TECHNOLOGY IN EDUCATION: A CRITICAL SOCIAL EXAMINATION OF A RURAL SECONDARY SCHOOL IN GHANA

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Abstract

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TECHNOLOGY IN EDUCATION: A CRITICAL SOCIAL EXAMINATION OF A RURAL SECONDARY SCHOOL IN GHANA (230 pp.)

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Research on the use of computers in Ghanaian schools indicates that there is a concentration of use in urban schools while rural schools continue to lag behind. This study examined how computers and related technology were used in a rural school in the Central Region of Ghana, Twifo Praso secondary school. It addressed issues on use or non-use of computers and related technology within the critical social theory framework in order to determine the underlying social, economic, and political factors that affected the use of the technology the school. Data was collected through in depth interviews of 16 interviewees, a teacher and student focus group, participant observations and document analysis. This research found that

1. There have been computers available at Twifo Praso secondary school since 2002. The computers were acquired through a school technology fee paid by all students.

2. Although most of the teachers interviewed had had some form of computer training, they did not use computers for any form of instruction in the school. This was attributed to inadequate training and a lack of
knowledge on technology applications in the curriculum.

3. Only students in grade 12 were observed using computers. A computer literacy class was taught with no association to any subject matter although some of the exams required computer knowledge. Also, students were generally found to be more knowledgeable about computers than teachers.

I conclude by proposing a model that could improve participation of teachers, students, parents in technology issues that affect the school. Participation could lead to an increase in access to computers and this could result in the effective integration of computers and related technology at Twifo Praso secondary school.

Approved: _________________________________________________

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CAI</td>
<td>computer aided instruction</td>
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<tr>
<td>EMIS</td>
<td>Education Management Information System</td>
</tr>
<tr>
<td>ERNWACA</td>
<td>Educational Research Network for West and Central Africa</td>
</tr>
<tr>
<td>ERRC</td>
<td>Education Reform Review Committee</td>
</tr>
<tr>
<td>fCUBE</td>
<td>Free Compulsory Universal Basic Education</td>
</tr>
<tr>
<td>GES</td>
<td>Ghana Education Service</td>
</tr>
<tr>
<td>GET fund</td>
<td>Ghana Educational Trust fund</td>
</tr>
<tr>
<td>GIIT</td>
<td>Ghana Institute of Information Technology</td>
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<tr>
<td>HIID</td>
<td>Harvard Institute for International Development</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>ICT4AD</td>
<td>Information and Communications Technology for Accelerated Development</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JICA</td>
<td>Japan International Cooperation Agency</td>
</tr>
<tr>
<td>MoE</td>
<td>Ministry of Education</td>
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<tr>
<td>MPATI</td>
<td>Midwest Program on Airborne Television Instruction</td>
</tr>
<tr>
<td>NCITE</td>
<td>National Council for Information Technology in Education</td>
</tr>
<tr>
<td>THLDD</td>
<td>Twifo Hemang Lower Denkyira district</td>
</tr>
<tr>
<td>TOPP</td>
<td>Twifo Oil Palm Plantation</td>
</tr>
<tr>
<td>TPSS</td>
<td>Twifo Praso secondary school</td>
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CHAPTER 1

BACKGROUND TO STUDY

The use of computer technology and the Internet in education, especially the teaching and learning process has resulted in academic improvements globally (Butzin, 2000; Sivin-Kachala & Bialo, 2000). As a result, there is concern for those who have had little or no experience with computer technology, most of whom are in developing countries (Cawthera, 2003) such as Ghana. An examination of the use of computer technology in Ghanaian schools indicates that computers and the Internet for educational purposes is used more in urban than rural secondary schools (Parthermore, 2003). This research examines how computers and related technologies are being used at a rural secondary school, Twifo Praso secondary school (TPSS) in the Twifo Hemang Lower Denkyira district (THLDD) in the Central region of Ghana. In this context, rural is defined primarily in terms of the social and economic activities in the community. The THLDD is characterized by poverty and the main economic activity is subsistence farming.

It is a case study that uses interviews, focus group discussions, document analysis and observations. Also, this study draws on critical social theory to analyze the use of computers and related technologies in a rural school environment. Critical social theory was used in order to understand the complex interplay between the socio-economic
and political factors that affect the use of computers and related technologies at TPSS.

As a qualitative research, the findings of this study are limited to the extent that it reflects on issues regarding how computers and related technologies are used and integrated into the TPSS curriculum. This study cannot be generalized as reflective of all rural secondary schools in Ghana. However, the findings of the study offer insightful information for similar educational settings in Ghana, regarding how to improve the use and integration of computers and related technologies in rural secondary schools. The integration of technology in education involves the actual process of using computers and related technologies for learning activities that support the curriculum. Often, this is confused with the infusion of technology which is merely the physical presence of computers (Lockard, Abrams, & Many, 1997).

Overview of the use of Computers and the Internet in Education

Cuban (1986) in Teachers and Machines: The Classroom Use of Technology Since 1920, reviews the history of technology in education in the United States. From this historical review, it appears that the first technologies that were introduced in education in the 1920s was radio. By 1945 many radio stations, departments of education and
various institutes of learning aired educational programs for instructional use. The use of instructional television became prevalent between 1954 and 1983 where talking heads were used to teach students. During this period, the use of instructional television was considered to make the classroom “an interesting and productive place for learning” (Cuban, 1986, p. 18).

By the 1980s, various studies were conducted to determine the effective use of technology in American classrooms (Cuban, 1986). The studies revealed that teachers seldom used instructional television, and there was a greater percentage of usage by elementary school teachers than secondary school teachers. Issues such as the lack of teacher skills in using equipment and film, the cost of purchasing film and the inability to store bulky equipment in the classroom were factors that decreased the interest of teachers in instructional television. The study indicated that teachers and principals were blamed by the public since they were perceived to be “hostile or indifferent . . . [to] modern technology” (Cuban, 1986, p. 51). In addition, the bureaucracy within the educational sector was viewed as stifling the use of instructional television. These types of non-involvement, non-interactive instruction often failed to interest and engage students in the learning process (Skolnik & Smith, 1993).

Talking heads are considered to be a recording of someone teaching a lesson. 
The first instructional television programs were not interactive. Carey (1996) reviewed various attempts to make television more interactive. One of the first documented interactive instructional television programs emerged from the Midwest Program on Airborne Television Instruction (MPATI) initiatives that began in 1959 as an effort to transmit television to a wide audience before cable and satellite technologies were available. This interactive instructional television, in the form of distance learning programs, used real time television or video to provide instruction to the classroom without teacher involvement. Since 1989, cable television giants such as Cable News Network (CNN) and Whittle Communications (Channel One) have pioneered instructional television through cable networks. Cable instructional television has been especially beneficial to rural schools by providing them with access to advanced courses at a distance (Kober, 1990). Schlosser (1991) also documented the benefits of cable television to urban and suburban schools and concluded that television was perceived to be a globalizing tool that brought the world into the classroom.

The emergence of the Internet and computerized smart systems has made interactivity through two way responses possible (Stewart, 1999). Teachers and students are able to interact via video conferencing, instant messaging and chat rooms. Also, developments in the form of web cams have made
interactions via video more interesting. The Internet is just one of the avenues for interactivity; digital television has taken interactivity to another level (Stewart, 1999). It provides users with control that its predecessors did not offer. Despite these new capabilities, digital televisions are still used primarily for television and the Internet remains the top pick for interactive services.

The advent of computers and the Internet is an indication of a new phase in instructional technology. By the mid 1980s, the Internet had gained acceptance in business and was finding its way into education in the United States (McChesney, 1999). In addition to the Internet, instructional materials such as CD-ROMs and other computer associated programs have been introduced and are widely used in education. Computer mediated instruction and programs have introduced a level of interactivity and immediate response that most instructional television and radio do not offer.

A meta-analysis of the history of instructional materials (Earle, 2002; Gall, 2002; Rogers, 2000; Kimmel & Deek, 1996; Hooper & Rieber, 1995) revealed that many studies emphasized the equipment being used rather than the effective use and integration of the technology. Often, the availability of equipment was equated to effective use in
the classroom (Cuban, 1993) without factoring in the concerns of users who would be interacting with the tools.

Secondary Education in Ghana

Secondary education in Ghana dates back to 1876 when the first secondary school, Mfantsipim, was established as a boys’ school. By the end of the nineteenth century, the Mfantsipim model of secondary education was duplicated in various urban centers as a model for public secondary schools in Ghana (Quist, 2003). The secondary school educational system in Ghana at that time was modeled after the British educational system. Students undertook the Ordinary and Advanced Levels examinations before entering the university.

Under Kwame Nkrumah, the first president of Ghana, secondary education in Ghana was regarded as “the lynchpin for educational progress, manpower development and overall national development” (Quist, 2003, p. 189). During this period, the government set up the Ghana Educational Trust (GET) fund, with the primary objective of increasing accessibility to education by improving rural secondary education. By the end of the 1980s, the number of secondary schools and enrollment in the secondary schools had risen significantly (Quist, 2003).

Between 1966 and 1981 various attempts were made to reform the education system. A very significant initiative
was under the Busia government (1969 – 1972) that started
the junior secondary school pilot project aimed at changing
the structure and curriculum of the secondary school system.
Under the Rawlings' government (1979 – 2000), an overhaul of
education occurred in Ghana. Educational reform occurred in
1987 when the Ministry of Education replaced the ordinary
level (O-level) and advanced level (A-level) system with
kindergarten to grade 12 (K-12) basic education system. This
reform was based on the review of the Dzobo Report of the
1960s on Education which produced a policy document titled
The New Structure and Content of Education for Ghana. Under
this policy, the seventeen year basic education system was
scrapped and the universal 6-3-3-4 system was implemented.
This system included six years in elementary school, three
years in Junior Secondary School (JSS), three years in
Senior Secondary School (SSS) and a minimum of four years of
tertiary education (Streicher, 1998). This reform
concentrated on basic education with an emphasis on
citizenship, and the mastery of science. Basic education,
from kindergarten to grade 9, became free and compulsory.
The resulting poor outcomes of this reform were blamed on
inadequate infrastructures, a poor curriculum structure and
lack of qualified teachers (Agyeman et al., 2000).

The Ministry of Education blamed the poor performance
of the reform of the old primary school system on the large
number of subjects offered at that level (Ministry of
Education, 1994). Hence, the new educational reform advocated for the reduction of subjects at the JSS and the concentration on vocational skills, technical drawing, technical skills, agriculture, science and life skills as well as social and cultural studies (Ministry of Education, 1994).

The first cohort of students to participate in this reform took the Senior Secondary School Certificate Examinations (SSSCE) in 1993 (Streicher, 1998). To the dismay of the Ghanaian public, only 4% of the entire senior secondary school population passed all nine required subjects (West African Examination Council, 1994). The government responded by establishing the Education Reform Review Committee (ERRC) of 1993/1994 to review secondary school education and offer recommendations for improvement.

The ERRC recommendations led to the formulation and implementation of a remedial education reform policy known as Free Compulsory Universal Basic Education (fCUBE) in 1996 which addressed shortcomings of the basic education system in Ghana (Agyeman et al., 2000). The review outlined four strategic objectives: 1) the decentralization of management, 2) the improvement of functional literacy programs, 3) the increase in access to science and computer education and training, and 4) ensuring the relevance of education to the needs of the country. The need to include science and computers was recommended without indicating how computers
would be integrated into the curriculum or how access to computers would be organized.

Computers in Ghanaian Educational Institutions

After the review of education and recommendations to include computers in the curriculum, the first computer technology project launched in Ghana was SchoolNet. SchoolNet was established and launched in March 1996 in secondary schools in Ghana. The objective of the SchoolNet project was to create and provide current information to teachers and students through information and communications technologies (ICTs), primarily the Internet. Although the intentions of the SchoolNet project were to promote the use of ICTs in secondary schools across Ghana, it was limited to 50 schools that had electricity and telephone connectivity, which were primarily elite urban schools².

The schools were equipped with computer labs with fully functional computers and connections to the Internet. According to the SchoolNet project documentation, teachers and students were provided with basic computer training that covered e-mail, the Internet, how to integrate technology in the curriculum and how to design collaborative projects. Students were permitted to use the computers after school

² Urban Elite Schools: Accra Academy, Accra; West Africa Secondary, Accra; Presbyterian Boys' Secondary, Accra; St. Thomas Aquinas Secondary, Accra; Achimota Secondary, Accra; Chemu Secondary, Tema; Aburi Girls' Secondary, Aburi; Opoku Ware Secondary, Kumasi; Yaa Asantewaa Secondary, Kumasi; Armed Forces Secondary Technical, Kumasi; Holy Child School, Cape Coast; St. Augustine's College, Cape Coast; Ghana National College, Cape Coast; Wesley Girls' High School, Cape Coast
hours on collaborative projects. Information gathered from a student who attended Achimota secondary school in Accra indicated that there were indeed computers at Achimota secondary school and students were permitted to use them. However, students used the Internet primarily for games and to send e-mails. Computer instruction was on the use of Microsoft Word for word processing and the duration of access to computers during school hours, besides computer lessons, was inadequate.

Another informant, a teacher at Wesley Grammar school in Accra also confirmed the availability of computers in her school. The teacher indicated that the Internet was available for a brief period. In this school, computer instructors, who were not Wesley Grammar teachers, often came to the school to teach computer literacy such as the parts of computers and how to use Microsoft Word and Excel.

The SchoolNet project was confronted with the following challenges; the cost of electricity, telephone connectivity and Internet access, poor telecommunications infrastructure, and the lack of technology experts for effective implementation.

Ghanaian ICT policies

The realization of the importance of ICTs in Ghanaian education could be traced to two periods. The first period began after the educational reforms of 1987 to 1996, and the second period between 1996 and 2004.
The realization of the value of ICTs in Ghanaian education did not emerge until 1987 when the education system was restructured. Although the first educational reforms were launched in 1974, it was not until 1987 that educational policies placed emphasis on the importance of science and technology. In 1998, a review and analysis of education was undertaken by the Ghanaian branch of Educational Research Network for West and Central Africa (ERNWACA). This review of education in Ghana focused on the period between 1987 and 1998. It was also within this period that the Ministry of Education formulated three strategic objectives namely: improving the quality of teaching and learning, improving the management efficiency of the education sector, and improving access to and participation in basic education, of which access to science and technology was given the utmost priority. This review found that there was not enough research on the applications of science and technology in Ghanaian education. ERNWACA recommended more research into the impact of emerging technologies on Ghanaian education.

In 1997, Ghana produced: *Ghana Vision 2020: The First Medium-Term Development Plan (1997-2000)*. The objective was to identify issues that needed attention in order for Ghana to face the challenges of the 21st century. It proposed an increase in access to education across all levels of society. Vision 2020 was aimed at addressing
a. poor educational outcomes 

b. limited access to basic education among low income people 

c. poor quality of instruction 

d. lack of qualified teachers in the basic and secondary schools 

e. inadequate instructional facilities and, 

f. inefficient management and administration of the schools (p. 88).

In 2000, a draft of the Information Technology Policy Framework for Ghana was published by the Ghanaian government. This document had information on the development of the telecommunications industry, and information and communications technologies (ICTs) in all aspects of the Ghanaian social, economic and political life. With regards to education, the government proposed the establishment of a National Council for Information Technology in Education (NCITE) within the Ministry of Education, which will be responsible for the development of IT curricula. Through proposed programs such as the teach-the-teachers program, the computer for schools scheme and the national telecenter program, the Government of Ghana aimed at achieving the following:

a. Make IT a mandatory subject at all levels of education, both public and private
b. Ensure that IT curricula are developed and used at all levels of education (nursery, kindergarten, primary, secondary, polytechnic and university)

c. Establish IT institutions in all districts (Government of Ghana, 2000, p. 10).

Other proposed IT in education initiatives were the establishment of an IT accreditation institute, the Ghana Institute of Information Technology (GIIT), networking of universities and institutions of higher learning for distance education programs, the development of SMART schools which emphasized IT skills, the establishment of digital libraries at district assemblies, the establishment of distance education virtual learning centers that will connect institutes of higher learning to pre-tertiary schools to make up for the shortages of qualified teachers and schools and the establishment of Science Resource Centers in all the 110 Districts and a National Resource Centre in Accra, the capital city.

The Ghana ICT for Accelerated Development (ICT4AD) policy document turned out to be the outcome of the 2001 draft information technology policy framework for Ghana, a comprehensive national IT plan. This policy prioritized the development and implementation of ICTs in education by concentrating efforts on the training, research and generation of resources for the expansion of ICTs. The policy aimed at improving human technical expertise in
Ghana, and the training of facilitators and experts in the applications of ICTs in education. In order to achieve the set goals and objectives of this policy initiative, the approach to implementation was to improve the telecommunications infrastructure, and facilities in educational institutions (tertiary and pre-tertiary), and promote ICT driven instructional systems. Also, distance education through e-learning initiatives was identified as a possible way of improving access to education to the Ghanaian population as a whole.

Following the various processes, President Kufour established a committee to review the entire education system and propose ways to integrate ICTs in Ghanaian education in 2002. Under the theme “Meeting the challenges of education in the twenty first century” the committee proposed educational reforms that will be more inclusive and technology driven. Apart from reforming the current structure of education in Ghana, this committee had four main technology driven proposals for Ghanaian education; the expansion of distance education initiatives to include pre-tertiary and tertiary institutions, the establishment of Open Colleges that will collaborate with industry and provide more education opportunities for Ghanaians, the establishment of digital libraries and information services through GET Fund resources at institutes of learning, and
finally the prioritization and promotion of science and IT in Ghana.

In April of 2002, the Ministry of Education and Ghana Education Service (MoE/GES) produced a draft policy titled: *Introducing Information and Communications Technology in Pre-Tertiary Institutions: a Policy Framework*, outlining how ICTs should be introduced and implemented in pre-tertiary educational institutions. This document proposed the introduction of ICTs in the education curriculum with the expectation that students will become "familiar with a range of technologies and have the skills to become effective, critical and autonomous users of ICT" (p. 5). As a follow up to this document, the Ministry of Education released an implementation guide to the type and condition of computers to be used in public schools. Computers that have a hard drive of 40 GB\(^3\) and those with Pentium 3 processors and above are the only ones permitted to be imported for schools tax-free.

With this background, it was apparent that Ghanaian ICT policy documents like the *National Development Policy Framework (Vision 2020)*, *The Information Technology Policy Framework For Ghana*, *The ICT4AD Policy* and *The Introducing ICT In Pre-Tertiary Institutions Policy*, have provided guidelines for the improvement of the use of ICT in education. These policies provide a set of guides and

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\(^3\) A gigabyte (GB) is a measurement of computer data storage capacity
strategies which district education administrators and schools should work with. It is against this background that I studied how the Twifo Praso secondary school, a model school, improved access to computer technology and the integration of computers and related technologies in its curriculum with the support of the Twifo Hemang lower Denkyira district (THLDD), of which Twifo Praso is the capital.

The Model School Project

In 2001, after the change of government in Ghana, the new government under President Kufour introduced two initiatives related to education; the first was to upgrade one secondary school in each district to ‘model school’ status, and the second was to connect all secondary schools and teacher training colleges with telephone lines and eventually broadband Internet.

