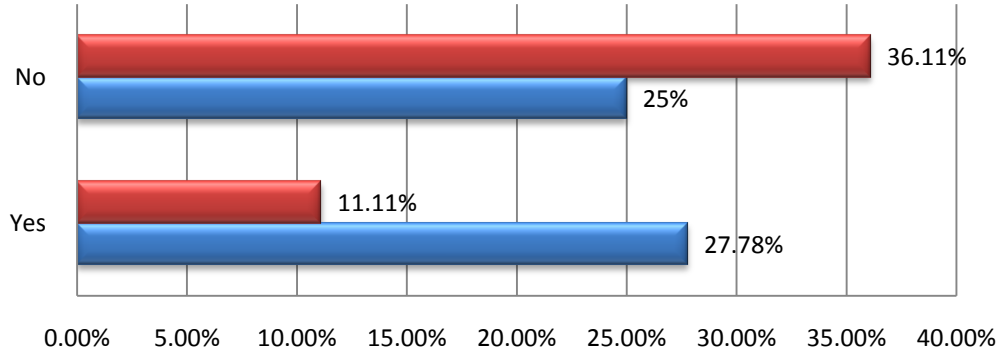
> "After teaching the theory, I set the computers up in the Staff Common Room and invite students in groups of four at a time to explain certain things to them on the computers"
>
> "I use the computer to teach students basic practical work in word processing and other application software related topics in the syllabus. I also use the computer to teach windows management and typing"
>
> "I put pupils into groups and assign each group with a computer. I then demonstrate and go round to supervise to ensure that the pupils go through the task practically"
>
> "I sometimes use my personal laptop to demonstrate to students what I teach. I also connect my modem to my computer to search for material on the internet to support what we have in the textbooks to teach my students. Besides, I keep my students' records on the computer to ease the continuous assessment workload on me"

The above statements by teachers confirmed earlier finding that computers were used only in the teaching of ICT as a subject. For subjects other than ICT, teachers used the computer and the internet to search for information to complement what they had in the

textbooks. It was also found that some teachers used computers to keep their students' records and prepare lesson plans.

Teachers who did not use ICT infrastructure in any way related to teaching cited many factors that hindered their readiness to do so. The major barrier to teachers' readiness to use ICT infrastructure for teaching was the lack of access to the infrastructure. Also, most teachers did not have the capacity to use the infrastructure for teaching.

Figure 4.2 Teachers' skills in ICT



	Yes	No
Urban	11.11%	36.11%
Rural	27.78%	25%

Source: Field data (2013).

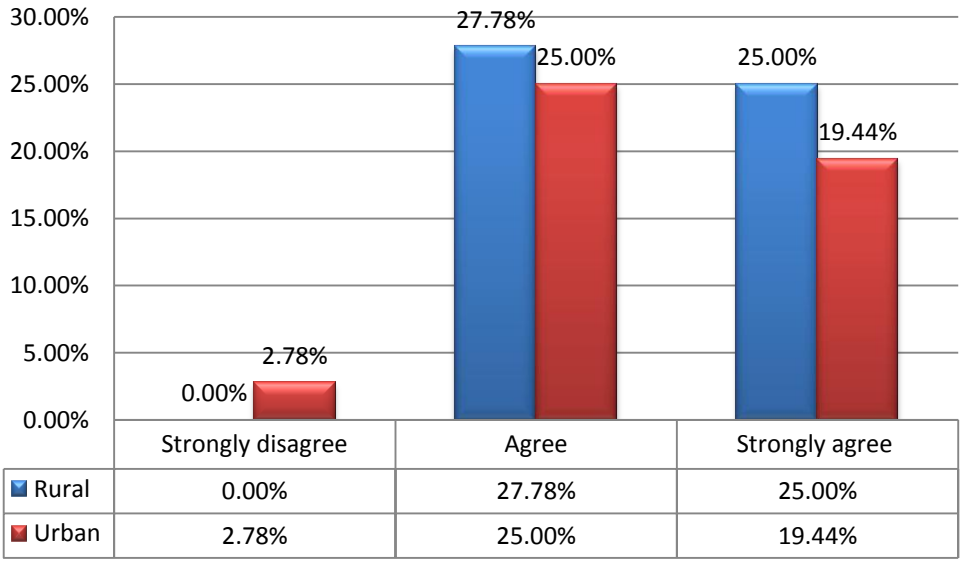
Overall, 38.89% of teachers were literate in ICT compared to 61.11% of teachers who were not. Out of the 38.89% of teachers who were literate in ICT, 27.78% of them were in rural schools and 11.11% in urban schools. Out of the 61.11% of teachers who lacked ICT skills, 25% and 36.11% were in rural and urban schools respectively.