The model school project was in response to the need to increase access to secondary education in Ghana, since the primary schools were producing huge numbers of students eligible for secondary education. The rationale for the model school project was to expand the basic school system at the senior secondary school level by increasing the capacity of schools in strategic locations, especially rural areas. The term ‘model’ refers to better facilities and the improvement of services at schools and does not necessarily reflect the outcomes of student performance.
It was aimed at increasing the facilities of a secondary school in each of the 110 districts in Ghana and upgrading them to the standards of well endowed schools such as Mfantsipim School, Adisadel College and Wesley Girls High School.

Project schools were selected according to the country’s poverty map. Twifo Praso secondary school is one of such schools selected for the model school project. It was envisaged that an improvement in infrastructure and school facilities would attract qualified teachers, increase student populations and improve educational standards in rural areas. A list of facilities that will be available at schools selected for the model school project is available under Appendix F.
Figure 1: Map of Ghana indicating the location of Twifo Praso.
Research Significance and Questions

It is hoped that this research will provide education policy makers, educators, and those interested in the use of computers and related technologies in rural schools in Ghana with an understanding of how computers and related technologies are used in rural secondary schools. This study identifies the social, economic and political factors that affect the deployment of computers and related technologies in rural schools. This study examines how a rural secondary school, Twifo Praso secondary school (TPSS), uses computers and related technologies in its curriculum in compliance with the national policies [National Development Policy Framework (Ghana Vision 2020), Information Technology Policy Framework For Ghana, The Ghana ICT for Accelerated Development (ICT4AD) Policy Document, Introducing Information and Communications Technology In Pre-Tertiary Institutions: A Policy Framework] to increase the use of ICTs in the pre-tertiary school curriculum.

This study provides a systematic examination and analysis of how a rural school has implemented the national education policies of improving the use of computers and related technologies in a secondary school setting in a rural environment. A study of this nature is also important because of the disproportional prevalence of computers and related technologies in urban schools (Parthermore, 2003).
This study examines how TPSS, a model school in the THLDD, is using computers and related technologies in the school’s curriculum. The questions addressed in this inquiry are:

1. How are computers used at Twifo Praso secondary school?
2. What can be done to improve access to computers to ensure the effective integration of computers in the curriculum at Twifo Praso secondary school?

Chapter Review

Chapter one begins with an overview of educational uses of technology and a brief review of Ghanaian education and the model school project. I also discuss the rationale for conducting this study. Chapter two provides a discussion of the issues and challenges involved in integrating technology in education. This discussion is done from the critical social theory standpoint in order to understand the underlying factors that contribute to the use or non-use of computers in educational settings.

Chapter three examines the research design emphasizing the importance of qualitative methods as the best approach to data collection and analysis for this study. In chapter four, I draw upon the findings of this research and report on the themes that emerged from the data. Chapter five concludes with a model for the integration of computer
technology at Twifo Praso secondary school, and recommendations for further study.
CHAPTER 2

CRITICAL SOCIAL THEORY AND COMPUTER TECHNOLOGY USE IN EDUCATION

The use of computer applications in education and computer use in school curricula to improve teaching and learning continues to be a debatable issue. The process of introducing computer technology in a school’s curriculum, and the issues and challenges associated with integrating such technology into education raises various social, economic and political concerns that need to be addressed in the process. In this chapter I address the various aspects of this debate as it applies to the Ghanaian education context.

Critical Social Theory

Critical social theory (CST) emerged from the works of the Frankfurt School who were concerned with the effect of capitalism on emancipation (Giroux, 1983). The Frankfurt School discussed capitalism on emancipation as examined by positivists because positivism was viewed as a means through which people accepted and perpetuated their situation without critically analyzing it. Positivism, in this context, is defined as an “organized belief system that represents social change as impossible” (Agger, 1998, p. 8). Critical social theory offers a critique of the positivist representations of social laws. It emphasizes the existence
of freedoms and creates opportunities for mobilizations to attain those freedoms (Agger, 1998).

Second, critical social theory acknowledges that the difference between the past and present is characterized by domination, exploitation and oppression (Agger, 1998). By creating an awareness of the historical nature of issues, it argues that the key to a better future lies in the past by offering insights and analyses about issues in order to bring about social change. Critical social theory is political in that it raises the consciousness about present oppression and deprivation to create awareness of the possibilities of a better future. Critical social theory is premised on the notion that “knowledge exists in history and can change the course of history if appropriately applied” (Agger, 1998, p. 12).

Third, critical social theory argues that domination lies within the structure of an organization (Agger, 1998). Structure exists as a form of authoritative figure to draft rules and policies in order to control a system, and also contributes to the oppression of people (Bolman & Deal, 1997). Therefore, critical social theory sheds light on the structure of a system in order to gain insight into the cause of power and control within a system. In this context, a system refers to a school system. In order to understand the structure of a system, it is important to collect other variables such as social class, level of education, age,
family size and political setup. These assist in determining the frame of reference of power and control as it exists in a system.

Fourth, critical social theory argues that the domination in the structure of the system is produced through the false consciousness and ignorance of people (Agger, 1998). In most organizations the structure and the nature of power and control feeds on the ignorance of the members of the organization. It creates a system of laws that either prevents people from getting to the core of issues or feeds people with false information in order to maintain the status quo.

Fay (1987) asserts that critical social theory is a science that seeks to inspire members of a social class to actively participate in society in order to correct the social, political and economic circumstances that do not satisfy their needs. The aim and intent of critical social theory is to provide environments for enlightenment, empowerment and emancipation (Fay, 1987). Enlightenment or the raising of the consciousness of the oppressed explains why the oppressed are dissatisfied with their condition. Through enlightenment, critical social theory provides motivation that empowers the oppressed to improve their situation. Alvesson and Willmott (1992) indicated that empowerment is
The process through which individuals and groups become freed from repressive social and ideological conditions, in particular those that place socially unnecessary restrictions upon the development and articulation of the human consciousness. . . .

Emancipation . . . involves an active process (or struggle) for individual and collective self-determination . . . Any substantial and lasting form of emancipatory change must involve a process of critical self-reflection and associated self-transformation (p. 432-435).

Criticism of this claim of enlightenment, empowerment and emancipation is based on the claim that human condition in almost every situation is more complex than the three steps. Fay (1987) and Agger (1998) assert that critical social theory is a complex theory. There are four main theories that need to be considered when dealing with the interpretations of critical social theory: the theory of false consciousness, the theory of crisis, the theory of education and the theory of transformative action (Fay, 1987). The theory of false consciousness offers explanations on how people entrench themselves in misunderstandings. It provides a “historical account of the development of [a] crisis . . . in terms of the false consciousness of the members of the group” (Fay, 1987, p. 32). The theory of
crisis examines the dissatisfaction of people that may threaten the status quo. The theory of education points out the conditions that have to be met for enlightenment to occur. And, the theory of transformative action provides a detailed plan of how social transformation can occur. This is done by isolating the “aspects of society which must be altered” (Fay, 1987, p. 32).

These four major theories provide an explanation of the different aspects of the social problem (Fay, 1987). The theory of false consciousness offers explanations for the misunderstandings of society, the theory of crisis explains the “causes and nature of the crisis in which a social system is caught” (Fay, 1987, p. 37), the theory of education stresses the conditions that have to be met for enlightenment to occur and the theory of transformative action calls for the “conditions that must be altered if the social crisis is to be resolved in a requisite manner” (Fay, 1987, p. 37).

Critical Social Theory and Information Systems

The main premise of critical social theory is the improvement of human conditions. Alvesson and Deetz (1999) assert that improvement or emancipation refers to the need to create information systems to help progress human development. From this perspective, information systems are “organizations where people, usually with the aid of technology, perform their duties and carry out business
activities. These systems . . . are social systems” (Liu, Sun, Dix & Narasipuram, 2001, p. 229). Information systems are concerned with the “effective design, delivery, use and impact of information technology in organizations and society” (Avison & Fitzgerald, 1995, p. xi).

Critical social theory in information systems builds on the work of Habermas (1971) who asserted that a broader approach to critical theory was needed to enable society to take advantage of technological advancements. In his book, Knowledge and Human Interest (1971), Habermas identifies three levels of knowledge that drive human inquiry; technical, practical and emancipatory. Technical knowledge refers to human need for control of society by defining means for attaining certain goals. And, this control is achieved through technology. Practical knowledge is human need for understanding social relationships in an attempt to improve society. And emancipatory knowledge is focused on human freedoms. The application of critical social theory to information system permits the examination of issues and challenges that emerge when using computer and related technology to ensure that exploitation of the users of computer technology does not occur. By understanding the environment within which computer technology is used, it prevents the “reproduction of social structures and relations that stand in the way of emancipation” (Ackroyd & Fleetwood, 2000, p. 23).
Feenberg (1991) acknowledges that the problem is not the technology itself but the social and political ramifications that arise from the use of the technology. He identified that most theories of technology fall into two approaches; instrumental and substantive, which do not acknowledge the social, political, economic, and cultural factors that influence how technology is deployed. According to Feenberg, instrumental theories offer the most accepted views on technology which perceive technology as standalone, neutral tools “ready to serve the purposes of their users” (p.5). This implies that technology is indifferent to the variety of ends it can be employed to achieve. Substantive theories, on the other hand, consider technology as “a new type of cultural system that restructures the entire social world as an object of control. This system is characterized by an expansive [force] which ultimately . . . shapes the whole social life” (p. 7). Substantive theories see technology as a “vehicle for social domination” (p. 8). Feenberg argues that critical theory of technology differs from the instrumental and substantive perceptions of technology because it acknowledges the issues and challenges that arise from the application of technology. And, it views technology as a tool that could structure the way society views itself. To this end, a critical social theory of information systems offers an alternative framework to the emancipation of society through technology while
acknowledging the issues and challenges that society faces as it embraces such technology.

Computers in Education: Issues and Challenges

A review of the literature indicates that the main issues associated with the use of computers and related technology in schools and school curricula are the attitudes and perceptions of administrators and teachers, community participation and involvement, teacher training, the financial costs of the technology and leadership.

**Attitudes and Perceptions of Administrators and Teachers**

Ruthvem, Henessy and Brindley (2004) researched the attitudes of in-service teachers towards the pedagogical use of information and communication technologies (ICTs) in mainstream public schools in England. This study particularly examined teachers’ perceptions towards the successful use of computer based tools in subjects such as English, Mathematics and Science. Computer based tools were defined as software applications such as Microsoft Office that could enhance learning. Seven themes emerged from this study:

a. effecting working processes and improving production
b. supporting processes of checking trialling and refinement
c. enhancing the variety and appeal of classroom activity
d. fostering pupil independence and peer support
e. overcoming pupil difficulties and building assurance
f. broadening reference and increasing currently of activity
g. focusing on overarching issues and accentuating important features.

The themes indicated that computer based tools do have a positive effect on students irrespective of subject area.

Ruthvem, Henessey and Brindley (2004) indicated that students were thrilled by their ability to receive immediate feedback, and with regards to grammar and spelling both teachers and students acknowledged that the computer based tools improved their spelling and vocabulary. Teachers also expressed the ability of computer based tools to expedite the learning processes and enhance learning, and this was particularly popular with math and science teachers who expressed the ease with which they organized and analyzed data using spreadsheets. In addition, teachers were of the perception that computer based tools promoted and fostered student dependence and collaboration with each other, which was in contrast with what was found in Singapore (Wang & Chan, 1995).

The perception of the teachers’ role in the classroom with computers is another factor that could affect their use of computers for instruction (Drenoyianni & Selwood, 1998; Galanouli & McNair, 2001; Wang, 2002). Wang (2002) investigated the perceptions of pre-service teachers in
Alabama, USA of their role in a computer rich classroom. Central to this research was; what was expected of teachers or what are teachers expected to do with computers. The role of the teacher was conceptualized in terms of either being teacher centered or student centered. Teacher centeredness defined the role of the teacher as the person who planned everything in the classroom. The teacher is viewed as the main source of information that would transfer the knowledge to the students. A student centered role viewed the teachers collaborating with students in a learning process. Although no significant difference was found between a student centered or teacher centered role in a classroom with computers, the pre-service teachers expressed the need for a balance between the two roles.

Wang (2002) pointed out that the indifference to the student or teacher centered approach to the use of computers is attributed to the uncertainty of the teacher’s role in a classroom with computers. However, the findings revealed that teachers were more inclined towards a teacher centered role due to the type of computer training they had received. A student centered role required more management skills, development of evaluation methods and the design of curriculum related materials. Therefore, teachers did not feel comfortable in student centered roles because they perceived such a role to require more skills and training they had not been prepared for. Similarly, Goodison (2002)
found that teachers in the United Kingdom were of the perception that students who had computer training out of the schools undermined their instruction, especially, when the students became aware of the teachers’ anxiety and lack of knowledge of computers.

The anxiety that teachers express towards the use of computers in the classroom has been a topic of concern by various authors (Russell & Bradley, 1997; Hong & Koh, 2002; Chou, 2003). Russell and Bradley (1997) examined the implication of computer anxiety on professional development. They studied the cyber phobia (computer anxiety) of rural and urban in-service teachers in public schools in Queensland, Australia. The teachers were required to identify their cyber phobia and suggest possible ways of reducing cyber phobia through professional development. Irrespective of teaching environment (rural or urban), the teachers had similar concerns. First, was access to computers. The teachers expressed that increased access would result in an increase in the use of computers in the classroom. Teachers in the rural schools were particularly concerned about the obsolete computers they had.

The second concern was the competency in the use of computers. Most of the teachers expressed that computer terminology sounded foreign to them and that their skills were limited to word processing. Third, was professional development opportunities. Teachers were critical of the
professional development opportunities at their disposal because it was limited and inadequate in facilitating their skill and knowledge acquisition. Also, teachers did not agree with having to pay for their professional development. They expressed the necessity for government to pay for such professional development since it was the government that usually wanted to implement computer use in educational curricula.

Asan (2003) investigated the perceptions of Turkish pre-service teachers on their experience in multimedia environments. The teachers were placed into two groups; traditional teacher centered environments and, multimedia situational learning and learner centered environments. The pre-service teachers were required to fill a survey, conduct observations in their teaching practice schools and keep a log and report on their experiences each week. Their reports were blindly reviewed by independent graders who were unaware of the differences in teaching approaches of the two groups. This investigation found that the pre-service teachers in the multimedia class expressed a better understanding of the classroom environment than those in traditional classrooms. Also, those in the multimedia classroom gave more detail and understood the concepts better (Asan, 2003; Reed, Oughton, Ayersman, Ervin, Jr, & Giessler, 2000).
In this study, an important factor was the issue of cognitive apprenticeship that argues that “meaningful learning will only take place if it is embedded in the social and physical contexts within which it will be used” (Asan, 2003, p. 24). Cognitive apprenticeship was conceptualized by Brown, Collins and Duguid (1989) who argue that the objective of cognitive apprenticeship is to enable students to construct the own meaning of a concept. Pre-service teachers that had the multimedia experience recognized the importance of contexts to ensure effective learning, which they intended to apply in the classroom.

The computer environment, Mac or PC is also important in an attempt to use computers in education. The findings of Galanouli & McNair’s (2001) study on Irish teachers were consistent with other studies with regards to the lack of time (Demetriadis et al, 2003), lack of resources (Demetriadis et al, 2003), incompetence of teachers (Demetriadis et al, 2003; Baylor & Ritchie, 2002), importance of in-service training (Demetriadis et al, 2003), and the importance of leadership initiatives (Sergiovanni, 1996). However, one unique issue that emerged from Galanouli and McNair’s (2001) study was the difference in equipment used during training and while on the job. The pre-service teachers expressed that the school labs were equipped with Acorns and Apple Macs whereas they had been Windows trained at the university. They suggested cross
platform training to enable them cope and be prepared for their teaching experiences.

The type of training that teachers have often has an impact on their perceptions about the use of computers in schools. A study by Cossa and Cronje (2004) on the introduction of computers and the Internet in Mozambiquan schools, addresses the issue of teacher training on the use of instructional tools. Teacher training took place at three levels; national, regional and school. In order for teachers, to adjust their teaching methods to include technology, they need support from school administrators (Thomas, 1999). Irrespective of the knowledge, competence and training of teachers, the use of computers in schools will not be successful without the leadership of the principal (Dawson & Rakes, 2003). Since school principals facilitate efforts to use computers in schools, they also need training in computers (Holland & Moore-Steward, 2000). A study by Dawson & Rakes (2003) indicated that through training, principals became more adept with technology and the improved skills of principals led to an increase in the use of technology tools in the schools. This result supports Maxwell’s (1997) recommendation that continuous training of principals on the applications of computers in schools resulted in the appreciation and awareness of the technology, and this increased its distributions and use in schools.
Similarly, a study by Davidson, McNamara and McGillivray (1999) on American schools in Germany concluded that through training, principals understood and became aware of the potential of instructional technology. This was supported by Cossa and Cronje (2004) who point out that “the approach to involving the principals in the training programs was particularly good because it allowed them to understand and support the project activities” (p. 93).

Teachers’ perceptions of principals and their role in the leadership of the school is yet another important factor when considering using computers in schools. A study by Demetriadis et al (2003) indicated that teachers perceived school principals as an important aspect of the school. The principals were considered to have both negative and positive attitudes towards the use of computers. Some principals supported computer initiatives whereas others were reluctant to use it in their schools. Principals that supported technology efforts were more favored by teachers than those who had negative attitudes (Baylor & Ritchie, 2002; Demetriadis et al, 2003). Baylor and Ritchie (2003) found that principals who participated and ‘got their hands dirty’ with the technology were perceived as better administrators.

In addition to positive attitudes and participation in technology efforts, the style of leadership for educational reform is essential to initiatives aimed at the use of
computer technology in the schools. Various studies (Baylor & Ritchie, 2002; Demetriadis et al, 2003; DeVoss & Selfe, 2002) found that teachers preferred shared leadership when it came to the use of technology in the classroom, and teachers wanted to be included in the entire process from planning to computer acquisition and implementation. Also, Cossa and Cronje (2004) found that teachers showed a preference for principals that discussed technology issues and trained with them. Chance (1999) concluded that successful leadership in rural communities was largely dependent on the understanding of the diversity and culture of the community, and constant dialogue between the school administration and leadership, and the community.

**Community Participation and Involvement**

This research is informed by the premise that secondary schools have to be understood from multiple layered contexts (Cuban, 1986; McLaughlin & Talbert, 1990). Sergiovanni (1996) further argues that schools should be viewed as communities. This perspective provides an alternative way of rethinking the social relationships, purpose and function of schools. Enomoto (1997) extends Sergiovanni’s metaphor to include structural constrains affecting school communities. Enomoto contends that schools are nested communities in which various conflicting entities may co-habit and provide conflicting views. This framework of a school as a nested community enables one to “account for the organizational and
cultural aspects of schools. Second, it [acknowledges] the complexity of social relationships in . . . schools, including subgroups within the organizations as well as those beyond the school boundaries. Third, it [provides] a realistic analogy for understanding how schools work, not merely describing what schools are” (Enomoto, 1997, p. 520).

Also, teaching effectiveness in the use of new technologies such as computers and the Internet for instruction is highly dependent on the “complex interplay of the multiple embedded contexts of the secondary school workplace” (McLaughlin & Talbert, 1990, p. 4). Fullan (2001a) argues that these multiple layers should be addressed to ensure success of the reform. Fullan (1991a) further states that an interest in educational reform that incorporates all these layers results in a “large scale reform grounded in local ownership” (p. xi). This is supported by Parson (1999) and Sergiovanni (2001) who agree that change is effective only when all the stakeholders construct meaning and agree to reform the school.

The involvement of a community in school initiatives has been lauded as a critical and important factor for the improvement of education. The term community is often associated with “communication and social support between people who share a common geographical location” (Loader & Keeble, 2004, p. 37). This definition of a community extends beyond a geographical location. Gatto (1992) argues
that communities are complex relationships that extend the home. When applied to a school, Sergiovanni (1994) asserts that a community could be a reflection of the quality of the school.

It is also important that parents be involved in their children’s education because it has been documented that parental involvement and participation leads to a better performance in schools by their children (Miller-Grandvaux & Yoder, 2002). In a review of community schools in Africa, Miller-Grandvaux and Yoder (2002) observed that community participation also involves the provision of human labor, financing and construction materials for building schools, and the paying of teachers. According to Sergiovanni (1994), “it is the tie that binds students and teachers together . . . [that is] shared values and ideals . . . Community can help teachers and students be transformed from a collection of “I’s” to a collective “we”, thus providing them with a unique and enduring sense of identity belonging and place” (p. xvii).

A review of the literature on community indicates that community has four major characteristics (Barab & Duffy, 2004). First, communities have similar cultural and historical backgrounds. Second, a community has shared visions, beliefs and practices. Third, a community is representative of a collective whole working towards common goals and finally, a community, is in constant reproduction
of itself and enculturation. In sum, community participation involves working towards a shared vision and towards common goals.

Within this framework proposed by Barab and Duffy (2004), Michener (1998) suggests that community participation can be viewed from two main perspectives. Michener (1998), in her work on community participation in schools in Burkina Faso asserts that the benefits associated with community participation are on a continuum from planner centered to people centered. She argues that participation in school initiatives, from the planner’s perspective, involves participating in the administration and logistics. Participation “facilitates people’s acceptance of new policies and technologies promoted by outsiders” (p. 2106). A people centered perspective, according to Michener (1998), is a means and an end in which the needs of the school are met through a redistribution of resources, “which empowers . . . by enhancing local management capacity, increasing confidence in indigenous potential and raising consciousness” (p. 2106), which are at the core of social capital.

Social Capital

Social capital as a concept became prominent in the 1980s by social scientists who examined the role and importance of interpersonal communications and relationships for development. Social capital came out of the realization
that there are other factors, other than human capital and physical asserts that affect development. The term social capital was first coined and used by Hanifan (1916) to describe the networks that existed between rural communities. It was used to describe the “tangible substances [that] count . . . in the daily lives of people” (Hanifan, 1916, p. 130). Through the latter works of Bourdieu (1986), Coleman (1988, 1990) and Putnam (2000) social capital has evolved to include the complexity of relationships and social values.

Bourdieu (1986) argues that there are three forms of capital: economic, cultural and social capital. Economic capital is the economic possessions and property rights, while cultural capital exists in educational qualifications. Bourdieu defines social capital as ones assert in society which is acquired through purposeful actions and is dependent on the social obligations, connections and networks available. Social capital has two major components. First, resources that are connected to social networks. One’s social capital is dependent on the “size of the network of connections that he can effectively mobilize” (Bourdieu 1986, p. 249). The second component is based on mutual trust (cognition and recognition).

Coleman (1988, 1990) takes a different standpoint from Bourdieu. Coleman studied the links between schooling and youth and based on his earlier works and observations
defined social capital as a “variety of entities that . . . consist of some aspect of social structures and facilitate certain actions of actors—whether personal or corporate actors—within the structure” (Coleman 1988, p 598). He later defined social capital as consisting of a variety of different “entities having characteristics in common: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure” (Coleman, 1990, p.302). He focused on the social structure as a network that could make members feel obligated to reciprocate and thus create trustworthiness within the network. Therefore, the social structure and network becomes members’ social capital when they can utilize it to their benefit (Coleman, 1990).

The work of Bourdieu (1986) and Coleman (1988, 1990) focused on individuals using their networks and relationships as sources of social capital. In contrast, Putnam’s (2000) work focused on organizational administration. He conceptualized social capital by including structural (social networks) and cultural (social norms) phenomena to the definition. He expands on the work of Bourdieu (1986), and Coleman (1988, 1990) by defining social capital as “connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them” (Putnam, 2000, p. 19).
Trust (Fox, 1974; Fukuyama, 1995; Woolcock, 1998) and networking (Castells, 1996) are important concepts of social capital. Fukuyama (1999) defines social capital as a “network . . . of individual agents who share informal norms and values” (p. 199). It is this shared norms and values that develop a system of reciprocity and trust between individuals in the network. Trust is defined as “the expectation that arises within a community of regular, honest, and cooperative behavior, based on commonly shared norms, on the part of other members of the community” (Fukuyama, 1995, p. 27). The network and interconnections determines how trust is built (Luhmann, 1988).

In The Rise of the Network Society, Castells (1996) argues that networking is highly important in social and technological domains. And, a society is defined not only in terms of technology but it is also made up of political, economic and cultural factors. He defines networks as a set of expandable interconnected nodes and argues that a “networked, deeply interdependent . . . society emerges [when it is] increasingly able to apply its progress in technology, knowledge, and management to technology, knowledge, and manage themselves” (p. 67). The expansion of the network is dependent on the trust that those of the network develop. Although Castells focused largely on globalization and technology networks, his concepts of networking are applicable to the notion social capital.
Social Capital and Schooling

Social capital assists in the understanding of school practices (Munn, 2000). It is an analytical tool for explaining how the school microcosm affects and influences social structures. Munn cites an earlier sociologist, Althusser (1971) who argues that schools perpetuate and reproduce social relationships. Therefore, social capital in relation to schools, emerged as a concept of making schools more effective by explaining the connections between the schools and society, and how these connections re-enforces the dominant structures within society. Munn (2000) defines social capital as a continuous “search to understand the connection between schools . . . , social, economic and political structures” (p. 172). The premise of this concept was that networks fostered greater understanding of society, which impacted the effectiveness of individuals and communities in achieving their goals. At the core of this theory are trust and reciprocity, which translate into benefits for both schools and communities. If one party views the benefits as one sided, trust is destroyed and the other party would be unwilling to reciprocate.

In such situations, Warschauer (2003) lays an emphasis on the importance of bridging social capital, which is defined as “ties that are formed with those from other social circles” (p. 155). This bridge becomes an important source of information and support for those in rural schools
who intend emulating the successes of schools that have integrated computers in their curricula. Putnam (2000) defines bridging social capital as the connections across diverse groups. This is related to Granovetter’s (1983) theory of the strength of weak ties that asserts that people share a lot in common with those in their immediate social circles and thus would have similar information. He contends that “our acquaintances (weak ties) are less likely to be socially involved with one another than are our close friends (strong ties)” (Granovetter, 1983, p. 201-202).

Based on this argument, “individuals with few weak ties will be deprived of information from distant parts of the social system . . . This deprivation will not only insulate them from the latest ideas . . . but may put them in a disadvantaged position” (p. 202). Bridging social capital is very important in schools since it tackles issues of exclusion and provides networks through the active participation of parents, teachers, and administrators.

Leadership

Leadership in rural schools has gained a lot of research attention (Chalker, 1999). Discussing leadership in the United States of America (U.S.A.), Chalker (1999) indicated that the U.S.A. has a structured form of leadership in schools in most districts. School leadership often consists of board members, community members, superintendents and the principal. The school
superintendent, and in some instances, the principal, are solely responsible for securing funds to supplement funding received from federal and state coffers. This mandate given to the principal and superintendents to raise funds is also present in Ghanaian institutions. However, such leaders in the Ghanaian education system have not been as effective as would have been expected. Their sources of funds are usually old student associations or alumni and parent-teacher association funds.

A study conducted by Kennedy and Barker (1986) revealed that superintendents of rural and small schools viewed issues of funding and improvements in school curriculum as fundamental issues that had to be dealt with. Danzberger, Kirst and Usdan (1992) identified that the main obstacle faced by rural school leadership is an apathetic community in the understanding of policy issues. Although these authors make this statement in reference to the U.S.A. schools and communities, this also applies to Ghana. Many Ghanaian rural communities view matters of the school as the sole responsibility of the principal or superintendent in charge, and thus have limited contact or interest in the affairs of the schools in their community. Also, in rural schools, the superintendent usually performs multitasks and may also be a “teacher, counselor, building principal, bus driver and the total central staff” (Chance, 1999, p. 83). Chance indicates that unlike their urban and suburban
counterparts, rural superintendents do not have the time and luxury to search for supplementary funds. This description is applicable more at the primary or elementary level in Ghana, where the principals in rural schools have their hands in all school activities and literally take charge of everything; without the principal the schools come to a standstill. Also, the size of the rural economy and the limited opportunities available for raising funds in the rural communities puts the rural principal in an awkward position with regards to the raising of funds.

Copeland and Chance (1996) indicated that despite the problems faced by superintendents, successful leadership of rural education managers was largely dependent on the understanding of the diversity and culture of the community in which they work, and constant dialogue with them. In understanding the dynamics of the situation of the rural principal in his or her role in the integration of computer technology in rural schools, there is the need to understand the diversity and culture of the rural community in Ghana in order to propose remedies or measures for addressing challenges.

Through a decentralized leadership and empowerment, subordinates are expected and trusted to complete tasks whilst guided by the vision of the organization. It encourages participation and involvement of subordinates in steering an organization to help inject innovative ideas in
the leadership apparatus available for creative and effective leadership at all times.

Leadership is critical for the success of the implementation of any technology for instruction (Kearsely & Lynch, 1994). Kearsely and Lynch argue that without leadership understanding of instructional technology, it would be difficult to prepare teachers and administrators to implement such technology in the classroom. There are various leadership theories and models (Yukl, 2001) that contribute to the understanding of leadership. However, for technology leadership, it appears that transformational leadership acknowledges the culture of an organization and one that is more inclusive with shared leadership and empowerment, has more positive outcomes. This is because “leaders [that] shape the culture of individual schools and school systems by creating new visions which members can believe in and act upon” (Kearsely & Lynch, 1994, p. 7) are more likely to have positive outcomes.

MaLaughlin and Talbert (1990), and Fullan (2001b) advocate for shared leadership and contend that successful technology leadership involves various people at different levels. This is because leadership is not limited to individuals (Kearsely & Lynch, 1994) and argue that leadership for instructional technology requires “technology leaders . . . [that] know what population to work with and, then, through a combination of managerial skills, personal
communication, and influence, lead the way to a visionary reality” (p. 8). Such leadership involves government, district administrators, principals, teachers, technology specialists, and any other group of people that can take up leadership roles.

Also arguing from an identical perspective, Blenkin, Edwards and Kelly (1997) suggest that all levels within the structure of an institution must be included in the management of the school. They pointed out two levels of structure; the macro level (social, economic and political) and the micro level (school and classroom). The micro and macro levels are also identified by Fullan (2001a) as the local level, and the regional and national level. Vertical coordination often occurs between the macro and micro levels, whereby the social, economic and political structures dictate what should be taught in the schools.

Fullan (2001a) indicated that in educational settings, interpersonal dynamics are very important at the micro level. The principal, teachers, students, district administrators, consultants, and parent and the community need to forge relationships that will enable them work towards the goals of the schools. However, this relationship is often severed due to political interplay that overshadows good management principles that is participatory in nature. “Managers [principals] . . . are often unconnected to their actions. They typically see themselves as rational, open,
concerned for others and democratic, not realizing that their actions are competitive, controlling and defensive” (Bolman & Deal, 1997, p. 154). This attitude affects the functioning at the micro level and yields unfavorable attitudes and actions from subordinates (teachers and students), which have the potential of being detrimental to the goals and vision of the organization. Yukl (2001) suggests that a participatory approach in the management of an organization is often more desirable.

Most leaders have become accustomed to the traditional view of a leader as one who “attends to performance, focuses on results, solves problems and influences lower level decisions” (Quinn, 1996, p. 149). Senge, Kleiner, Roberts, Ross, Roth, and Smith (1999) argue that the key to sustaining successful reform is to move away from the myth of the leader or what Lambert (1998) terms “formal authority to lead the way” (p. 3). Leaders tend to myopically focus on small changes instead of the larger whole. The outcome is the non performance of many systems and the lack of progress when a leader leaves a particular institution. In addition, this traditional ‘one-boss’ leadership model in which information and decisions have a one-way flow; from top to bottom, often leaves “subordinates . . . [are often] frustrated when directives they receive are slow or ill-suited to their work” (Bolman & Deal, 1997, p. 84).
School Culture

Culture is a concept that emerged in organizational research to explain why things happened the way they did even after structural bureaucracy had been changed. Bolman and Deal (1997) defined the culture of organizations as the "interwoven pattern of beliefs, values, practices, and artifacts that define for members who they are and how they do things" (p. 217). Schein (1992) quoted in Bolman and Deal (1997) asserts that culture is not only defined in terms of shared values and beliefs. It is also a pattern of shared basic assumptions that a group learned as it solved problems of external adaptation and integration that has worked well enough to be considered valid and therefore to be taught to new members as the correct way to perceive, think and feel in relation to those problems (Bolman & Deal, 1997).

Schein, and Bolman and Deal’s definitions of culture indicate that culture is both a product and process. As a product, culture “embodies accumulated wisdom from those who came before” and as a process “it is continually renewed and recreated as new comers learn the old ways and eventually become teachers themselves” (Bolman & Deal, 1997, p. 217). Peterson and Deal (1998) examine the concept of culture as it applies in schools. They define culture as the "underground stream of norms, values, beliefs, traditions, and rituals that has built over time as people work together, solve problems and confront challenges" (p. 1).
Cultures can be toxic or positive (Deal & Peterson 1998; Bolman & Deal, 1997). Toxic cultures in schools are cultures that have been damaged by unconstructive, pessimistic approach to building relationships with the school, teaching and learning.

Toxic subcultures within the school culture often emerge when there is resentment and disagreements between members. Such culture can be detrimental to the health of the school. Positive cultures, on the other hand, foster an atmosphere of communality, improvements, collegiality, good networking and shared visions, which is a commitment to improving the learning environment. And, it is the responsibility of school leaders, teachers, and often parents to ensure that a positive school culture is maintained.

Greenlee and Bruner (2001) apply the metaphor of grafting in gardening to the concepts of school culture and how it is transplanted and maintained even after a change organizational structure has occurred. By using the grafting method, they argue that teachers in low achieving schools can improve their output through the use of prepared materials and lesson plans. These materials can then be transplanted into the schools; easing the burden of teachers thus giving them more time to concentrate on its implementation which could lead to an increase in student achievement. Schools have the potential to cause problems or
find solutions to their problems (Maehr & Midgley, 1996). Maehr and Midgley argue that the problems that occur in schools do not originate from “bad teachers, poor administrators, unsupportive parents . . . inadequate curriculum [or a] . . . lack of resources” (p. 53). The main culprit for nonperformance of schools often lies in the culture of the school.

Similarly, Hamilton and Richardson (1995) examined the importance of school culture in staff development outcomes. A comparison of two schools concluded that school culture and the level of participation in the school affected the staff development process. In addition, they concluded that the traditional staff development approaches where unique to schools due to the distinction of cultures to specific schools.

The culture of an organization is also crucial to its success or failure (Deal & Kennedy, 1982). In order to transform the culture of an organization, Fullan (2001b) suggests ‘reculturing’ as essential for organizational reform and improvement. Fullan (2001b) indicated that reculturing in educational institutions involves a concentration on pedagogy and assessments that could be associated with improvements. The participatory approach to leadership thrives in a culture of learning, where the collective experiences of the organizational members become a rich resource that can be used for the advancement of the
organization as group members’ work inter-dependently to achieve goals and objectives. Through the support of interrelationships, participatory leadership fosters empowerment of the group members.

Leaders have an important role in improving the culture of schools (Deal & Peterson, 1998). Leaders can improve the school culture by first knowing and understanding the history and context that shape the culture. Transformation of the culture is dependent on the school. In addition to school culture and for effective transformation to occur, leaders must focus on the core important values by identifying constructive cultures which could lead to the fostering of more positive cultures.

Teacher Training

Teacher training in the effective use of technology for instruction is more critical than the acquisition of hardware and software (Sayre & Wetterlund, 2002; Tarleton, 2001; Hoogveld, Paas, Jochems & Merriënboer, 2001; Hammond & Mumtaz, 2001; Lang, 2000; Bakar & Mohamed, 1998). Teachers that lack basic computing skills and knowledge were less likely to use computers for any aspect of their teaching. Various studies by Bakar and Mohamed (1998), Plomp (1996), and Sayre and Wetterlund (2002) suggest some form of training program as a way of improving computer use for instruction.
Bakar and Mohamed (1998) suggest after the initial teacher training program that includes a course in computer instruction should go with periods of continuous in-service training for the upgrade of skills and knowledge. This is supported by Plomp (1996) who articulates that teacher training is an “ongoing problem . . . [therefore it is important] . . . to attune . . . courses to the rapid changes that are made in hardware and software infrastructure” (p. 25). In the same regard, Sayre and Wetterlund (2002) propose a train-the-trainer model. This model was based on the training of highly skilled teachers who in turn conducted workshops in their regions. Although their model was intended to improve teacher use of ArtConnectEd resources for the classroom, it can be modified and applied to various contexts.

In service training has been found to decrease anxiety and increase competency and knowledge in computer use. Therefore, without a teacher training program to enable teachers to master computer skills, efforts to effectively integrate technology in schools will be hampered (Bakar & Mohamed, 1998). Most research has been focused on the preparedness and training of teachers to use computer technology in schools but very few addressed computer and teaching in rural schools. A review of the literature revealed that both pre-service and in-service teachers are inadequately prepared to work in Australian rural and remote
areas (Yarrow, Ballantyne, Hansoford, Herschell & Millwater, 1999). Also, research conducted in the U.S.A. found similar patterns and most concluded that pre-service teachers were not prepared for the realities of rural districts (DeYoung, Howley & Theobald, 1995; Stone, 1990; Luft, 1992). According to Stern (1995), the success of rural schools lies in school staff, yet many training institutions do not offer specialized training for work in rural schools.

Teacher recruitment and retention has been identified as an issue affecting rural schools. A study conducted in rural British Columbia, Canada, found that teacher retention was difficult in such communities mainly due to spatial isolation (Murphy & Angelski, 1996). Other factors identified from studies in the U.S.A. included lesser pay and fewer benefits compared to urban educators (Hare, 1991), teaching of more subjects (Kannapel & DeYoung, 1999) and close scrutiny of teachers in rural schools compared to their urban counterparts (Massey & Crosby, 1983). In addition to that, rural educators were largely not prepared to use and were often resistant to using computer technology in the classroom (Christensen, 2002). When in use, technology was often limited to word processing and drill and practice exercises.
Financial Costs of the Computer Education

Given the current debates on narrowing the digital divide, most rural school are faced with the high costs of technology and spatial isolation. Spatial isolation usually means that it takes a considerable amount of time before resources reach targeted communities. The cost of networking and wiring, sustainability of technology programs and training of educators are factors that need to be considered in any attempt to integrate computer and related technology in education, especially in rural settings. A national survey conducted by Barker and Hall (1994) in the United States of America (U.S.A.) on the costs of distance learning programs revealed that, on average it cost a minimum of $6,838 to $19,335 to provide such services, given the availability of the infrastructure. In another successful rural project, it cost the Wayne School District in Nebraska (U.S.A.) over $4 million to install and network 330 workstations for 950 students (Jensen, 1998). These funds were provided through grants and not from the schools or community. The cost of the applications and software needed to run computers is also high. Schools need to buy licenses and upgrades to keep abreast with the latest technologies.