4.8 ICT Infrastructure and Teaching Motivation

Teachers were very optimistic about the prospects of using ICT infrastructure to improve teaching and learning. The widely held belief of teachers about ICT infrastructure was that the latter enhances quicker and easier understanding of concepts by students. As a result, many (52.7%) teachers agreed that teaching with ICT

infrastructure made teaching and learning interesting. Out of the total number of teachers who agreed that ICT made teaching and learning interesting, 27.7% were in rural schools and 25% in urban schools. Moreover, 25% and 19.44% of teachers respectively of urban and rural schools strongly agreed that ICT infrastructure made teaching and learning interesting.

Figure 4. 3 ICT makes teaching and learning interesting



	Strongly disagree	Agree	Strongly agree
Rural	0.00%	27.78%	25.00%
Urban	2.78%	25.00%	19.44%

Source: Field data, (2013).

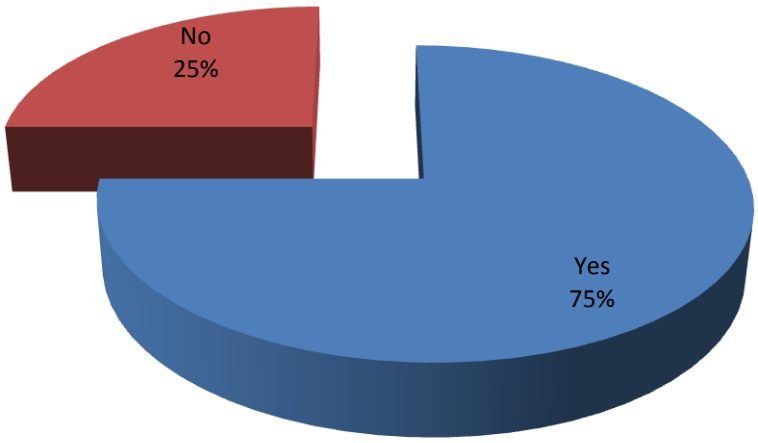
Apart from ICT infrastructure making teaching and learning interesting, teachers were also motivated to adopt ICT in teaching because they were convinced it could bring about efficiency. Some teachers said:

> "When one is able to present topics using PowerPoint presentation or word processing, it will go a long way to facilitate teaching and learning"
>
> **"**The use of multimedia software or audiovisuals captures learners' and teachers' interest in the learning process for instance PowerPoint presentation. Again, ICT can reduce stress in access to information on the part of teachers and learners."
>
> **"**With ICT, more lessons can be treated as one can do many things at the same time. Teaching and learning go faster and understanding is enhanced. Besides, ICT can produce pictures and videos that can be appealing to students. If teachers have the skill to use ICT tools, it can bring about efficiency".

Teachers expressed positive views about the capacity of ICT infrastructure in enhancing the quality of education. Most teachers were of the view that ICT infrastructure could help them access extra information on the internet to supplement

what they had. The majority (75%) of teachers were prepared to use ICT infrastructure to teach their students. However, about 25% of teachers were not ready to use ICT infrastructure for teaching purposes. Teachers who resigned to using ICT infrastructure to teach reported that it was difficult for them to learn how to use computers and other ICT tools. Others were of the view that some students were even more knowledgeable in using ICTs than they do; and that they would not make any impact teaching such students.

Figure 4. 4 Teachers' preparedness to use ICTs for teaching



Source: Field data, (2013).