Given the initial costs, schools also have to make provision for in-service training of teachers and sustainability due to the dynamic nature of computer technologies. Consequently, it is important to research the
financial needs of computer integration in rural schools in Ghana, if such projects are to be successful, in order to ensure that the technology needs and skills of rural school children are at par with national standards. In most African countries including Ghana, the infrastructures for such projects are either not available or barely adequate. In Ghana, the funding of schools is largely dependent on government financing. Most rural communities do not have the infrastructure; electricity, telephones and building to support such initiatives. Such schools often receive old computers that either cost a fortune to refurbish or are no longer compatible with the current technologies. Also, most of such technologies have to be imported which adds additional costs to the implementation of educational technology in school curricula.

Confronted with such enormous challenges of meeting the cost of integrating technology in rural schools in a country like Ghana, there is a need for research to investigate and derive strategies for addressing the issues of infrastructure and funding. In the United States, there is a trend to have at least a ratio of one computer to three students in rural schools but this is currently not possible in developing countries. Kahn (1998) suggests that schools that do not have the resources could opt for a one-computer classroom. Such classrooms could have one computer and a projector for all students to see, follow instructions and
demonstrations, and students could either work on exercises collectively or in teams that take turns to input answers into the computer.

Educational Technology in Ghanaian schools

In 1997, the Government of Ghana received a loan from the World Bank and part of it was used to start and pilot the Education Management Information System (EMIS) at the Ministry of Education (MoE)/Ghana Education Service (GES) headquarters in Accra and in three regions; the Ashanti, Central and Northern. Five districts were selected from each region (table).
Table 1: Pilot regions for EMIS

| Ashanti Region                  | 1. Kumasi Regional Education Office |
|                               | 2. Adansi East District Education Office (New Edubiase) |
|                               | 3. Adansi West District Education Office (Obuasi) |
|                               | 4. Asante-Akim North District Education Office (Konongo) |
|                               | 5. Kumasi Metropolitan Education Office |
| Central Region                 | 1. Cape Coast Regional Education Office |
|                               | 2. Assin District Education Office (Foso) |
|                               | 3. Awutu-Efutu-Senya District Education Office (Winneba) |
|                               | 4. Cape Coast Municipal Education Office |
|                               | 5. Mfantsiman District Education Office (Saltpond) |
| Northern Region                | 1. Tamale Regional Education Office |
|                               | 2. Tamale Municipal Education Office |
|                               | 3. West Gonja District Education Office (Damongo) |
|                               | 4. West Mamprusi Education Office (Walewale) |
|                               | 5. Yendi District Education Office |

The objective of the EMIS project was to provide a database for the collection of educational statistics. The information gathered is to enable MoE/GES to monitor
educational programs and initiatives, and also help the MoE/GES to draft informed policies that would improve education in Ghana. The EMIS was piloted under the guidance of the Harvard Institute for International Development (HIID)\(^4\). The HIID’s role in this project was to assess and identify the needs of the MoE/GES at regional and district offices, provide EMIS at pilot areas, train operators of the system and provide technical support.

Although this was a laudable initiative for Ghanaian education in terms of the centralization of data collection and statistics, and the potential of bringing uniformity in educational policies and programs in the country, the two year review of the implementation process indicated that the project was flawed. There were insufficient time and human resources allocated to the execution of the pilot EMIS project. According to the report, and the findings by PriceWaterHouseCoopers, the development process (planning, design and implementation strategies) of the EMIS for Ghana was conducted in the USA, making it nearly impossible for the Ghanaian MoE to participate in the development. The participation of designated people; primarily the statistics unit at the MoE headquarters; was limited to the testing of certain components of the EMIS. The report pointed out that "most people within the ministry felt distant from the project due to their lack of involvement and there was no

mechanism to ensure the acceptance and ownership of the project within the MoE” (PriceWaterHouseCoopers, p. 28 -29).

Other issues that arose from the pilot EMIS project were the inability of education officers to make use of the reports generated since some of them were irrelevant. There was also a lack of uniformity in data structure at the various levels of implementation and the most frustrating factor was the inability of the MoE to migrate and integrate existing data to the EMIS.

In 2001 Ghana participated in the Scan-ICT project (Dzidonu, 2002). At the end of the pilot program, a report detailing the activities undertaken by the Scan-ICT program in Ghanaian schools from September 2001 to December 2002 was published. This report was based on a nationwide survey conducted in 500 urban and rural primary and secondary schools, 13% of the schools were rural. The report indicated that about 79% of the schools surveyed had an average of 19 computers (Dzidonu, 2002, p. 131).

In March 2004 Ghana signed a memorandum of understanding with Microsoft Corporation to participate in the Partners in Learning program. This program is designed to provide Ghanaian schools with subsidized Microsoft products and training. This agreement is recent and therefore, no information was available on the impact on Ghanaian education.
The emergence of new technologies and the integration of such technologies in educational institutions is an important issue in the quest to bridge the rural-urban digital divide in Ghana. Norris (2001) defined the digital divide as a “multidimensional phenomenon” with three aspects; the global divide, the social divide and the democratic divide (p. 4). The study of the integration of computers and related technologies in rural school curricula in Ghana falls under the social divide, as identified by Norris. The social divide is concerned with the gap between the information rich and poor within Ghana, and this is often reflected in the urban rural divide.

The integration of new ideas into established practices has always been challenging for educators. Educators often have to examine the impact of new technologies in the workplace, classroom and how it relates to community needs. This is a challenge faced by most educational institutions, and Ghana is no exception. In the Information technology policy framework for Ghana (2001), the government spells out the need to increase and sustain socio-economic development through the implementation of ‘solid’ information technology (IT) program at all educational institutions. Some of the issues the government intends to develop are a ‘Teach-the-Teachers’ program to regularly upgrade the IT knowledge and skills of teachers, and a Computers-for-Schools Scheme to
enable every student, teacher or school to purchase computers through attractive financial packages.

In another government publication, Vision 2020 (1997), the government argues that Ghana will have to embrace science and technology in order to make sustainable economic and social progress. Global trends in the use of computer technology to execute most official and commercial activities, puts pressure on Ghana to introduce computer education in the curriculum of its schools in order to keep up with the trends and improve the lives of Ghanaians through computer technological innovations and education. Educational change occurs through various mechanisms and this research seeks to address the issues that arise as Ghana initiates structural, human resource, symbolic and political programs to effect the introduction of computer technology in rural communities and schools.

As illustrated in this chapter, the integration of computers in a school’s curriculum requires leadership, coordination and situating the technology in the cultural setting of a school or society where the integration is to take place. The studies reviewed on the use of computers and related technologies in Ghanaian schools are descriptive and do not address how computers can be integrated in rural schools. As Ghana attempts to bring computers and related technologies into schools, it is important that rural schools and how they are handling this integration, needs to
be examined for effective integration. This study is such an attempt and it focuses on a rural school, Twifo Praso Secondary School in the Twifo Hemang Lower Denkyira district.
CHAPTER 3
RESEARCH METHODS

Bogdan and Biklen (1998) defined qualitative research as an inquiry approach that uses several strategies to understand a phenomenon. It is characterized by rich descriptions and analysis of people, places and concepts that cannot be explained by statistical processes. It is often concerned with inductive processes and analysis of data and how to make meaning of the data collected (Bogdan & Biklen, 1998; Denzin & Lincoln, 2000). These characteristics of qualitative research create conditions that enable the researcher to accurately capture the perspectives of the subjects being studied through systematic data collection.

According to Patton (2002) research questions determine the research method to use. The questions that guided this inquiry are:

1. How are computers being used at Twifo Praso secondary school?
2. What can be done to improve access to computers to ensure the effective integration of computers in the curriculum at Twifo Praso secondary school?

In this study, I adopt the qualitative methodological approach because the objective was not to generalize but to understand (Patton, 2002; Glesne, 1999) how computers are being used at Twifo Praso secondary school. Qualitative methods enable the researcher to conduct systematic data
gathering and analysis which take into consideration the complexity of the setting under study as well as the context since it shapes the experiences of the informants (Patton, 2002).

According to VanMaanen (1988), there is "no one way of seeing, hearing, or representing the world to others that is absolutely, universally valid or correct" (p. 35). In essence, qualitative research is a field of inquiry often designed as a multi-method approach that attempts to secure an in-depth understanding of a phenomenon from a relatively subjective but significant viewpoint due to the systematic process used in the generation and analysis of data (Bogdan & Biklen, 1998). Qualitative methodology enables a researcher to examine the subject of interest in depth and detail. The researcher becomes the instrument of inquiry (Patton, 2002) and therefore is not limited by predetermined positions and may be open minded in her or his inquiry.

Qualitative research gives the researcher the choice to make decisions in terms of how to gather data based on the ontology (nature of the reality), epistemology (the nature of the knowledge) and the methodology (how the data would be obtained) (Patton, 2002). Consequently, the qualitative research approach enables the researcher to use various research tools to attempt to know a phenomenon from the viewpoint of the studied.
Research Design

The principal method for generating data for this research was interviews. Such an approach to inquiry requires the researcher to study and understand the subject of research in its own setting, based on the assumption that "human behavior is significantly influenced by the setting in which it occurs, and whenever possible [it is imperative for the investigator to] go to that location" (Bogdan & Biklen, 1998, p. 5) to conduct a study. I conducted the research as a case study.

Case Study

Qualitative case studies provide the opportunity for triangulated research through theory, open ended questions and other data collection methods that provide a holistic picture of the case (Snow & Anderson, 1991). Within the context of this research, a case study is defined as a way of organizing social data so as to preserve the unitary character of the social object being studied. It is an approach which views any social unit as a whole. Almost always, this means of approach includes the development of that unit, which may be a person, a family, or other social group, a set of relationships or processes or even an entire culture (Goode & Hatt, 1952, p. 331).
In essence, a case study attempts to “keep together, as a unit those characteristics which are relevant to the scientific problem being investigated” (Goode & Hatt, 1952, p. 333). On the other hand, Creswell (1994) provided a definition that included the concept of time. In a case study

the researcher explores a single entity or phenomenon (the case) bounded by time and activity (a program, event, process, institution or social group) and collects detailed information by using a variety of data collection procedures during a sustained period of time (Creswell, 1994, p. 12).

Lamnek (1993) expanded on this definition by considering case studies as an approach that aims to gain deeper understanding of how certain factors are related and how these factors influence each other by making use of various research methods such as interviewing and observations. While Hammersley (1992) indicated that case studies usually involve “the investigation of a relatively small number of naturally occurring [rather than researcher created] cases” (p. 185).

From the standpoint of Stake’s (2000) notion of case studies, this study is considered as an intrinsic case study because the objective is to gain deeper understanding into how computers are being used at Twifo Praso secondary
school. The research goal is not to build theory, rather as recommended by Stake (2000), it addresses the following elements; the nature of the case, a historical background, a description of the physical background of the setting, and other contexts such as the social, economic, and political settings, and it involves informants through which the case is studied.

Case study research methods are also suited for information system research because they provide the opportunity for:

a) the support of an active process for individual and collective self-determination  
b) it involves a process of critical self-reflection and associated self transformation  
c) it encompasses a broader set of institutional issues relating particularly to social justice, due process and human freedom.  
d) the incorporation of explicit principles for the critical evaluation of claims made through a systems development process, by questioning the knowledge and beliefs upon which specific claims are based (Alvesson & Wilmott, 1992).

As a case study, this research employed the analytical framework of critical social theory of information systems and examined the socio-economic and political factors that perpetuated and maintained a school system that has not
effectively integrated computers and related technologies in the school curriculum at Twifo Praso secondary school. The main premise of critical social theory is the improvement of human conditions. Therefore, by exposing the underlying issues affecting the use of computer technology at Twifo Praso secondary school, this research hopes to educate and improve the use of computer technology at the school.

My interest in this case was to engage myself in the lives of the teachers, students, and parents in a rural Ghanaian context and undergo a discovery learning process, not just to understand issues related to the use and integration of computer technology in education but also to experience the lives of teachers and students and how it impacts the use of computers in the school. In this process, I also took into consideration issues of school leadership and management coordination as well as issues related to culture, community participation in school activities and teacher training and attitudes towards the use of computers. By applying the principles of qualitative research design which demands that the researcher or person who intends interpreting the case must spend time in the subjects’ world, observing and participating, while being conscious of her/his own reflexivity, I traveled to Ghana in the fall of 2004. Prior to the trip, I conducted a pilot study.
The Pilot Study

I conducted a pilot study to determine the suitability of the questions for the research, clarify interview questions and develop a priori assumptions. Also, it provided me with the opportunity to familiarize myself with the data collection strategy of interviewing and the process of transcribing, coding and development of categories from transcribed interviews, and also review research questions.

The pilot study was conducted in Athens, Ohio between February and March 2004 prior to entering the field. Five Ghanaian teachers furthering their education in colleges in Athens, Ohio, and surrounding areas were interviewed. Three of the teachers had taught in rural secondary schools, one taught in an urban private school and the other at a public institution of higher education in Ghana. The teachers were interviewed in order to elicit their understanding of computer technology and its applications in the classroom in Ghana.

An interview guide was developed for semi-structured interviewing and the conversations were recorded with a tape recorder. Each interview lasted between 30 and 45 minutes. Interviewees were provided with a consent form, which was signed before the interview. Bogdan and Biklen (1998) define data analysis as the process of systematically analyzing the data collected in order to increase the understanding of a
phenomenon. I developed a coding system to find the emergent patterns in the transcripts.
The dominant themes that emerged during the interviews were
1. The importance of the Internet.

The initial design of this study excluded the Internet because computers can be used in the classroom without the Internet. I envisioned a situation whereby teachers would not use the Internet due to lack of infrastructural capabilities and costs, but all five interviewees stressed the importance of the Internet to enable them to use computers in the classroom.

2. Knowledge of software and hardware.

It appeared that the teachers did not know much about computer hardware and software issues. All the interviewees were aware of the parts of the computer such as the mouse, monitor, and central processing unit (CPU) but were not aware of the CD-ROM drives, Zip drives or internal hardware such as the hard drive. With regards to software, their knowledge was limited to Microsoft products such as Word, Excel, Access and PowerPoint.

3. Application of computers in the classroom.

When asked how they would use computers and the Internet to teach various subjects, all the teachers did not know how. Three of them (two from rural and one private school) stressed the importance of typing, knowing how to use a mouse and using the spell checker in Word and the use
of PowerPoint to deliver lectures or classroom lessons. The teacher from the institute of higher education was more knowledgeable about how Microsoft suite can be used in the classroom.

4. Teacher attitudes towards computers in the classroom.

Overall, it appeared that teachers had positive attitudes towards computers and were eager to learn how to use them in their classrooms. This was evident in their affirmative comments.

5. Teacher training opportunities.

Teachers mentioned that they did not have pre-service or in-service computer training opportunities. Three of the interviewees, who were relatively new to the teaching profession, mentioned that they had theoretical computer classes. They did not have hands-on experience during those classes. Two rural educators mentioned that they found time to take computer training, and paid high fees to learn DOS, Microsoft Word, and Excel. With regards to the Internet, most of the teachers learned how to navigate the Internet by going to Internet cafés and learning from the attendants. For those that answered the question on the use of computers in the classroom, they said they would have taught what they had learned from their computer instructors, if they had the opportunity.
6. School leadership.

During the pilot study school leadership was often blamed by the interviewees for the lack of computers and the absence of computer aided instruction in the schools. Teachers blamed not only the principal but also the educational leadership as a whole. Also, they felt that their principals did not do anything to support or encourage them (as teachers) to learn how to use computers in the classroom. This was expressed by two interviewees (a teacher who taught in the private school system and the other in the public institution of higher education). Both institutions had computer laboratories but teachers were limited by the leadership from having easy access and on-demand use of computers. Computer labs were often locked up when not used for teaching of the computer science students or during computer literacy classes.

Another comment mentioned by the private school teacher was that the school principal had two computers in his office but barely used them. The availability of computers at Ghana Education Service district offices and national headquarters was also mentioned by the interviewees and they were of the perception that the computers were either underused or not used at all.

The findings of this pilot study created an awareness of the complexity of the problem and created an awareness of issues I had not initially included in this study. Also, it
gave me the opportunity to modify the research questions by focusing on computers and related technologies such as the Internet, prepare questions for the leadership and make the interview questions more open-ended.

*Site Selection Criteria: How TPSS was Selected*

The type of site selected for a research is an important aspect of research design. The criteria for selecting Twifo Praso secondary school (TPSS) was dependent on three main factors; previous studies, a public secondary school in a rural setting and accessibility.

1. Site selection in previous studies

As mentioned in chapter 1, most of the studies that were reviewed for this research on the use of computers and related technologies in Ghanaian schools have focused primarily on the uses in urban school. Also, education technology projects have occurred in urban elite schools or private schools. This research is an attempt to fill in the gap in the literature of the use of computers and related technologies in a rural school.

2. Public secondary school

Secondary education in Ghana has been identified as important for national development. In chapter 1, I provided a chronology of the establishment of secondary education in Ghana, how it has not achieved the desired outcomes and how various educational reform policies are in place to improve the quality of secondary education in
Ghana. I therefore selected a research site that had not had desired outcomes and I wanted to determine how educational reform policies had affected the school. As an added bonus to this research, Twifo Praso secondary school had been selected for the model school project. The participation in this project translated into better school infrastructure and facilities. A list of facilities that will be provided for the school is available under appendix F.

3. Accessibility to site

Having identified that I wanted to conduct research in a rural public secondary school, accessibility to the site had to be considered. Since this research was conducted in Ghana, gaining access to the site without knowing anyone in the school would have been a potential problem. Facilitators are also important for qualitative research as they assist in facilitating entrée and the accessibility to key informants. I had been in contact with two teachers at Twifo Praso secondary school, I. Adomako and P. Y. Essel since the summer of 2002 through a non governmental organization called Action for Rural Education (ARE) with which I am affiliated. ARE has conducted various social development projects and AIDS awareness campaigns at Twifo Praso and surrounding communities, and through ARE activities, we have gained the trust and respect in the community. I was in constant
communication via e-mail and telephone conversations with these two teachers and through that, I gained access to the school. During my conversation with them in October 2004, prior to entering the field, I was assured of my access to the school and the preparations that were underway for my arrival.

As indicated earlier, preparations for this research and the data collection process began in the summer of 2002. I traveled to Ghana at the end of October 2004 and lived at my research site, Twifo Praso for two weeks. The time spent in the field was primarily to conduct interviews and observations, and to finalize the data collection process that began in 2002.

*Before Gaining Entry into the Field - Ethical Issues*

Ethical issues in all research, particularly qualitative research are essential and needs to be considered since the researcher may often delve into the private lives of the researched. Ethics involves issues of “harm, consent, privacy and confidentiality of data” (Berg, 1998, p. 31). Berg contended that a research study may be considered ethically permissible if the “amount of benefit outweighs the amount of potential risk or harm” (p. 35) it may cause the subject under study.

There are two types of ethical issues that were considered for this research - formal and informal or unwritten ethical issues. The formal ethical issues are
these related to Ohio University regulation such as Institutional Review Board (IRB) forms and written consents. All the participants were provided with written consents and given the opportunity to determine their confidentiality or anonymity. Informal ethical issues are those that emerged in the field. I was considerate and respectful of informants’ requests. One informant requested not to be audio taped and remain anonymous throughout my writings. Also, some informants had some issues related to the school management and school politics, which they wanted me to know and include in my final report but not identify the source.

Data Gathering Techniques

As indicated in the pilot study, interviews were the major technique for gathering data in this research. The pilot study enabled me to prepare and improve my interview protocol. Data were gathered through informal interviews using an interview guide with open-ended questions. The teachers, students, headmaster and assistant headmaster of Twifo Praso Secondary school were interviewed. Also, the Ghana Education Service (GES) administrators, the district chief administrator and district coordinator and a teacher from one of the rural communities near Twifo Praso who visited the ICT center to reserve a time for his students. In addition to individual interviews, focus groups of teachers and students were conducted. A total of 16 individual interviews, a focus group of teachers and a focus
group of students were conducted. The interviews were important because they enabled me to obtain descriptive data in the subjects’ own words within their own context. The list of interviewees is available under Appendix E.

In addition to interviews, I conducted observations of computer use at the school. My role shifting between that of an observer and a participant observer. As an observer, I observed the dynamics between teacher, students, parents and administrators. I also observed teacher non use of computers in their school. My initial objective was to be an observer without participating in any of the schools activities. However, I was unable to remain in the background on some occasions, when I felt that I could assist students and teachers. During my first observation of a computer technology class by M. Honma, I took on the role as a participant observer, assisting students as M.Honma taught, although I soon retracted to the background to be an observer. I also conducted workshops for teachers and my role as a participant observer in this regard, enabled me to facilitate the learning process while observing teacher reactions to my workshops.

Another source of data was documents such as published Ghanaian education and information technology policies. Striecher (1998), in a research conducted on systemic educational reform in Ghana, suggested that the researching and analyzing of the Ghanaian government educational and
policy documents prior to conducting interviews is crucial to any research process that uses interviews as a data collection technique. Streicher noted that the process of obtaining policy documents is painstaking, but he observed that “things became clearer after reading particular reports” (p. 26). Streicher’s recommendation, when taken, allows the researcher to identify key issues that are available in the documents, and the interviews could then become a source of clarification and confirmation of the information in the documents. Relying on Streicher’s suggestions, I reviewed some policies and other documents before entering the field. This was particularly useful because it gave me the opportunity to compare what was proposed and mentioned in the documents with what actually occurred in the field. This approach revealed the information gap that exists between policy formulators and the implementers. Most of the interviewees had not heard of, seen or read most of the policy documents I had in my possession.
The Role of the Researcher

Patton (2002) and Marshall and Rossman (1999) indicated that in qualitative inquiry, the researcher is the instrument for data collection. Therefore, the researcher is expected to maintain a “value neutral position” (Berg, 1998, p. 126) to enable her/him to understand issues. Researchers are expected to “study the world without imposing their own views or taking stands on social and political issues” (Berg, 1998, p. 126). However, research is seldom neutral since people are oriented by their background, attitudes and beliefs. As a result, the researcher’s background and preconceived notions cannot be ignored during the gathering and analysis of data. The researcher must be aware of her preconceived ideas and biases before beginning the research (Douglass & Moustakas, 1984; Glesne & Peshkin, 1992). To minimize researcher biases, it is imperative that the researcher’s interpretation of the data is kept as close as possible to the story of the subject of interest, to elicit thick description (Geertz, 1973). Thick description consists of various layers of societal values, culture and meanings, and it ensures that the informants’ stories are told within their contexts.

Apart from providing a detailed description of what is studied, qualitative researchers should gather information from two perspectives, the insider (emic) and outsider (etic) perspectives (VanMaanen, Dabbs & Faulkner, 1982). I
am Ghanaian by birth, and I have been a secondary school teacher in South Africa for three years. My role as a researcher is dual as I brought both insider and outsider perspectives to this research. As an insider, I entered the rural secondary school as a fellow teacher who was able to work with local jargon and understand the natural language of the subjects as argued by VanMaanen, Dabbs and Faulkner (1982). I understand and speak the language spoken at Twifo Praso. It was important that I understood and spoke the language rather that rely on “prepackaged . . . language system originating in . . . scholarly circles . . . [as there is] no guarantee that this language captures anything of meaning for those studied” (VanMaanen, Dabbs & Faulkner, 1982, p. 19). Also, I went into the field with an understanding of the concerns of teachers working in less than ideal conditions, who are often blamed for educational failures, since I have had similar experiences as a high school teacher.

Although Ghana is the country of my birth, I have not had any educational experiences there. My pre-tertiary and high education experiences were in different countries. Such experiences make me an outsider to the Ghanaian educational system. The outsider perspective that I brought to this research enabled me to hold empathic neutrality from the subjects. As a researcher, it is important not to take a particular stance (insider or outsider) when conducting
research. These perspectives lie on a continuum and I understood that I had to continuously shift roles in order to get the information needed. My insider and outsider perspectives are a strength of this research.

The Relationship between the Researcher and the Researched

Since qualitative research can be uncertain, it was important that I continuously adapted to the situations I encountered. I continuously engaged in dialogue with interviewees in order to reach a consensus that would transform the researched and the researcher. Dialogue is essential in a flexible research design. In addition to flexibility, reflexivity is required. According to Patton (2002) reflexivity is “a way of emphasizing the importance of self-awareness, political/cultural consciousness, and ownership of one’s perspective” (p. 64). Through reflexivity, the researcher becomes aware that neutrality during data collection and analysis is not completely achievable (Mason, 1996). This is sometimes demonstrated by the use of ‘I’ to indicate aspects of the researcher’s involvement, which creates a consciousness and possession of the researcher’s perspective.

As my contribution to the school, I offered educational technology workshops for the teachers. I realized that the teachers were willing to learn but politics within the school made it nearly impossible for most of the teachers to use the computers in the computer lab. The computer teacher
had, on numerous occasions, told the teachers that they would damage the computers. Therefore, my role as a researcher was not only to gather information but to demystify the computer for the teachers. I conducted six workshops for the teachers in which I taught how to design a certificate in MS Word, how to use PowerPoint for presentations and most importantly, how to manage the classroom using MS Excel. I have since received e-mails that they would like to implement the Excel spreadsheet in their work by the end of the academic year. I feel fulfilled as a researcher since I have been able to impact the informants in a positive way.

Analysis of Data

Case studies are applied to develop an understanding of the realities of the respondents. In order to reconstruct this reality, the type of analysis used often emerges from the data collected (Creswell, 1994). Qualitative cases studies often involve complex forms of analysis. Usually, qualitative analysis may occur through the theoretical framework or the development of categories to explain the information that emerges from the field (Yin, 1989). The analysis of qualitative research, like any other research, involves categorizing and re-combining evidence to make the material clearer and distinct without losing the depth of the information collected. The major strategies that were
used to analyze the data generated were the development of a typology or classification, and the use of theoretical framework for analysis.

Coding and the development of themes is an iterative process that began during my fieldwork. Observational field notes, which were largely descriptive in nature, were coded. The observational coding focused on teacher and student activities in and around the school and the community. I also coded policy documents and interviews and compared them with observational codes. The data were recoded several times to form categories, which were later developed into themes as I sought deeper meanings from the case.

This study was analyzed within the critical social theory framework. First, it examined how Twifo Praso secondary school was established, the background of teachers and how they joined the school. It was important to obtain historical information of the case in order to understand the context and origins of the informants’ perspectives. According to Agger (1998), the key to the improvement of human condition lies in the past. Therefore, a historical analysis offers insights into the cause of oppression and offers the opportunity for the raising of consciousness and the emancipation of a society. In effect “knowledge exists in history and can change the course of history if appropriately applied” (Agger, 1998, p. 12).
Second, it examined how government initiatives and policies played a role in the facilitation of the process of using computers and related technologies at Twifo Praso secondary school. Such an approach is supported by Avison and Fitzgerald (1995) who argue that it is important to be concerned with the design, delivery, use and impact of initiatives and technology in information systems. Finally, this study provided the opportunity for emancipation by creating environments for active participation of the informants to enable them to improve the socio-economic and political aspects of their lives that do not satisfy their needs. I was able to organize a few workshops for the teachers and have sent them tutorials for use by teachers and students in their computer lab.

The use of critical social theory as the framework within which this case was analyzed was appropriate because it provided an in-depth understanding of this case. Also, as a multidisciplinary framework, critical social theory is aimed at the advancement of knowledge through emancipation and empowerment. It is my intention to make sections of this report to TPSS with the hope that it would create awareness and teacher empowerment on the use and integration of computers and related technologies at TPSS. Although I am not in a position to determine what impact this report will have on the use of computers and related technologies in the curriculum at Twifo Praso secondary school, I was able to,
at least, get some of the teachers at the secondary school to attend the workshops I organized. Hopefully, this will generate more interest and impact the use of computers and related technologies at the secondary school.
COMPUTER TECHNOLOGY USE AT TWIFO PRASO SECONDARY SCHOOL

As discussed in chapter 2, the use of computers and related technologies has had positive effects on learning. Because of this realization, Ghana has embarked on educational reforms aimed at the effective integration of technology in school curricula. In this section, I discuss how computers and related technologies are being used at Twifo Praso secondary school. I also discuss community based initiatives aimed at improving access to technology. The findings determined from this study are

1) There were computers available at Twifo Praso secondary school.

2) Although computers were available, teachers were not using the computers.

3) When in use, computer classes were taught as stand-alone subjects without any relevance to the curriculum.

4) The lack of use of computers and related technologies in the classroom was attributed to the inadequate training of teachers in the effective use and integration of computer technology in the school curriculum.

5) There were community initiatives at Twifo Praso aimed at increasing the awareness of technology, not just at the secondary school but in surrounding schools and communities.
Before discussing the findings, I provide background information about the school and community, in order to contextualize the study.

The Context: Twifo Praso and Twifo Praso Secondary School

The trip to Ghana was a discovery process in which I immersed myself in the lives of the teachers and students at Twifo Praso secondary school (TPSS) in order to learn about how they use computers and related technologies at the school. Twifo Praso is the district capital of the Twifo Hemang Lower Denkyira district (THLDD) in the Central region of Ghana. Occupationally, most of the inhabitants are small scale subsistence farmers. Twifo Praso is also home to the Twifo Oil Palm Plantation (TOPP) Limited, one of the largest palm plantations in Ghana. As a farming community, Twifo Praso is home to the main market center for the district. Although the market operates everyday, Tuesday’s and Thursday’s are considered market days that attract a greater number of traders. Market days are days when farmers in the neighboring communities bring their produce for sale at the main Twifo Praso market. I observed that students from TPSS in their uniforms were at the market center on market days and some TPSS teachers did not stay the full day at school during market days.

The THLDD was created in 1988 with Twifo Praso as the district capital. This district has over 1000 small settlements and most of the people in the district are small
scale farmers. There are a total of 132 schools, two of which are secondary schools. The two secondary schools are Jukwa secondary school which has an agriculture focus, and Twifo Praso secondary school, the oldest school in the district, which was established in 1981 and was elevated to ‘model school’ status in 2003. TPSS accepts students from grades 10 – 12 and has boarding facilities. The research data for this study were primarily collected from Twifo Praso secondary school. The Twifo Praso secondary school has three buildings. The first building, at the entrance of the school is the administration block, which houses the principal’s office, the library and administrative services. The middle block has the staff room and classrooms. There is an extension of classrooms in another building on the left of the middle block. That block houses the computer and science labs. The third block sits behind the middle block and had more classroom and boarding facilities for male students. The female students are housed at the GES offices, which is a stone throw away from the guest house where I lived.

Twifo Praso secondary school has twenty two teachers, one of whom is a female teacher who has been teaching there for twelve years. During my first visit to the school, I was welcomed by one of my facilitators, P. Y. Essel, who introduced me to the assistant headmaster, D. C. K. Baidoo. The headmaster, H. K. K. Graham, had been sick. The
assistant headmaster invited me, and P. Y. Essel, also a teacher at the school into his office. During this initial meeting, the issue of language and culture was very important. The conversation was in Twi - one of the Ghanaian languages and the welcoming was done according to Ghanaian tradition. After introducing myself and my intention at the school, the assistant headmaster asked me of my roots, where I came from, with regards to my maternal and paternal heritage. And, after informing him of my roots, he informed me that I was his daughter and gave me the permission to speak to the teachers since I had come to my ‘father’s’ school. This gesture is highly significant in Ghanaian culture as it symbolizes receiving clearance to enter the school campus. From then on, I was viewed as part of them and had to be given any information and access I needed.

Living in Twifo Praso during the data gathering stage of this research made me realize that living and working in a rural community was challenging. Although Twifo Praso has electricity, communication networks and running water, it was often difficult to make telephone calls, and water and electricity were often turned off. In discussing how computers are being used at the secondary school, it is important to identify the social and economic issues in the community in order to understand the factors that shape the perspectives of interviewees. Issues related to computer use cannot be discussed without placing them into context.
At Twifo Praso secondary school, teachers complained about the lack of interest in education by both students and parents. Some of the interviewees, mainly teachers, blamed poor education results on the inability of the school to attract good students because of its location and the lack of role models within the community. Also, they blamed parents for their lack of interest in their children. Most of the teachers accused parents of focusing less on their children’s education than social activities. These issues were expressed in the following statements by interviewees. D.C.K. Baidoo, the assistant headmaster noted that

the problem that we faced was that of enrolment. It was difficult to get the best type of students. So, teachers had to make extra effort (personal communication, November 5, 2004).

Also, J. S. Effah, the project coordinator of the district ICT center remarked that

getting people into the classroom is problem. Most of them wouldn’t go because their parents don’t have enough money so they pick a few of the bright ones and support him or her with the income they have. They would rather spend it on funerals (personal communication, November 4, 2004).
Similar notions were expressed by G. K. Allotey, the biology and computer studies teacher (personal communication, November 3, 2004) and D. P. Afram, the agricultural studies teacher (personal communication, November 8, 2004).

Another significant challenge of the Twifo Praso secondary school and the district is attracting qualified teachers in the school and district. There are not enough qualified teachers in the district. According to R. V. Longdon, the District Education director of Ghana Education Service (GES):

We have a problem finding teachers. It is a typical rural area and nobody wants to come here. So, a lot of the teachers who moved here are pupil teachers – teachers who have had no training at all. Anybody with a high school certificate, who can speak English, is employed (personal communication, November 9, 2004).
Also, Y. Adu Asamoah, coordinating director of the THLDD noted that

The combination of living conditions and socio-economic factors within the community also made it challenging to attract qualified teachers to the community. Many of the schools are in the rural areas – far remote areas. So getting teachers for those schools is also a problem (personal communication, November 2, 2004).

Speaking on the issues of attracting teachers to Twifo Praso secondary school, the assistant headmaster, D. C. K. Baidoo had this to say:

The majority of teachers who teach in the big towns and big schools have access to certain facilities like cars. So, when somebody is brought down here, he compares all this and makes a choice. For example, a lady coming from the university may come with a mobile phone. When she comes down here, the mobile phone ceases to work because we are not connected. (personal communication, November 5, 2004).

This assertion by the assistant headmaster, D. C. K. Baidoo, was supported by the headmaster H.K.K. Graham, who indicated that:

The school has to be made by people, beginning with staffing. The caliber of teachers that we have here is
not the same as those in grade A schools. A majority of the teachers are non university graduates so their output is limited. The setting itself is not conducive for teachers with high capacity to stay (personal communication, November 9, 2004).

In addition, parents who took their students to public schools were less likely to be interested in their child’s education. One teacher gave an example of a public school he had taught in where parents argued that since it was a government school, the government had to provide everything for their children. His argument was that parents were more likely to value education if they paid for it.

Almost all the teachers expressed the view that if they had better living conditions, better wages and better students, their teaching profession would be fulfilling in Twifo Praso secondary school. They were generally not satisfied with their employment conditions. They lamented on the lack of incentives and meager remuneration for teachers, therefore, they had to find other jobs to supplement their salaries. They were of the opinion that they have to be paid more than their urban counterparts since they were sacrificing by being in rural schools and having to teach students who came to secondary school with low scores.

Evidently, the lack of incentives was an underlying issue for the lack of interest in various school activities
by teachers. This reality is evident in a statement by a teacher during the teachers’ focus group session:

Teachers must be well motivated. They say that teachers in rural areas are motivated by giving them things but we do not get anything (personal communication, November 3, 2004).

This statement was supported by another teacher during the teacher focus group discussions; teacher C noted that:

Motivation for teachers is poor in the country. The bonuses for teachers are not encouraging. Also, being in the rural community is a problem due to a lack of materials. Teachers become static since there is very limited support for teachers in terms of getting access to current information to give to students (personal communication, November 3, 2004).

Although teachers lamented and spoke about the need for incentives, Ghana Education Service (GES) officials informed me that teachers were given incentives to encourage them to stay in rural communities. According to R. V. Longdon the director of GES at Twifo Praso:

We try to motivate them [the teachers] by giving them good accommodation and incentives like bicycles, radio sets and roofing sheets. We try to lift them up here. Even community members give them land to farm if they
are interested in farming (personal communication, November 9, 2004).

This was confirmed by the district coordinator, Y Adu Asamoah, who affirmed that the district administration had acquired accommodation for teachers. At least I observed one teacher at the high school using his GES-provided bicycle to commute to school and I was privileged to visit some of the government provided teacher accommodations.

A teacher, who had previously done his national service at Twifo Praso secondary school and had been asked to continue teaching, mentioned that the conditions under which they (as teachers) lived was less than ideal. He had been teaching for a little over a month but had not received his teaching contract and did not know how much he would be paid. He was living on loans at the time I interviewed him. He was one of the young teachers at the school, and because of the prevailing condition, he had no intention of staying long at TPSS. This decision not to stay at the school for long was due to the factors mentioned earlier and an interest in pursuing further education. Ghana has a policy that permits teachers to pursue further education at the expense of the government while receiving their regular salary after serving for a minimum of two years. Most of the young teachers I interviewed expressed interest in pursuing bachelor’s degree or graduate studies. Although
this policy has existed for decades, R. V. Longdon the
director of GES at Twifo Praso mentioned that most of the
teachers in the rural schools had
not showed any interest in furthering their studies
although the content and structure of education had
changed, and most of the requirements for teaching in
senior secondary schools had been upgraded. Most of the
teachers have stayed in one school for more than
fifteen years (personal communication, November 9,
2004).

Having been selected as a model school, the headmaster
of TPSS hoped that the facilities that the school will have
for students and teachers will attract better qualified
teachers to the school. The constructions of the new
facilities were underway when I was at Twifo Praso and I was
informed that the school would move to its new facilities in
January of 2005. The headmaster believed that good teachers
were needed to ensure the success of the school. He cited a
situation that occurred in 2003 when most of the students
who took the final senior secondary school year exams failed
English due to the absence of qualified English teachers at
Twifo Praso secondary school. During the 2003/2004 academic
year, the headmaster arranged for English teachers from
schools in Cape Coast to offer supplementary lessons to the
students. The result was an improvement in the English results in the 2004 final exams.