4.9 Teachers' Confidence and ICT Infrastructure

Teachers' confidence in using ICT infrastructure was measured using a five point Likert scale starting from 1(Never confident) to 5 (Very confident). The results showed that 30.56% of teachers were confident of the use of Microsoft Word processor in carrying out their educational activities. Also, 13.89% of teachers were very confident of using Microsoft word processor for educational purposes. About 25% of teachers

were little confident while 11.11% and 19.44% were respectively not confident and never confident of using Microsoft Word processor.

Regarding Spreadsheet application, 19.44% of teachers were never confident. Also, 27.78% of teachers were little confident of the use of spreadsheet application. However, 27.78% and 5.56% of teachers were confident and very confident respectively in using Spreadsheet application for educational purposes.

In the use of ICT infrastructure for preparing lesson plans, most (33.33%) reported that they were never confident. Also, 13.89% of teachers were not confident of using ICT to prepare lesson plans. All the same, some teachers reported being little confident (25.00%), confident (22.22%) and very confident (5.56%) in this regard.

The majority of teachers reported having some level of confidence in using the internet. About 22% of teachers were very confident of using the internet to access information. Moreover, 25% and 19.44% of teachers were confident and little confident respectively of using the internet. Nevertheless, 8.3% and 25% of teachers were not confident and never confident respectively of using the internet to search for information.

Table 4.13 Confidence of teachers in using ICT infrastructure

Area	1 Never confident	2 Not confident	3 Little confident	4 confident	5 Very confident
Using Microsoft word processer to carryout teaching activities	19.44%	11.11%	25.00%	30.56%	13.89
Using Microsoft Excel for educational purposes.	19.44%	19.44%	27.78%	27.78%	5.56%
Using database to keep students records	36.11%	19.44%3	30.56%	13.89%	0.00%
Use of Educational software to find information	25.00%	5.56%	25.00%	25.00%	19.44%
Using ICT to prepare lesson plans	33.33%	13.89%	25.00%	22.22%	5.56%
Using ICT to manage files	30.56%	19.44%	16.67%	19.44%	13.89%
Using the internet to search for information	25.00%	8.3%	19.44%	25%	22%

Source: Field data (2013).

4.9.1 Testing Hypothesis 3

The score of each teacher in the seven areas used to measure confidence was added to determine his or her overall score on confidence. The scores were then grouped to allow for the use of the Chi square statistic to test the third hypothesis of the study. About 22.2% of teachers of urban schools scored between 7-16 marks on confidence as compared to 16.7% of teachers in rural schools. However, 27.8% of teachers of rural schools scored between 17 and 26 on confidence while their counterparts in urban schools who scored between 17 and 26 were only 11.1%. Again, urban school teachers scored 11.1% more than rural school teachers on the third category of scores (27-35) on confidence.

Table 4.14 Chi square test of teachers' confidence in ICT usage

Category	Range of Scores			Total
	7-16	17 - 26	27 - 35	
Urban	8 22.2%	4 11.1%	6 16.7%	18 50%
Rural	6 16.7%	10 27.8%	2 5.6%	18 50%
Total	14 38.9%	14 38.9%	8 22.2%	36 100%

$\chi^2 = 4.85, p>0.088$

Source: Field data (2013).

It was hypothesized that there was no significant variation in confidence between teachers in urban and rural schools in the use of ICT infrastructure for teaching. In order to test the validity of this statement, we need to state the null and the alternate hypotheses.

H_o: There is no significant difference in confidence between urban and rural teachers in using ICT infrastructure for teaching.

H_a: There is significant difference in confidence between urban and rural teachers in using ICT infrastructure for teaching.

The p-value (0.088) generated from the test was greater than the significant level (0.05) chosen for this study. As a result, we fail to reject the null hypothesis and conclude that the observed difference in confidence between urban and rural teachers in using ICT infrastructure for teaching was not statistically significant

Section II

4.10 Discussion of Findings

The main objective of this study was to investigate the availability and use of ICT infrastructure in teaching and learning in rural and urban public Junior High Schools (JHS) in the Ga South Municipality. The section presents the discussions of the main findings in accordance with the specific objectives of the study.