Twifo Praso secondary school has twenty two teachers. There is only one female teacher, R. A. Fianko who had been at the school for twelve years at the time of this research. R. A. Fianko moved to Twifo Praso after her husband, who worked in a government position, was transferred to the district.

Although she did not like the conditions initially, R. A. Fianko has since established a restaurant at a gas station in Twifo Praso close to the banks of the Pra River. I had the opportunity to visit R. A. Fianko’s establishment, which serves food and beverages. None of her children attended any of the local schools, and she lamented about the slow pace of progress in education in the community, and the lack of female role models in the community since most of the women were petty traders, and the few female teachers who were posted to the secondary school stayed a few months and sought transfer to supposedly better schools. R. A. Fianko was not the only teacher who had a business to supplement her teaching salary. Most teachers, with the exception of the new ones, had other jobs in the community or their wives were traders at the local market. I had the opportunity to visit the other workplaces of D. P. Afram and P. Y. Essel.
D. P. Afram operated a lucrative palm oil business which was established in 2000. Because of his agricultural background and his previous experience at the local JSS where he managed the school owned palm plantations, D. P. Afram learned the art of processing palm kernels for oil. Through his wife’s trading and sowing business, and his teaching salary, they purchased palm plantations and have set up a large palm oil processing plant near the Pra River. Also, P. Y. Essel, an accounting and business teacher, operates a communication center. Through the use of an analogue radio telephone system and a connection through Ghana Telecom, P. Y. Essel established a communication center in the community where he employed two community members. His small establishment was always packed whenever I went over to make calls. His phone service was the cheapest, in terms of call charges, and was the most reliable in the community.

The absence of qualified female teachers in rural schools was a recurring issue that was raised by most of the interviewees. An interviewee mentioned that since there were few female teachers in rural schools like TPSS, 'good' female students who complete secondary school are often offered jobs to teach in rural primary schools. However, most girls preferred to trade since they received instant remuneration and sometimes, more money than they would have
if they were to teach. E. K. Buah, a math teacher at TPSS, stated that

A student who finished school here (TPSS) was asked to teach a kindergarten and primary class in one of the schools close by. What she said was that, she would rather trade than teach. She thinks that when she goes into trading, she will get more money than when she gets into teaching (personal communication, November 5, 2004).

Computer Use At Twifo Praso Secondary School

Computers were first introduced to Twifo Praso secondary school in 2002 through an initiative by the district assembly in collaboration between a non-governmental organization (NGO) and the school. Thirty computers were initially brought to the school to set up the computer lab and then Internet connectivity was established shortly afterwards. These computers were on lease to the school and therefore, the school instituted a computer fee of ¢50.000 (App. $5.15 US) per term to enable them pay for the cost of the use of the computers and Internet connectivity. Although the Ministry of Education in Ghana had set a ¢30.000 limit for ICT fees in school, TPSS charged ¢50.000; ¢30.000 for computer use per government fee and ¢20.000 computer maintenance fee.

Although the interviewees could not recall the name of the NGO, they acknowledged that the initial contract was
exploitative. The terms of the collaboration was such that at the end of the lease term, the NGO would take back the computers and the school had to enter into another contract with the NGO. However, after extensive deliberations, the school decided not to continue their contract with the NGO, but purchase their own computers through the computer fees the students were paying. Twifo Praso secondary school later purchased fourteen computers, eleven of which were in the computer lab and the other three and a printer were in a storage room.

Figure 2: Layout of Twifo Praso secondary school computer lab
During my observations, the computers were primarily used by SSS 3 (grade 12) students only during computer period. The students were taught by the Japan International Cooperation Agency (JICA) volunteer, M. Honma because a component of the Integrated Science and Business final year examination required computer knowledge. The computer lessons that M. Honma offered the students was important because, as one of the teachers at Twifo Praso secondary school observed:

every section of the Integrated Science Paper 2 has certain areas that ask about computers so if you are in the rural areas and there is a question about computers and you do not have computers and the teacher does not know anything about computers, students cannot answer the questions (Teacher C, teachers’ focus group, personal communication, November 3, 2004).

I had the opportunity to observe several computer classes taught by M. Honma and an except from my first observations on November 3rd 2004 is documented below:

There are 11 computers in the room but only 5 are in use. This is the form 3 (grade 12) class. There are two girls and three boys. Masanori takes out the user guide he designed and takes the students through it. My initial reaction was to participate in the lesson. I went around the class, helping students as Masa told
them what to do. The students responded well but then I realized that my role has to be an observer and not a participant observer. It is often difficult to resist the temptation of helping out and not participating when observing. After about 10 minutes, I retreat to a chair in the corner of the class to continue my observation.

As the lesson proceeds, the two boys at the back continuously ask questions. Masa speaks English with a Japanese accent (which I barely understood) and the students speak English with a local accent. Masa shows them how to access MS Word, horizontal and vertical movement. He asks the students to type their name. The students search through the keyboard for the letters to type their names.

Question: Masa, how do we do capitals? Masanori shows them how to use the shift key, and how to highlight words, copy, cut and paste. During the lesson, Masa goes around the class to assist students. The 40 minute period goes on for one hour, twenty minutes. At 9:45am, he tells the students to shut down MS word and leave so that the next batch of students would come in. When asked to leave, the students, especially, the males protest and complain that they pay and do not have access to the computers.
Comment from student: Masa, it will be one month before we come again. By the time we come, what we have learned will be gone. Masa explains that if all the computers worked, then more students would have lessons and the rotations would go faster.

All the computer lessons I observed took on the same format. M. Honma informed me that he could not move to other lessons until the rotation was complete. And, it was not his job to teach computer lessons to students. He was a volunteer physics teacher and he taught computer lessons during his spare time. Masanori was in school only during the first week of my visit. He did not teach his classes for the rest of my stay there due to an illness.

G. K. Allotey, the biology teacher had been designated to teach computer literacy in the school. But, according to several teachers, G. K. Allotey had stopped teaching computer classes for two years. Apart from the computer lessons, the computers were idle most of the time. I did not observe teachers, librarians or administrators using the computers for any of their work.

Teachers and Computer use

Teachers at Twifo Praso Secondary school did acknowledge the importance of the use of computer technology in education. However, they were unsure of how to apply
computers and related technologies in their subject areas.

E. K. Buah, the math teacher made the following remarks:

Computers and Maths? I don’t even know if they have a relationship. I don’t know. I don’t know if it is because I don’t know much about computers. I don’t know if you can use the computer to teach Maths (personal communication, November 5, 2004)

Also, P. Y. Essel, the economics and math teacher made similar remarks; he expressed that:

I can’t apply it to my teaching. I don’t know how I can apply it. There are some one or two topics that I can use it in calculating some of the data but I don’t know how I can use it to teach (personal communication, November 5, 2004).

Also, during the teacher focus group discussion, Teacher E commented that

If you do not know how to use the computers, how are you going to apply it to your subject? (personal communication, November 3, 2004).

The comments of teachers on their lack of knowledge on the applications of computer technology in the classroom were insightful because it became clear that the majority of the current crop of teachers in a rural school like Twifo
Praso secondary school do not have knowledge on how to apply computers and related technologies in their teaching areas. And, it became obvious that there was an urgent need to train teachers to use these technologies if the initiative to integrate computers and related technologies in education is to become a success.

On the contrary, the students had fairly good ideas about how to apply computers and related technologies in their school work. One student, during the student focus group, gave some indication on how computers can be used in the accounts department in the school. Student A commented that

The computer could be used to determine the amount that we owe in the school (personal communication, November 10, 2004).

This student further noted that

I am a business student and I want to learn how to use the computer to balance our equations and do the workbooks, especially in accounting (personal communication, November 10, 2004).

Another student, O. Ockran, who accompanied me to the headmaster’s home, indicated that computers could be used for Math and other calculations. He also expressed an
interest in getting to know about other parts of the world through the Internet.

These observations, like many others was particularly revealing since the most of the teachers interviewed did not have ideas on how to apply computer technology in their subjects.

On the other hand, G. K. Allotey, the biology teacher and designated computer teacher and M. Honma, the JICA volunteer, were able to give me examples of how to apply computer technology in their subject areas but I did not observe them using the computers for their classes. G. K. Allotey commented that

Normally, apart from the (Inter)net, the only way that I sometimes use it [computers] is that I go in there to make my own notes, which I later deliver to the children. I remember when we were hooked up to the net, sometimes I would search for information on the website for my material for teaching. And, the few children that came, I introduced them to the site so that they could get information (personal communication, November 3, 2004).

Similarly, M. Honma noted that

I would like to use the computer. For example, after practicals and after experiments, maybe they can input the data into the computer and create the graph and
G. K. Allotey went beyond computer applications in the classroom to discuss how computers and related technology can be used to assist farmers since the THLDD’s economy is driven by farming. During my interview with him, he drew my attention to the weather station located at the school. He expressed that:

We have a weather station here manned by the meteorological institute or department and it is in the center of the school and they have a lot of studies which could give data about the climate in the district. If an investor outside there could know the rainfall patterns of this area for a year and he is able to know the weather conditions, at least the temperature and the soil types that we have here. Right over there he or she gets everything there, he or she knows when to come in and plant. So the computer is going to help us. It could really help our local farmers. If the local farmer needs information, he might be able to use an electronic system on farming. He can go to the website to search and draw some of the solutions that will help to build capacity and help with the farming method (personal communication, November 3, 2004).
At least there was evidence of some knowledge about how computers and related technologies could be used in teaching and innovatively in school-community based projects. From my experience discussing and interviewing teachers and students at Twifo Praso secondary school as well as Ghana Education Service (GES) officials and community members, it became clear that integrating computer technology in education is a complex initiative that requires careful planning and utilization of the resources available. While it was clear that there were various initiatives on the ground to ensure the integration of ICTs in the school curriculum, it was expressed by some of the interviewees that the interest in some of teachers to use computers in teaching in the school, even when they have access to them is low because Most of them do not see the importance of the computers (P. Y. Essel, Economics and Math teacher, personal communication, November 5, 2004).

Similarly, G. K. Allotey observed that:

I don’t know if they (teachers) have interest in using computers. I think that computer literacy comes with interest. They (teachers) are not enthusiastic about it (personal communication, November 3, 2004).
This was affirmed by M. Honma:

I don’t think other teachers are keen or willing to use computers. They are not keen to practice in order get used to the use of computers in the school (personal communication, November 3, 2004).

According to the G. K. Allotey, the computer teacher, and the headmaster H. K. K. Graham, teachers had access to the computer lab at all times since there was a spare key in the staff room. However, when I asked some of the teachers about access to the school computers, most of them cited prevention of access by the computer teacher and lack of interest by most teachers. Comments about some form of gate keeping going on regarding access to the computer lab were often said off record. The computer teacher was viewed as an embittered person who passed a lot of blame around. He was considered very political and was quick to denounce ICT initiatives as politics, especially when he did not find them favorable to his political views and political affiliation. During my visit to the school, I never observed G. K. Allotey come to the staff common room. Also, during the workshops I conducted for the teachers, he only attended the first one and the teachers attributed it to the fact that he appeared not to know what we did during the first workshop. He was portrayed as someone who made it difficult for staff to use the computer lab.
The view that G. K. Allotey was an obstacle to the use of the computer lab was not shared by all the teachers. E. K. Buah, a math teacher expressed that:

Normally, if I’m not in the staff room, I’ll be in the classroom or computer room. I have learned a lot about computer but it is all theory. I do not have a PC and in my school, there was a lot of people to one PC so one could not even get the chance to practice on the computer (personal communication, November 5, 2004).

Also, P. Y. Essel, the economics and math teacher indicated that

I have learnt how to use Word, Excel and one or two basics in PowerPoint. I have been able to compile all my notes that I use in teaching and I did the typing myself (personal communication, November 5, 2004).

Teacher Training and Competencies

In order to implement the national ICT policy in relation to education, teachers need to be competent in the use of technology for instruction. According to Sayre and Wetterlund (2002), the training of teachers to effectively use technology for instruction is more critical than providing current hardware and software. Although Twifo Praso secondary school had computers, it was determined through observations and interviews, that teachers did not use the computers for any form of instruction, with the
exception for the JICA volunteer, M. Honma who taught basic computer lessons to students. However, the computer course is taught as a separate stand-alone course with no relation or application to subjects in the school curriculum.

Contrary to the fact that most of the teachers were not applying computer technology in teaching any aspect of their subjects, I was informed that they had received some form of computer training prior to teaching at Twifo Praso secondary school. M. Honma, the JICA volunteer narrated that:

I didn’t use a computer until I got to the university. I didn’t use anything at senior secondary school so I was a bit amazed when I came here. This school has got computers. So, I was very surprised. The students are learning computers at senior secondary school in this country. But in Japan, people use computers when they get to university because they need that for their research projects (personal communication, November 3, 2004).

Similarly, D. C. K. Baidoo, the assistant headmaster pointed out that:

I passed through the computer system (computer course) for only a semester, which is not enough to make me competent enough to handle the machine (personal communication, November 5, 2004).
And, P. Y. Essel, the economics and math teacher stated that:

I had some training at the University of Cape Coast. That is, as part of our program, we did management information systems and we have computing on a semester of work (personal communication, November 5, 2004).

The issue on the type of training teachers had had was echoed by D. P. Afram and a teacher from the teachers’ focus group.

I have some computer training. Just the intro to computers. We learnt things like the PC, the monitor at the University of Education, Winneba (D. P. Afram, personal communication, November 8, 2004).

At the university we had training but it was not enough to let us use it. I remember in my class, it was about 10 people to one computer and you could not even touch it (Teacher A, teachers’ focus group, personal communication November 3, 2004)

These remarks from the teachers indicated that many of the teachers have had some experience using computers or had been introduced to computers some how during their university education. It was puzzling that they showed so much enthusiasm during the workshops but had not made many
attempts to explore how they could use their computer lab facility to improve their skills or teach their students. On that note, G. K. Allotey, the biology teacher informed me of other in-service training activities which he had attended.

Training was organized by the Ministry of Education for selected math and science teachers in Kumasi. It was an intensive training program for seven weeks in 1996. We learned about biology instrumentation, data logging and some programs on the computer like Word, Excel and then Paint (personal communication, November 3, 2004).

From the interviews and discussion, it became evident that the training most of the Ghanaian teachers had received; either while at university or on their own was in Microsoft Word. Teachers were familiar with saving documents, and formatting text such as bold and underlining. Also, most of the training was theoretical or teachers had to share computers. Despite these basic skills, teachers lamented that since they had very limited hands-on experience with the use of computers and they were green on the use of computers. Most of them indicated that they could not remember what they had learned and effectively apply their knowledge, even if they had access to computers to teach or do other work related tasks. This was evident when I organized the workshops for them. The teachers knew some

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5 Green often refers to a complete lack of knowledge of something. It is used frequently in the Ghanaian context.
computer parts such as the monitor, keyboard and mouse but did not know what the hard drive or a storage device like a disk was. Most of the teachers expressed the notion that teacher training in computer use was important. However they could not give specifics on how or what sort of training should be done. G. K. Allotey, the Biology teacher remarked:

We have to change the method of training teachers and look at their areas of specialization and relate them to computing. We need to be trained on how to log in some of these databases and how to use them (personal communication, November 3, 2004).

It was obvious that teacher training had to be redesigned to make computers and related technologies relevant to various subjects and their application in teaching.

Also, it was clear that teachers at Twifo Praso secondary school did not have enough knowledge and skill in computers to be able to effectively apply the technology in their teaching, even if they had the interest. Even for those who had some knowledge about how to use the technology, they could not effectively articulate how they could apply the technology theoretically and practically. I observed that there is some level of interest by almost all the teachers to learn how to personally use the technology in their teaching, if some form of well coordinated and sustained training was available. This is because the
teachers expressed the importance and need for regular in-service training.

There should be vacation classes for masters (teachers). Teachers should have access to training and facilities during vacation. When the school is in vacation, they can make arrangements with the (computer) instructor to take them through (D. C. K. Baidoo, assistant headmaster, personal communication, November 5, 2004).

This view was shared by D. P. Afram. He affirmed that We are having teachers who are well versed in the computer studies. They can lead such a class (personal communication, November 8, 2004).

Another teacher, during the teachers' focus group, hinted that:

The headmaster was thinking of arranging a series of courses for us but that has not been done yet. As at now, there is no formal training (personal communication, November 3, 2004).

The importance of training cannot be overemphasized as noted by R. A. Fianko:

Training will lead to the use of the computers (personal communication, November 3, 2004).
The patronage of the workshops I organized was encouraging since the attendance was voluntary. Some teachers were willing to stay after school hours to go through some of the simple exercises I had designed for them. The workshops took the teachers through simple exercises with the focus on showing them how to apply Microsoft Word and Excel to perform some of the basic job related tasks. After the workshops, the teachers that participated became aware of how to use Microsoft Excel for data and classroom management. Twifo Praso is a vibrant agricultural community and Twifo Praso secondary school has a weather station so I created awareness on how Excel could be used to gather daily weather data which could be of relevance to the community.

In reference to the first question; How are computers being used at Twifo Praso secondary school, I determined that the lack of use of computers and related technologies was attributed to insufficient training and lack of knowledge on how to use the computers by teachers. This was evident in their statements that were reported earlier. Students, on the other hand, were more knowledgeable about computers and related applications use in their subjects than teachers, as was evident during the focus group discussions. However, student access is restricted and limited to computer class times when the JICA volunteer taught them. Students argued that they should have access to
From my observations, it appears that teachers and students have access to computers at Twifo Praso secondary school. However, students were restricted and limited to computer use only during computer class times. During my observations and discussions at the school, students were not permitted into the computer lab during computer class when there was no one to supervise them. Since, it was only the JICA volunteer who was actively involved in computer instruction during his spare time; students could not use the computers when he was not available.

With regards to teacher access to computers, I was informed that there was a spare key in the staff common room to enable teachers to access the computer lab at all times. However, some teachers cited that they were limited by the computer teacher from accessing the lab or using the computers, although this opinion was not supported by all teachers since some of them had on numerous occasions, used the spare key to access the lab and use the computers.

In addition to access at the school, the THLDD has instituted two programs that would improve access and promote the use of computers by teachers, students and the
Twifo Praso community at large. According to Y. Adu Asamoah, the coordinating director of the THLDD, Twifo Praso is one of the first rural communities in Ghana in which the district administration is actively involved in bringing ICTs into the community and school. Beginning in 2002, the district assembly attempted to create awareness about the importance of ICTs, not only in schools but in the community. According to the coordinating director of the Twifo Hemang Lower Denkyira district (THLDD), the district administration has been involved in three main technology related projects; the e-health project, e-agric project and the community computer lab. The objective of the e-health project is to connect the hospitals to the Internet so that the health providers can have access to current information and can connect to other health providers around the world. Also, the e-health project could be an opportunity for telemedicine, with the appropriate training and equipment.

Most of the communities in the THLDD are farming communities. While I was at Twifo Praso, the president of Ghana, J.A. Kufuor, visited the area to inaugurate a Presidential Special Initiative (PSI) to promote the cultivation of palm oil in the area. According to the coordinating director of the THLD district, through the e-agric initiative, and in collaboration with the agricultural information center (which already exists at Twifo Praso) farmers could get access to current information on how to
increase the yield of their crops. This was important since Twifo Praso was one of the communities that had had a high cocoa yield under a presidential initiative.

Of the district administration’s initiatives, two were directly linked to increasing access to computer technology and education namely; the district ICT center and the distance learning program.
The ICT center

The community ICT center is located within the district administration building. The district administration building is a three storey building with a huge satellite dish on the roof. The ICT center, called the Twifo Praso ICT center is on the second floor of the building. The ICT center was established in 2003 to promote the importance of and use of ICTs in the THLDD. It serves the communities and the surrounding schools, most of which are junior secondary and primary schools.

The ICT center is part of the district’s development program. The initial project was to network 12 districts in the Central Region. However, many of the initiatives were concentrated in the regional capital, Cape Coast. The Twifo Praso district assembly then researched into communication system providers in the country and selected NetPlux as an Internet Service Provider (ISP) for the district. The district’s ICT initiatives and the ICT center were officially commissioned in November 11, 2003.

In addition to helping individual community members, the Twifo Praso ICT center doubles as a computer lab for surrounding schools without computers. According to the district coordinator, the schools in the surrounding communities have been informed of the facilities at the center and are encouraged to bring their students on tours to the ICT center and familiarize themselves with computers.
After the tour, schools are encouraged to bring their students for computer lessons at a small fee.

Also, the ICT center serves as a training center for community members and teachers in the community. J. S. Effah, the project coordinator of the district ICT center informed me of the computer training programs such as basic computing and graphics design conducted at the center for a fee. Some of the teachers at Twifo Praso secondary school mentioned that the headmaster had arranged for them to have training at the ICT center but this had not yet begun when I was at Twifo Praso.

According to the Y. Adu Asamoah, coordinating director of the THLDD, the ICT center has been very useful to both parents and students. He narrated the story of a student who got admission in Kumasi, one of the major cities in Ghana; Not quite long ago, one of the security personnel’s sons got admission at Cambridge Secondary School [a private school] in Kumasi. The student was always at the ICT center learning how to use computers and other applications. For one of his trial exams to get admission, he surprised the teachers with the level of his computer skills. That child, fortunately, got admission there and was able to perform remarkable tasks with the computer test during the admissions aptitude test. Some of the tasks he performed the teachers could not even do them. They were surprised
that someone from the rural area like Twifo Praso had such high levels of computer skills and could outperform students in Kumasi. So, the ICT center is helping. I know it is helping the children (personal communication, November 2, 2004).

I had the opportunity to observe a class in the ICT center. The students were taught by J. S. Effah. The students were from a primary school from one of the neighboring communities. They had traveled for about one hour to come to the ICT center.

J. S. Effah has a background in mining and after college he was posted to Twifo Praso for his national service in 2001 but he opted to remain in Twifo Praso after his service. It was during this period that the district office was considering using ICTs to accelerate development projects. The ICT center has 20 computers but only five were functional during my stay in Twifo Praso. J. S. Effah was their instructor and he first spoke to them in English then switched to Twi, the local language. He went through the four main parts of the computers – monitor, keyboard, mouse and CPU. He used both English and Twi when he showed them each part and explained what each component does. When he used the local term for the computer mouse – ekura, the students laughed. After his lesson, J. S. Effah gave the
students the opportunity to ask questions. Only one question was asked (in English):

A student asked: If you want to write something, do you have alphabet on the keyboard?

J. S. Effah: Yes. He has asked a question. Can anyone answer him?

Chorus: Yes.

Then another male student explained to him how the keyboard works. J. S. Effah then took a keyboard and explained the setup to them. He gave the students a computer mouse. While the mouse passed around, he motioned to the students to turn to the computers and walked them through the launching of MS Word. The students had to share computers since not all the computers were functional.

He showed them different font styles in Microsoft Word. He also told them about computer games and e-mail addresses. He explained to them how e-mail works and how they could get e-mail accounts so that they could communicate with each other but cautioned them not to run away from school to play games on the computer. He talked about how some of the games can help them with English and spelling and informed them that they will learn while playing.

The lesson continued for about an hour, however, as the students left, they lamented about the lack of access, and how they had to wait long periods before returning. Although I could not speak to the students during my
observations at the ICT center, I had the opportunity to speak with one of the teachers from a neighboring community, J. Effih, who had visited the ICT to reserve a time for his students to use the center.

J. Effih is an assembly man (local council representative) at Wamaso West, a neighboring community and teacher at Abuabo primary school, who had become aware of the district’s initiative on creating awareness and promoting the use of technology in education. As a rural primary school teacher, he taught Math, English, Environmental Studies and Science because of the limited number of teachers in the school. He had taken the initiative to visit the ICT center to reserve a slot for the students in his school to learn about computer technology, although he had never used and did not know how to use computers. Through the use of computers and the Internet, he hoped to create a virtual space through which his students could communicate and share ideas with other students within Ghana and abroad.

The ICT center was put in place a year after the Ghana government district ICT initiatives had begun, and J. S. Effah spoke of the emerging computer culture in the district. This was supported by R. V. Longdon, who affirmed the work of the district assembly. She mentioned that, even when the district education office did not have any plans for promoting the use of computer technology in the
communities and schools in the district, the district administration’s initiatives for the promotion of ICTs are commendable and had created opportunities for the youth in the area.

Despite the successes in promoting technology in the Twifo Hemang Lower Denkyira district (THLDD), various challenges had emerged during the first year of operation. Issues of structure and the bureaucracies of the system frequently appeared in conversations with teachers, students and community members. On several occasions, interviewees spoke about how politics played a role in everything. Often, such comments were made off record.

Interviewees also commented about the management of the center. There was no system to monitor computer use, the Internet was down most of the time and attendants could not assist patrons when they needed help at the center. According to interviewees, the ICT center attendants could not answer any of the queries about computers.

Another issue was the lack of technological expertise and costs involved for Internet connectivity. This was an issue that I encountered almost on a daily basis during my stay in Twifo Praso. With the exception of J. S. Effah, the ICT center coordinator, who had some knowledge of computers, no other person at the district assembly offices had knowledge in ICT applications. Also, the company with which the district administration had contracted to supply
Internet connection to Twifo Praso did not offer any training to anyone in the district administration or ICT center. This was confirmed by J. S. Effah and I observed this while in Twifo Praso. There were several occasions when the Internet was down.

J. S. Effah lamented that when there was no Internet connection; he often had to take the server to Cape Coast, which is the capital of the Central district about 70km away from Twifo Praso. And this was often a whole day’s journey since the problem is often not solved immediately. On one occasion, I spent the whole day with him, waiting for connection, which according to him, was sometimes done remotely. Our conversations during this period gave me the opportunity to inquire further about the Internet connection at Twifo Praso.

NetPlux, the Internet service provider (ISP) was selected by the district administrators. The district assembly pays a monthly connectivity fee of $1 200 US and irrespective of whether they have extended periods of no Internet connections. This amount, according to J. S. Effah, was too high for a setup like the Twifo Praso ICT center since it was not generating enough revenue to pay for its operation costs. While we conversed, people came to his office to inquire about the Internet, which remained unavailable for the whole day and subsequent days.
I conducted a survey at the ICT center and the cost of use of the center and the intermittent Internet connectivity were of major concern to patrons. It emerged that the ICT center was primarily used to check e-mail and surf the Internet. The ICT center is located at the district administration offices, the local seat of government. This is a government building that most people would rather not visit. Therefore, this became an issue for most respondents. By nightfall, the area around the center becomes very quiet and dark, and this made it difficult for people to frequent the place at night because of security reasons. The ICT center was walking distance from where I lived but it was often discouraging to walk about 15 minutes to the center only to find it closed or the Internet connection down.

Most of the respondents interviewed complained about the cost of use of the ICT center. It costs ₦200 per minute, which amounts to ₦6000 (about $0.66 US) per 30 minutes to surf the net. This amount is higher than the fees charged by any of the Internet cafés I had used traveling in Ghana. Most respondents argued that it was too expensive, given that most of the computers were slow. According to them, ₦6000 can buy more than a daily meal in Twifo Praso and therefore some interviewees expressed the view that most potential users were caught between using their meager resources to either use the computers at the center or provide for their daily bread.
**Distance Education Initiatives**

The district administration, in collaboration with the district Ghana Education Service (GES) has also embarked on initiatives to promote education through technology. The GES officials informed me about the distance education programs being promoted by the district administration and the local GES to expand access to education and technology in the rural communities. A GES official commented that:

The district office is trying to have television at vantage points within the district which will be used to deliver government ICT programs to the community to provide access to distance education initiatives. The goal is to bring the technology and distance education to the people beyond Twifo Praso. The general goal is to link up with the people through ICT so that people can have telephones and access to the Internet at home (personal communication, November 9, 2004).

This was confirmed by A. D. Odoom, the district Chief Executive of the Twifo Hemang Lower Denkyira district (THLDD). He spoke at length about the Presidential Special Initiative in distance education aimed at improving access to education for both teachers and students. Through the distance education program, it is hoped that students in the remotest areas of the community will be provided with television sets, electronic libraries and computer centers.
The distance education programs are televised twice a week and through such programs, schools that lack teachers or need additional information on various subjects could get information and instruction through that.

To prepare teachers to use computers in their classrooms and also to become facilitators of distance education programs, I was informed of a plan to train teachers in the use of such technologies. The district GES office had received sponsorship from World Vision, an international organization, to train teachers in the use of computers for teaching. Although the project had not begun, I was informed by R. V. Longdon, the director of the GES district office that the teacher training project would begin in primary schools.

Significance of findings

The findings of this study indicate that teachers need to be empowered for educational reform and computer technology integration to occur effectively. The findings are significant in that they present the nature of the social, economic and political issues surrounding the use of computers in education, and conditions that have to be met for enlightenment, in this case, teacher empowerment for the effective use and integration of computers and related technologies to occur in a rural school like Twifo Praso secondary school. They demonstrate that the traditional, non
participatory approach to educational reform and computer technology integration in the Ghanaian curriculum needs to be addressed.

Although the interviewees, particularly teachers, acknowledged their lack of knowledge and skills to enable them integrate computer technology effectively, they stressed the need for the Ministry of Education to involve them in the planning, execution, implementation and evaluation of educational technology initiatives. This was echoed by a teacher during the teacher focus group and affirmed by other teachers. Teacher A stressed that

If the government wants education to improve in Ghana, they should come down to the education policy implementers, us the teachers. Opinion leaders and stakeholders must come down to the grassroots, study us and know us, and know our problems (Teacher A, teachers’ focus group, personal communication November 3, 2004).

The findings and this statement by Teacher A during the focus group clearly indicates that teachers are dissatisfied with their conditions, with regards to their involvement in the planning and executing of educational policies. Although there is no single solution to address issues related to the effective use and integration of computers and related technologies in the curriculum at Twifo Praso secondary
school, it is evident that without addressing the issues that affect the implementers of the technology, such initiatives are less likely to succeed. What is needed is for the Ministry of Education in Ghana, particularly Ghana Education Service (GES) to develop two-way communication channels between them and the schools, since the top-down approach to policy implementation has not yielded favorable outcomes. Also, they need to promote participatory models that will ensure that teachers (the implementers) have the opportunity to acquire the necessary skills that will enable them use computers and related technologies to address the social and economic issues that affect rural communities.

The workshops I organized were a way of demonstrating how computers and related technologies can be used not only in the school and classroom but to address some of the economic issues in the community. The workshops were a hands-on demonstration to indicate to teachers that the use of computers and its applications to the curriculum was not an abstract concept but something that they could do themselves. It was evident, from the workshops, the interviews and discussions around computer technology use the in the curriculum, that teachers were motivated to use computers and related technology to enhance their classroom experiences. The computer was demystified and teachers felt empowered from their interactions during the workshops.
Summary

The objective of this study was to examine and explore how computer technology was used in a rural secondary school in Ghana. Specifically, it addressed the factors that contributed to the use and or non use of such technology at Twifo Praso secondary school. As a case study, the objective was not to generalize the findings but to provide an expansion on the debate on the use of computers in rural schools in Ghana. Single case studies may not be used for generalization, however they may provide insights that may enable people to modify old generalizations (Stake, 1995).

The first question that guided inquiry into this research was: How were computers and related technologies used at Twifo Praso secondary school? The themes that were discussed emerged from document analysis, observations and interviews of teachers, students, district administrators and GES officials.

In answering this question, I argue that the educational technology programs that utilize social and cultural resources of their communities are more likely to succeed. Therefore, it is important to understand the context in which such technology programs occur and how the community or community leadership supports efforts of the school, because learning can only occur when students actively participate and are productive citizens of the community.
The analysis indicates that social and economic issues such as the rural context and lack of financial resources by the community highly impacted access to computers in the community and the applications of computers for instruction at Twifo Praso secondary school. The response of the interviewees clearly supports claims of critical social theory that emancipation can occur through transformative education. Practical and transformative education will enable teachers to gain the skills to effectively use computers for teaching at Twifo Praso secondary school. Teachers feel disempowered due to the lack of knowledge on how computers work and how they can be applied to the curriculum.

Secondly, according to CST, the bureaucracies of the system are enforced to maintain the way things operate in a system. This was evident at the district administration level and at Twifo Praso secondary school. Often people were refused certain information to prevent them from inquiring or questioning certain decisions. And, at the school, the computer teacher did not want to share his knowledge of computers. This was observed during the workshops I conducted for teachers. After the first lesson, the computer teacher did not attend any other workshops because the teachers made comments about how easy it was to use computers, and how the computer teacher often prevented them from using it and continuously told them they would break
the computers. Therefore, as suggested by Fay’s (1987) arguments, a critical social framework, in the form of workshops are needed to enable and inspire the teachers to actively participate in their own education and emancipation.

Issues of use and non-use of computers by teachers was complex. This research revealed that teacher training on computer use was not enough for them to apply it to their teaching and management of the classroom. Although this may be true for most teachers, other teachers also took the initiative to expand the knowledge they had received by practicing on their own. This raises the debate on who is responsible for further training and upgrading of teacher computer skills; is it the teachers or should there be a government policy compelling teachers to use technology in their classroom or should there be in service training? The answer lies in both the teachers and formulators of educational policies. A continuous technology training program could provide teachers with learning opportunities. However, if teachers learn the technology and do not apply it, technology initiatives are less likely to succeed.

In answering the second question of this research; What can be done to improve access to computers at Twifo Praso secondary school, I first looked within the school and community to determine what initiatives were available to improve access to technology. The initiatives proposed by
the Twifo Praso district administration that directly impacted access to technology by students, teachers, and community members were the establishment of the ICT center and distance education. The ICT center doubles as a computer lab for schools in surrounding communities to get access to technology. Also, the ICT center is used for the training programs that could be helpful to community members. In addition, the distance education initiatives will assist in the professional development of teachers and increase access to education in neighboring schools through technology.

Chapter 5 offers further recommendations on how to improve access to computers and related technologies in a rural school like Twifo Praso secondary school.
CHAPTER 5
RECOMMENDATIONS AND CONCLUSIONS

The use of computer technology at Twifo Praso secondary school is ongoing. As a rural school implementing the Ghanaian government education initiative to integrate computers and related technologies in education, the school is confronted with how to whip up the interest of teachers to use computers for instruction and class management, and how to train them to do it effectively.

In this section, I provide a summary of my findings, recommendations, a model for the integration of computers and related technology in a school like Twifo Praso secondary school and suggestions for future research.

Summary of findings

Computer technology at Twifo Praso secondary school

This research determined that there are computers at Twifo Praso secondary school. The computers were acquired through a $50,000 ($5.15 US) per term technology fee which all the students had to pay. The school had purchased fourteen computers to begin computer technology lessons since part of the final examinations for some of the subjects such as integrated science had technology components. Indeed, the students were taught computer literacy by the JICA (Japan International Cooperation Agency) volunteer, M. Honma, and not the designated computer teacher, G. K. Allotey. The
lessons were not applied to any subject area; they were on basic word processing skills in Microsoft Word. M. Honma used a rotational system and a two page user guide to ensure that all students, particularly those in their final year, had the opportunity to use the computers. Student rotations were slow because, of the fourteen computers, only five were functional during my visit, which translated to fewer students in the computer lab per session. Also, M. Honma taught computer lessons during his spare time since he was not the designated computer teacher.

Apart from M. Honma, the JICA volunteer, none of the Twifo Praso teachers, assistant headmaster or administrators were observed using computers. Inquiry into this revealed that, although teachers had had some form of computer training, none of them were comfortable enough to use computers for any school related tasks. Most of the pre-service training they had received was theoretical. For those who used the lab, computers were primarily used for typing school notes. Also, teachers did not know how to apply computer technology to their subject area. The teachers attributed their lack of use of computers to the inadequate training of teachers in the effective use and integration of computer technology in a school curriculum and social and economic factors related to living in rural communities.
Community based initiatives

The Twifo Praso community is unique in that the Twifo Hemang Lower Denkyira district (THLDD) administration is actively involved in improving access to technology in this rural community. The two main district initiatives aimed at increasing access to education and technology were the establishment of the Twifo Praso ICT center and the development of a distance education program for teachers and students.

The Twifo Praso ICT center was established in 2001 in the THLDD district capital, Twifo Praso, to promote the awareness of and increase access to technology among schools and community members in the district. The ICT center served as an Internet café and a training center for community members and schools in surrounding communities. Although the ICT center is a laudable venture, the sustainability of Internet connectivity and access to the community were issues of concern. The cost of Internet connectivity was high (at $1,200 US per month) and this translated to high fees for Internet use at the café leaving patrons with the choice to either use the ICT center or provide for themselves. Also, Internet connection was unreliable, with frequent periods of no connection. In addition to connectivity and cost issues, technological expertise and the lack of user guides for patrons was an issue at the center. J. S. Effah, the coordinator of the district ICT
center, was the only person who had sound knowledge of computers in the district administration. The lack of user guides also contributed to low patronage of the ICT center since attendants did not know much about computers and could not offer patrons with alternative resources.

The distance education program was another initiative instituted by the THLDD administration to improve access to education in the district. The largely rural environment of this district has contributed to the unwillingness of qualified teachers to work in the area. And, in some communities, schools had to be consolidated due to the lack of teachers, forcing students to walk long distances before reaching schools. A combination of these factors led to the realization that a distance education program could curb some of these problems. By providing community based centers with computers and Internet connectivity, electronic resources and television sets, students could get access to televised educational programs. Also, through the technology and resources, students could follow national curriculum and syllabus in the absence of teachers. Although the distance education program had not begun when I was at Twifo Praso, officials at the GES district offices commended the initiatives and were collaborating with the THLDD administrators to facilitate the program.
Recommendations

Often technology initiatives focus on the technology, an approach which Lockard, Abrams and Many (1997) identified as technology infusion. The infusion of technology at Twifo Praso secondary school had occurred. The teachers at Twifo Praso secondary school indicated that the computers at the school were few and the school needed to acquire more computers. Teachers also mentioned the need for government to provide teachers with computer allowances to enable teachers to purchase computers for their personal home use. The findings from this research established that teachers did not use the computers at the school, mainly because they did not know how to apply it to their teaching. Also, access to computers for both teachers and students was an issue. There is therefore a need to improve access to computers and re-orient teachers into understanding the main function and purpose of computers and how to effectively use them.

In this section, I identify a number of technology related activities, based on my discussions with teachers, students and community members that could encourage teachers and staff at a school like Twifo Praso secondary school to use computers. The recommendations are based on my discussions with the interviewees.