4.10.1 Access to and Use of ICT Infrastructure by Students

It was clear from the study that state provision of ICT infrastructure was limited or in adequate in both rural and urban schools. Computers were the most commonly used ICT infrastructure in sampled schools. Other important ICT infrastructure such as projectors, interactive whiteboards, printers and digital cameras were virtually unavailable. There was rural-urban disparity in the provision of ICT infrastructure. While all sampled schools in urban areas had computers, only one school in the rural area had computers. Two schools in the rural area had no computers. It was observed that computers were unevenly distributed. The only school that had access to computers in the rural area had 20 computers. In urban areas, two schools had 18 and 16 computers respectively. The other school in the urban area had only 2 computers. Nonetheless none of the schools, rural or urban, had access to the internet. These trends in students' access to computers in schools in the Ga South municipality to some extent buttress the findings of Akuoma (2012) in Nigeria that, computers were more accessible to teachers and students of urban schools. The inadequacy and uneven distribution of ICT infrastructure to schools could limit the opportunities of using ICTs to improve access to quality basic education in the country.

Inadequacy and uneven access to ICT infrastructures translated into their use. Students of urban schools were 28.72 minutes more likely to use computers in the classroom

than their rural counterparts because they had access. The use of computers in only ICT lessons was an indication of the fact that ICT integration in the education sector in Ghana was at its infant stage. It also indicated the lack of capacity of teachers to use ICT infrastructure for pedagogical purposes.

4.10.2 Impact of ICT Infrastructure on Learning Motivation

It was obvious that ICT infrastructure had positive impacts on students learning motivations. Most students reported that their willingness to learn had been improved by the use of ICT infrastructure. Also, students' attentiveness in class and school attendance had improved through ICTs. It was, however, observed that ICT infrastructure had positive impact on the learning motivation of students of urban schools than their rural counterparts. ICT infrastructure could impact more on students' learning motivation if other ICT infrastructure in addition to computers, were made available. The uneven distribution of ICT infrastructure was a major reason accounting for the difference in the learning motivation of students of urban and rural schools.

4.10.3 Access to and use of ICT Infrastructure by Teachers

Access to computers by teachers of the Ga South Municipality was generally insufficient. Only 47.22% of teachers had access to computers. Access to internet was also very low. However, teachers of urban schools had better access to computers than their rural counterparts. Teachers' use of ICT infrastructure for instruction was also low. However, some teachers reported using computers in the class to demonstrate to students. Others used the internet to search for information to supplement what they had in the textbooks. Some teachers did not use computers to teach partly because they lacked the capacity to do so. The major obstacle hindering teachers' ability to use computers to deliver their lessons was the lack of access. This finding confirmed a related discovery by Mwalongo (2011) in Tanzania that most teachers did not use ICT

infrastructure to teach mainly because the infrastructures were unavailable. The lack of ICT infrastructure and related low usage by teachers for teaching could limit the ability of students to acquire the necessary ICT skills to participate fully and meaningfully in a world that is dominated by technology.

4.10.4 Impact of ICT Infrastructure on Teaching Motivation and Confidence of Teachers

Teachers were optimistic about the prospects of ICT infrastructure in enhancing teaching and learning. Teachers were motivated to adopt ICT in teaching because they believed it brought about efficiency. Teachers who had no access to computers expressed willingness using ICT infrastructure to teach if they had access. Apart from lack of access, the lack of ICT skills prevented some teachers from incorporating ICT infrastructure in their teaching activities. The lack of ICT skills resulted in less confidence of teachers in the use of ICT infrastructure. As the Chi Square indicated, there was no statistically significant difference in confidence between urban and rural teachers in using ICT infrastructure for teaching. Whether a teacher is confident or not in the use of ICT infrastructure for teaching does not depend on the area where he or she teaches. What is decisive in teachers' confidence in using ICT is access to the infrastructure and the capacity to use them. However, the result of the Chi Square test cannot be generalized to include all teachers in urban and rural schools in the Ga South municipality because teachers who took part in the research were not randomly sampled. The result is only applicable to only teachers who took part in the research.

4.11 Conclusion.

This chapter analyzed and discussed empirical data collected from the three categories of respondents: Students, teachers and school administrators. The analysis of data was done in line with the specific objectives of the study. Descriptive statistics such as

tables, cross-tabulations, charts and graphs were used to describe qualitative data. The Student's t-test and Chi square statistic were employed to analyze quantitative data. The results showed that access to ICT infrastructure by students and teachers was generally inadequate. Nonetheless, there were differences. Students of urban schools were 28.72 minutes more likely to use computers for studies per week than those in rural schools. ICT infrastructure had positive motivations on the learning of students of urban areas than their rural counterparts. Also, ICT infrastructure had a major impact on teachers' motivation to deliver education through ICTs. The majority of teachers (75%) were prepared to use ICT to teach if they had access. Most teachers (61.11%) did not have the capacity to use ICT infrastructure to teach. The lack of capacity to use ICT infrastructure translated into low confidence of teachers in using ICT infrastructure for teaching purposes. No significant difference was found between teachers in urban and rural schools regarding their confidence in using ICT infrastructure to teach. The results relating to differences in teachers' confidence could not be generalized because teachers who took part in the research were not randomly sampled.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter consists of three sections. The first section presents a summary of the research findings. The second and third sections present respectively the conclusions drawn from the research and recommendations put forward.

5.2 Summary

This study sought to investigate the availability and use of ICT infrastructure in teaching and learning in public Junior High Schools in the Ga South Municipality. The study examined access and use of ICT infrastructure by students of rural and urban schools, the impact of ICT infrastructure on learning motivation, access to ICT infrastructure by teachers in urban and rural schools, the impact of ICT infrastructure on teachers' motivation to teach through ICTs and the confidence of teachers in the use of ICT infrastructure for teaching purposes.

It was discovered that access to ICT infrastructure was generally inadequate in both rural and urban schools. However, students of urban schools had better access to ICT infrastructure than their rural counterparts. Also, students of urban schools used ICT infrastructure for studies more than their rural counterparts. The impact of ICT on learning motivations was higher for students of urban schools than those of rural schools.

Teachers of urban schools had better access to ICT infrastructure than those of rural schools. Also, ICT infrastructure had positive motivations on teachers of both rural and urban schools. It was found that even teachers who did not have access to ICT infrastructure were willing to incorporate ICTs into their teaching activities. A few

teachers, however, were unwilling to use ICTs to teach even if they had access. The lack of access to ICT infrastructure and the lack of capacity of teachers to use ICT infrastructure accounted for teachers' inability' to use ICT infrastructure for teaching. However, no significant difference was found between teachers of urban and rural schools in their confidence in the use ICT infrastructure for teaching, even though teachers of urban schools had higher scores on confidence than those of rural schools..

5.3 Conclusion

The potential of ICT infrastructure in enhancing education has received wide attention in most countries including Ghana. Consequently, the Ministry of Education came out with the ICT in Education policy to guide the introduction of ICT into teaching and learning at all the levels of education. The policy is currently at various stages of implementation in all tertiary, secondary and basic schools across the country. It is however useful to note that the provision of ICT infrastructure and the capacity of teachers and students to effectively use them in teaching and learning are crucial to the successful implementation of the policy. Given the paucity of studies on the state of access and use of ICT infrastructure, especially at the basic level, an empirical research into the availability and usage of ICT infrastructure in teaching and learning becomes necessary. What this study sought to achieve was to investigate the availability of ICT infrastructure and how teachers and students use them in teaching and learning.

Even though access to ICT infrastructure across the municipality was generally inadequate, students and teachers of urban schools had better access to ICT infrastructure than their rural counterparts. On the average, students of urban schools were 28.72 minutes more likely to use computers in the classroom per week than those in rural areas. Also, students of urban schools recorded higher scores on ICT impact on their learning motivation than students of rural schools.

It was also discovered that teachers of rural and urban schools had positive motivations towards the use ICT in the classroom. Differences were observed between teachers of rural and urban schools of their confidence in using ICT infrastructure for teaching. The difference was, however, not significant.

5.4 Recommendations

Based on the findings of this study, the following recommendations are made.

1. Efforts should be made by Government to provide all basic schools in the country with computers and other ICT devices as well as laboratories where these infrastructures could be kept safely. Adequate provision of ICT infrastructure in Basic schools will increase the motivation of both teachers and pupils to use them for teaching and learning purposes. This will go a long way to improve the quality of education.
2. The Ghana Investment Fund for Electronic Communication (GIFEC) should be given enough funds to carry out its mandate of ensuring universal access to ICT by unserved and underserved communities in Ghana. The current Community Information Centres (CICs) in rural and urban areas should be expanded by GIFEC and be adequately stocked with ICT infrastructure to provide teachers and students with easy access to ICT services.
3. There is also the need for capacity building of teachers in ICT skills to be able to utilize ICT infrastructure effectively in teaching not only ICT but also other subjects. This may start at the Colleges of Education in the country where teachers are trained to teach at the Basic level. Building the capacity of teacher trainees in ICT skills will go a long way to improve teaching and learning of ICT at the basic level. There is also the need for periodic workshops and in-

service training of Basic School teachers in ICT skills to enable them use ICT services for teaching.

4. In addition, effective monitoring and evaluation of the ICT in Education policy from time to time is needed to check on the progress and weaknesses in the implementation of the policy. This will provide policy makers with feedbacks that may inform proper planning towards integrating ICT into education.

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APPENDIX A

QUESTIONNAIRE FOR STUDENTS

UNIVERSITY OF GHANA
INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER).

I am a student of the above named institute carrying out a research on "Access **to and use of ICT Infrastructure in Teaching and Learning: A comparative study of Rural and Urban Public JHS in the Ga South municipality**" The information provided would be used only for academic purposes and kept highly confidential and anonymous. Your participation in this exercise would be very much appreciated. Thank you.

Questionnaire for students

Circuit …….

School category……

Serial Numbers……

SECTION I

Background Information

1. Name of school……..
2. Gender……
3. Class……
4. Age……

SECTION II

Access to and use of ICT infrastructure

5. Does your school have computers? ( ) Yes ( ) No ***(if 'no' skip to question 8***)
6. If yes, how many of the computers are working?.....
7. What is the number of computers connected to the internet?.....
8. Apart from computers, what other ICT infrastructure are commonly available in your school? (***please tick as many items as are available***)

(a) Projector (b) Interactive whiteboard

(c) Printer (d) Digital camera

9. Does your school have a computer laboratory? ( ) Yes ( ) No ***(if 'no' skip to question 12***)

10. If yes, what items are available in your school's computer laboratory?

……

……

……

……

……

11. Where do you keep the computers kept?

……

……

……

……

12. Do you have ICT lessons in the school? ( ) Yes ( ) No ***(If 'no' skip to question*** **15**)

13. How many times do you use computers during ICT lessons in a week?

(a) Once in a week (b) Two times in a week

(c) Three times in a week (d) Four times in a week

(e) Five time in a week (f) Others (please specify)……

14. How many minutes do you spend on the computer per one ICT lesson?

……

15. Are computers used in teaching other subjects in your school? ( ) Yes ( ) No ***(If no, skip to question 21***)

16. If yes, tick the subjects for which computers are used in teaching (***You can tick as many as apply to your school***)

(a) Mathematics (b) English Language (c) Social Studies

(d) Integrated Science (e) Basic Design and Technology

(f) Ghanaian Language (g) French(h) R.M.E

17. Apart from using the computers for lessons, are you allowed to practice with the computer during your free times?

( ) Yes ( ) No ***(If 'no', skip to question* 20 in the next section**)

18. I f yes, how many minutes do you practice with the computer per week?

……..

19. During practice hours, what things do you use the computer to do?

……

……

……

SECTION III

ICT and Learning Motivation

Please indicate below how the use of ICT at the school and outside the school has improved your motivation in the following areas. (*Please, tick once per item*)

No	**Areas**	**Scale**				
		1 Never improved	**2 Not improved**	**3 Neutral**	**4 improved**	**5 Well improved**
20	Willingness to learn					
21	Attentiveness in class					
22	School attendance					
23	Using the computer and internet to search for information to do your assignment					
24	Using word processing application to type letters, etc.					
25	Understanding what is taught in class					
26	Helping you to learn without assistance					

APPENDIX B

QUESTIONNAIRE FOR TEACHERS

UNIVERSITY OF GHANA

INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)

I am a student of the above named institute carrying out a research on "Access **to and use of ICT Infrastructure in Teaching and Learning: A comparative study of Rural and Urban Public JHS in the Ga South municipality**" The information provided would be used only for academic purposes and kept highly confidential and anonymous. Your participation in this exercise would be very much appreciated. Thank you.

Questionnaires for teachers

Name of school……

Circuit…….

Category ……

Serial number……..….....

SECTION I

Background Information

1. Gender ( ) Male ( ) Female
2. Age…….
3. Academic qualification……..
4. What subject(s) do you teach? (***Please you can tick two or more if you handle many subjects***) (a) Mathematics (b) English (c) Integrated Science
   (d) Social Studies (e) Information and Communication Technology (ICT)
   (f) Basic Design and Technology (g) Ghanaian Language (h) French
   (i) Religious and Moral Education
5. For how many years have you been teaching?.....
6. Do you have the capacity to use ICT infrastructure for teaching?

   ……

SECTION II

Access to and Use of ICT Infrastructure

7. Does your school have computers? ( ) Yes ( ) No (***if 'no' skip to question 10***)
8. How many of the computers are working?.....
9. What is the number of computers connected to the internet?.....
10. What other ICT infrastructure are commonly available in your school? ***(please tick as many items as are available***)

    (a) Projector (b) Interactive whiteboard (c) Printer

    (d) Digital camera (e) Other (please specify)……
11. Is your school having a computer laboratory? ( ) Yes ( ) No ***(If no, skip to question 13***)
12. What items are available in your school's computer laboratory?

    ……

    ……

    ……
13. Where are ICT infrastructure kept?

    ……

    ……

    ……
14. Do you have access to a computer at school? ( ) Yes ( ) No (***If no, skip to question 17*****)**
15. Do you use it for teaching purposes?

    (a) Never use (b) Rarely use (c) Sometimes use

    (d) Often use (e) Very often use
16. Can you describe how you use the computer to teach?

    ……

    ……

    ……

    ……

    ……

17. Do you have access to internet connection at the school ( ) Yes ( ) No

(If no, skip to question 21 in the next section)

18. By what means are you able to able to access internet at school?

……

……

……

19. Do you use it for teaching purposes?

(a) Never use (b) Rarely use

(c) Sometimes use (d) Often use (e) Very often use

20. Please describe how you use the internet for teaching purpose

……

……

……

……

SECTION III

ICT and Teaching Motivation

21. How do you feel using ICT?

……

……

……

……

22. Do you think ICT can bring about efficiency in your teaching activities? If yes how?

……

……

……

……

……

23. Do you use ICT infrastructure for teaching in any way? ( ) Yes ( ) No. (***If no, skip to question 38)***

24. Can you describe how you use ICT for teaching?

……

……

……

……

……..

25. What prevents you from using ICTs for teaching?

……

……

……

…….

26. ICT can make lessons more interesting to teachers and students. To what extent do you agree or disagree with this statement?

(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree

(e) Strongly agree

27. Please give reason(s) for your choice in question 46 above?

……

……

……

……

28. Are you prepared to use ICT infrastructure to teach if you have access?

( ) Yes ( ) No. **(If yes proceed to section IV)**

29. Why are you not prepared to use ICT infrastructure to teach?

……

……

……

……

SECTION IV

Confidence and attitude towards ICTs

Please indicate your level of confidence in the use of the following applications						
No	**Application**	**Scale**				
		1 Never confident	**2 Not confident**	**3 Little confident**	**4 Confident**	**5 Very confident**
30	Word processing					
31	Spreadsheet/ Excel					
32	Educational software, e.g Encarta					
33	Using ICT to prepare lesson plans					
34	Managing files					
35	Using the internet to search for information					
36	Managing files					
37	Creating students database					

Thank you very much

APPENDIX C
QUESTIONNAIRE FOR SCHOOL ADMINISTRATORS

UNIVERSITY OF GHANA

INSTITUTE OF STATISTICAL, SOCIAL AND ECONOMIC RESEARCH (ISSER)

I am a student of the above named institute carrying out a research on "**Access to and use of ICT Infrastructure in Teaching and Learning: A comparative study of Rural and Urban Public JHS in the Ga South municipality** "The information provided would be used only for academic purposes and kept highly confidential and anonymous. Your participation in this exercise would be very much appreciated. Thank you.

Questionnaire for School Administrators.

Name of school……

Name of Circuit ……

School category……..

Serial number ……

SECTION I

Background Information

1. Gender……
2. Age……
3. Academic qualification…….
4. Number of years in school administration position……..
5. For how many years have you been heading this school…….

SECTIONII

ICT to and use of infrastructure

6. Does the school have access computers? ( ) Yes ( ) No ***(If no, skip to question 9*)**
7. How many are working properly.....

8. How many computers are connected to the internet?.....

9. What other ICT infrastructure are commonly used in your school
   (*please tick as many items as are available*)
   (a)) Projector (b) Interactive whiteboard(c) Printer
   (d) Digital camera (e) Others (Please specify)……

10. Is the school having a computer laboratory? ( ) Yes ( ) No
   ***(If no, skip to question 12*)**

11. What items are available in the computer laboratory?
   ……
   ……
   ……
   ……

12. Where are the computers and other ICT infrastructure kept?
   ……
   ……

13. Who has access to computers at the school?
   ……
   ……
   ……..

14. How are computers in the classroom in teaching ICT?……..

15. How many minutes do teachers use computers in the classroom in a week?
   ……..

16. Are students allowed to practice with computers during their free times?
   ( ) Yes ( ) No. (**If no skip to question 18**)

17. How many minutes are they allowed to practice with computers in a week?

18. Why are students not given the opportunity to practice with computers during their free times?
   ……
   ……
   ……
   ……..

19. Is ICT infrastructure such as computers used during lessons in other subjects?
    ( ) Yes ( ) No ***(If no, skip to question 20)***

20. Does every teacher has access to a computer at the school? ( ) Yes ( )No
    (If yes, skip question23)
21. How many of them have access to computers at school?.....?
22. Do they use them for teaching purposes? ( ) Yes ( )No
23. Is the school connected to electricity? ( ) Yes ( ) No**(*If no, skip to question 25*)**
24. How would you describe the supply of electricity in the school?

    ……

    ……

    ……
25. What have you done about it?

    ……

    ……

    ……

    ……

26. Are your students benefiting from the use of ICT in teaching and learning?
    ( ) Yes ( )No
27. How confident do you think your teachers are in the use of ICT for teaching?
    (a) Never confident(b) Not confident (c) Little confident
    (d) Confident (e) Very confident
28. Do you think your teachers need some form of training in ICT to be able to incorporate it into teaching? Why?

    ……

    ……

    ……

    ……

29. What do you think are some of the barriers to your teachers' ability to use ICT in teaching?

    ……

    ……

……

……

……

30. What do you think should be done to make teachers extensively use ICTs in teaching?

……

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Thank You Very much

APPENDIX D

Student's t test of Mean use of Computers per Week in school

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Urban	70	49.28571	1.730513	14.47851	45.83343	52.73799
Rural	70	20.57143	3.428571	28.68549	13.73162	27.41124
combined	140	34.92857	2.268005	26.8354	30.44432	39.41282
diff		28.71429	3.840544		21.12036	36.30821

diff = mean(Urban) - mean(Rural) t = 7.4766
Ho: diff = 0 degrees of freedom = 138

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

.

APPENDIX E

T-test for Significance of ICT on Learning Motivation

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
Urban	70	31.92857	.6844385	5.726423	30.56315	33.29399
Rural	70	10.94286	1.837823	15.37633	7.276501	14.60921
combined	140	21.43571	1.321621	15.63763	18.82264	24.04879
diff		20.98571	1.961134		17.10796	24.86347

diff = mean(Urban) - mean(Rural) t = 10.7008

Ho: diff = 0 degrees of freedom = 138

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000