Leadership (school-GES relationship)

Fullan (2001a) asserts that successful leadership using technology in education requires involving people at
different levels. Kearsely and Lynch (1994) argue that leadership for instructional technology requires “technology leaders . . . [that] know what population to work with and, then, through a combination of managerial skills, personal communication, and influence, lead the way to a visionary reality” (p. 8). Such leadership involves government, district administrators, principals, innovative teachers, technology specialists, and individuals that can take up leadership roles in its initiative.

The integration of computer technology in the education curriculum at the senior secondary level in Ghana has been delayed due to the absence of an orchestrated plan for implementation. The approach to teaching computer literacy and the absence of the integration of computer technology in the teaching of subjects at Twifo Praso secondary school indicated that there was no systematic approach to integrating computer technology in the school curriculum. The impression I got from my study on how computer technology was used at Twifo Praso secondary school is that, there is the awareness of a government policy spearheaded by the Ghana Education Service. But the initiative to acquire and use computers for the school’s computer literacy program is usually the concern of the school’s management. What is needed in a school like Twifo Praso secondary school is a model for the implementation of the policy on computer integration in the school’s curriculum. Such a policy will
provide an unambiguous guide for the effective integration of computer technology in the curriculum of the school which school administrators, teachers and all other staff can follow with relative certainty.

Before a model for the effective integration of computer and related technology is developed, there is a need for a national information and instructional technology policy that will guide instructional processes and the effective integration of computers and related technology in education. The policy should allow flexibility and adaptability to enable educators and learners to maneuver within the parameters of the national technology policy to achieve its objectives.

In chapter one, I provided a chronology of the development of educational policies in Ghana. It was not until 2002 that a technology related policy, specifically targeted at pre-tertiary institutions was developed (Introducing information and communications technology in pre-tertiary institutions: A policy framework). Also, in 2002, a review of Ghanaian education and how information and communications technologies (ICTs) could assist in the improvement of education was conducted (Dzidonu, 2002). The policies and educational reforms identified what needed to be changed in Ghanaian education. However, Rusten (2003) asserted that most educational reform policies focus on the identification of what needs to be changed or what is wrong
with the educational system instead of how or what can be done to improve education. To ensure that computers and related technology are effectively implemented in rural schools like Twifo Praso secondary school, three questions need to be addressed to ensure success; the ‘what’, ‘why’ and ‘how’ computers and related technology can be integrated in a school’s curriculum.

The ‘what’ question should identify the national goals and objectives of the country and how information and instructional technology will assist in satisfying those goals and objectives; the ‘why’ question should address why information and instructional technology is important to achieve those objectives. The present Ghana ICT policy vaguely mentions the need for the development of a ‘dynamic curriculum’ but stops short of expanding on what that dynamic curriculum is and why it is needed, and finally, the ‘how’ question should outline a detailed plan of how to plan, develop and implement this ‘dynamic curriculum’.

The issues that recur in the policies that have been formulated since 1997 are

1) increasing access to education,
2) the improvement of efficiency and management of education
3) an increase and emphasis of the use of science and technology in schools,
4) making the use of information technology mandatory in schools.
While these are laudable objectives, they are often difficult to achieve, especially in rural schools. It appears that when issues related to improving access to education and the integration of computers and related technology in education are formulated by policy makers in Ghana, there is almost always the tendency to leave out the planning of how to implement and sustain such initiatives. This is a bureaucratic bottleneck that needs to be checked, as suggested by Ayee (2000).

Against this backdrop the question to ask is; what then is the problem with the education system in Ghana and why would the integration of technology in education be the solution to the problem? The educational reforms of the 1980s and 1990s have not resulted in desirable outcomes (Agyeman et al., 2000). The latest education reform is the Free Compulsory Universal Basic Education (fCUBE) of 1994 that seeks to address the failures of the earlier reforms targeted at the basic education system (K -12). One issue that the fCUBE policy does not address is the possibility of the failures emanating from the pre-service and in-service educators, because if the educators are not equipped with the requisite tools for effective teaching and learning, it is unlikely that educational reforms will yield desired outcomes.

To develop efficient and effective curricula, it is imperative to use innovative approaches in instructional
planning. Three issues need to be addressed to ensure successful innovations in education;

1) Teachers who are deeply concerned about their teaching effectiveness and who are motivated by a desire for improvement,
2) Administrators who are willing to encourage and support those teachers, and
3) a carefully designed plan for developing improved instructional practices (Kemp, 1977, p. 4).

Collaboration for an effective integration of technology in education also requires leadership that is willing to share power and change the organizational structure to make it more efficient. Research indicates that effective leadership emphasizes shared vision, shared power and shared action rather than control and command (Yukl, 2001), as desired in an instructional design process. In addition to shared leadership and vision, Bolman and Deal (1997) suggested that another element that needs to be addressed when introducing new innovations that will bring about organizational (school) change is the culture of the organization. Leaders have to understand the cultures of educational system which plays out in the schools in order to bring technological change to these environments.

School cultures are complex traditions that have been developed by students, parents, teachers and even
administrators that impact the accomplishments of an organization. A school’s culture has an enduring impact on how people think and behave. Although the cultures of individual schools may vary, there are some general characteristics that apply to the Ghanaian education system, especially the public school system. It is characterized by low morale in teachers, lack of infrastructural and instructional capabilities, and a relative lack of supervision, as was evident as Twifo Praso secondary school. All these characteristics have led to a ‘toxic culture’ (Deal & Peterson, 1999) which is characterized by the development of subcultures within the culture, the focusing on negative values and people becoming exclusively destructive, not only to themselves but to the entire education system.

In Twifo Praso secondary school, it was evident that there were negative sentiments with regards to teaching and access to information and, computers and related technologies. It appeared that there was fragmentation in the school, particularly between teachers and administrators. Teachers were of the perception that, and did not believe that, education in the rural schools could be improved. They blamed students for not learning and parents and the community for not providing the best children to the school. As indicated in chapter 4, teachers felt that students that attended Twifo Praso secondary
school often had the lowest grades and were rejected from good schools.

It is important that the negativity within TPSS is addressed in order to facilitate the successful use of computers and related technologies at the school. Over the past couple of decades, theories have emerged to bring about change in organizations, and what factors to consider when implementing such change. Theories and models of the processes of organizational and instructional change provide indicators of how change affects societal behaviors under different circumstances. They offer foundations for planning, introducing, and evaluating educational reform and technology projects.

The identification of the issues within an organizational structure of the Ghanaian education system that need to be addressed before and during the introduction of technology is the beginning of the technology innovation, development and implementation process. According to Rogers (1995), the diffusion of an innovation, in this case, the diffusion of technology in education, begins with the “recognition of a problem or need [that will] stimulate research and development activities designed to create an innovation to solve the problem/need” (p. 132). In this regard the diffusion of technology in the curriculum needs to start with a curriculum evaluation and the development of
Ghana’s instructional design process, as stipulated by the standards set by the education policy.

With such foundational starting points, leadership for the effective integration of technology in education in Ghana should incorporate national goals with instructional technology principles, and allow for flexibility to enable communities to modify their instruction based on their needs but within the confines of the national plan and standards. Blenkin, Edwards and Kelly (1997) assert that the success of any change process in an organization is dependent on the coordination between the macro level (district education structures) and the micro level (school). In this case, the district education administrators in collaboration with the Ministry of Education at the national level are responsible for formulating policies, communicating national policies to the schools and ensuring that the national curriculum is followed. The schools are, in turn, responsible for complying with national educational technology policies.

During my observations at Twifo Praso secondary school, neither the headmaster nor the assistant headmaster was observed using computers for any administrative or management work. During one of my visits to the school, the bursar together with the assistant headmaster had produced a handwritten list of students that was to be used to send students home to bring their school fees. I also observed and overhead some students talking with the assistant
headmaster and bursar, saying that they had paid their fees, and one student even produced a receipt. It appeared that such information was not recorded in the bursar’s accounting book or system.

Such observations raised concerns about what the staff, teachers and administrators at the school understood to be the integration of technology in the curriculum. The use of computer technology in processing some of these minor managerial tasks could go a long way to prove how vital computer skills and integration of technology in the school curriculum is. When I prompted the headmaster, H.K. K. Graham, on the use of computers by the teachers in the school, he indicated that he had had training, similar to what the secondary school teachers had. However, during his teaching period at Adisadel College, teachers voluntarily used the computers for their work with little or no urging from the headmaster. He recounted the following experience:

When I was at Adisadel College, the school made it possible for all teachers and staff to have some knowledge in computing. So when I was transferred here, I thought of implementing the same program in this school (personal communication, Nov 9, 2004).

He attributed the lack of use of computers by teachers and staff to the caliber and attitude of teachers that the school had. This was supported by the district education
director, R. V. Longdon, who asserted that most of the teachers at the secondary school had become "stale and difficult to train" and, some of them had become so "engrossed in the farming and forgotten that they are teachers".

The headmaster had been there for two academic years and was in the process of streamlining and computerizing the administrative system at the school. His vision was to integrate computers and related technology into the entire administrative system at Twifo Praso secondary school when they move to their new buildings in January 2005. According to him, the computerization of the administrative system would involve the admission of students, the collection of fees and preparation of bills for parents, and school and class management with regards to grades and the printing of reports. In addition to the computerization of the school, the headmaster had proposed an ongoing teacher professional development technology program to be held regularly at the ICT center. He also expressed the notion that he hoped the teachers would take advantage of professional development initiatives and the distance education program which was being championed by the district assembly.

From all indications, the Twifo Praso headmaster has a great vision for the school. However, at the end of the interview, he informed me that he had been appointed
headmaster of Adisadel College and was leaving Twifo Praso secondary school to lead his alma mater.

The literature (Brockmeier, Sermon, & Hope, 2005) indicates that principals (headmasters) were viewed as important determining factors in the use of technology in their schools. Also Creighton (2003) and Anderson and Dexter (2005) state explicitly that school administrators and principals should have administrative oversight on educational technology use in their schools. Principals should not only know how to use the technology but they should be able to communicate with others and carry out their administrative duties using the technology.

School Technology Committee

The convening of a technology committee is the first step to developing a technology plan for the school. An effective team should take advantage of the expertise in the community and input from parents, students, teachers and the district Ghana Education Service (GES) office. Teachers are very important in this process since teachers are often given the task of implementing technology programs and educational reforms formulated and initiated by government. According to Sayre and Wetterlund (2002) the success of technology programs in educational institutions is highly dependent on the implementers of the programs, mostly teachers. Teachers need to be involved in the preparation, planning, implementation and evaluation of the computer
technology projects in their schools. And, as one teacher pointed out:

If the government wants education to improve in Ghana, they should come down to the education policy implementers, us the teachers. Opinion leaders and stakeholders must come down to the grassroots, study us and know us, and know our problems (Teacher A, Teachers’ focus group, personal communication, November 3, 2005)

The resulting input from such a committee with knowledge and experience with technology in education could be the development of a plan based on their expectations on the role of computer technology in the school. It is also important to include people who do not have much experience with computer use in education in order to bring in viewpoints and opinions that the technology savvy people may overlook. Such a committee should be representative of all possible users of the technology.

This committee will be charged with the responsibility of developing a school technology use plan. The development of the school’s technology plan should be broad but must focus especially on how it can facilitate teaching and learning process - how can technology be used to enhance learning at Twifo Praso secondary school and what skills and equipment do the teachers need to use it in teaching and
what skills do students need to acquire to compete in an
information society.

In addition to that, the technology committee should be
aware of the school’s budget for technology. At Twifo Praso
secondary school, students paid €50,000 ($5.15 US) per term
as a computer fee. It was unclear if the district education
office allocated money for technology in the school. The
money collected from the students was used to purchase the
computers. This infusion of technology into the school was a
step in the right direction. However, the budget should not
only be used for the purchase of hardware. The technology
committee should be aware that technology is always evolving
and there will be a need to review their technology plan
periodically, and upgrade them accordingly.

Also, software is highly crucial to the learning
process. Twifo Praso secondary school had Microsoft Office
on their computers. Although integrating technology in
education requires many more applications than Microsoft
Office, given the limitations in the budget and with the
guidance of the technology committee, a plan could be
devised on how to apply Microsoft Office into the
curriculum. That seemed to be an area of critical concern at
this school. Teachers were not aware of and did not possess
the knowledge on how to apply the software in their subject
areas. Therefore, computer classes were taught independent
of any subject. The technology committee could be tasked
with the development of materials for the integration of technology in the curriculum. By making such materials available to teachers, it will create awareness of how teachers can enhance learning through the use of computers and related technology.

**Professional Development of Teachers**

Teacher training in the effective use of computer technology for instruction is more critical than the acquisition of hardware and software (Sayre & Wetterlund, 2002; Tarleton, 2001; Hoogveld, Paas, Jochems & Merriënboer, 2001; Hammond & Mumtaz, 2001; Lang, 2000; Bakar & Mohamed, 1998). As indicated by these authors, teachers that lack basic computing skills and knowledge were less likely to use computers for any aspect of their teaching. The teachers at TPSS acknowledged the need for professional development opportunities to improve their knowledge in the applications of computers and the Internet in the classroom, and enhance their teaching skills. They often spoke of how the computer training they had was limited to theory, and that when they were taught, there were many people to one computer to the extent that most of them did not even have the opportunity to use the computer on their own. Therefore, at the end of the training, most teachers could still not use the computers. Although there were insufficient opportunities for hands on experiences during teacher training, the comments from teachers indicated that the issue is not one
of a lack of training opportunities, but a situation where training was not directed at implementing and applying the technology in the classroom.

The professional development of teachers is very crucial for the effective integration of technology into the curriculum (Bakar & Mohamed, 1998). Most of the Twifo Praso secondary school teachers had some computer training. The biology and computer teacher, G. K. Allotey had received a one time professional development opportunity. Research (Shelton & Jones, 1996; Hawkins & MacMillan, 1993) has shown that traditional one time sit down training sessions are not effective in making teachers comfortable enough to integrate technology in a school’s curriculum.

A well organized, continuous professional development program that includes the school’s curriculum and a monitoring and evaluation system would be appropriate for a school like Twifo Praso secondary school. Similar to the professional development opportunities that teachers have to further their education, the technology committee could, in coordination with the district education office, communicate the technology development needs of the teachers to national offices in charge of technology integration in school curricula so that any professional development initiatives will factor in those needs. Such a program should be available throughout the year. For instance, there could be training on a particular application each month. Equipped
with such a yearly continuous professional development calendar, teachers will be aware of training opportunities available to them. Such a program could be weaved into the school technology budget so that training will be of no cost to the teacher, since cost of technology training was an issue for most teachers.

The evaluation of the professional development program will emerge from the mandatory use of technology in the curriculum. By integrating technology based on the training received, issues will be raised by the challenges faced in the classroom. This will spur the evaluation of the training program to include teacher concerns and ensure the improvement of learning. Because teachers will be part of the technology committee and they will be at the forefront of the implementation, they will be in a better position to develop and implement a technology plan that they come up with.

Teachers need training in class management and integrating computer technology into the curriculum not as a standalone subject, as taught by the JICA volunteer. Teaching computer literacy is important but teachers also need to be able to apply the technology to their subject area. Teacher training should involve

1) Introduction to computers and the Internet for teaching and learning.
From my observations during the workshops I conducted at the school, it appeared that teachers needed training in basic computing such as introduction to hardware, software, the Windows environment, file management (saving and retrieval), and the Internet. My first workshop was on basic computing skills. Subsequent workshops built on the knowledge they had acquired and I observed that those who did not attend the first basic computing class were often confused when I asked them to perform simple tasks like saving and retrieving files.

2) Collaborative and Individualized learning.

The integration of technology in education should not be limited to use by teachers for class management. Since the objective of using technology is to enhance learning, students should be active participants in the process; making the teacher a facilitator of the education process. Teachers should be trained in the creation of projects that will promote collaborative learning in students. This is important since it will equip students with skills for the workplace. In order to achieve this, it is important to involve teachers and community members in the technology committee to help develop collaborative projects. In addition to collaborative learning, training in individualized learning is important, since students will be required to do some projects on their own. This will give them the opportunity to work alone with computers, and boost
their confidence and competency levels in the use of the technology.

3) Class management

Twifo Praso secondary school teachers need training that is directed. Directed training is defined as training that will give them the opportunity to practice and see how to, for example, use Microsoft Excel to manage their class. Teachers and administrators need to be trained on the actual applications and not the features of the software. Class management involves managing of grades for various tests and exams, keeping daily records of student attendance and monitoring individual student performance.

Teachers also need training in software installations and minor troubleshooting. A school like Twifo Praso secondary school does not have any of that and often have to wait for days to reach someone in Cape Coast, the regional capital of the Central region, to fix the computers. Also, teachers need training in hardware, especially basic setup of computers. While at the school, I observed that some of the computers were not functional and the JICA volunteer had to request the services of a private company in Cape Coast, which is about 70km from Twifo Praso. The computer technician did not come to the school during the period I was there.
4) Applications of computers in real life situations.

This is particularly important for students at Twifo Praso secondary school since most of them come from farming communities. They can learn how to manage their farming businesses better. Another example is the collection of data from the weather station which will be useful to farmers.

In addition to the training of teachers, there needs to be development of a network for teachers to enable them to communicate with other teachers and professionals in or outside Ghana. Lessons can be drawn from the Enlaces project in Chile where virtual spaces for teacher interactions have been created (UNESCO, 2001). Through such a network, teachers can share ideas and find solutions to various challenges they face. Also, it will provide teachers with security, knowing that they are not alone.

School-Community Relationship

The improvement of the relationship between a community and school is very important, particularly, in a community like Twifo Praso where the district administration is actively involved in bringing technology not only to the community but to the school as well. The coordinating director of the Twifo Hemang Lower Denkyira district (THLDD) mentioned that, nowadays most donors require that communities provide matching funds for any projects that require funding. Thus by strengthening the relationship
between the school and community, communities could participate in the support as well as learning process.

Studies in Ghana on community-school relationships in rural schools revealed that community members were often apathetic in terms of their involvement in local schools (Asare-Bediako et al, 1995; Pryor & Ampiah, 2003). Participation in school activities was attributed to the lack of initial involvement of parents in school activities, and social, economic and political factors. According to Pryor and Ampiah (2003), power imbalances between educated teachers and informally educated and ill-informed parents often led to lack of trust between village teachers and the community. Although this was not evident during my research, one teacher, E. K. Buah, informed me that, in his two years at the school, there had been no parent-teacher association meeting. Even when meetings were called, parents did not attend.

Rural communities that do not have the infrastructural and financial capabilities to purchase computers could look at other less capital intensive initiatives to begin the process of technology integration in the school curriculum. One option could be the one computer classroom, as suggested by Kahn (1998). The projection of materials on the computer could be done either by connecting a computer to a television or to a projector so that all students can see and participate in activities as information is input into
the computer. Another option that could be explored is the development of community learning centers. Most Ghanaian communities, urban or rural, have community centers that are used for convening meetings and other community activities. Such community centers could be developed for use as a telecenter. The telecenter / lab concept should emphasize access to basic education through computer technologies, and also offer multimedia facilities that could be used by schools and the community as a whole. Such telecenters could provide a wide range of services to underserved communities including distance and traditional education. A key to ensuring that such services and instruction offered at the community telecenter is effective are good instructional strategy.

The delivery of instruction can range from a typical classroom lesson to the use of interactive e-learning and web based lessons. Given the characteristics of a rural school like Twifo Praso secondary school and its communities, the delivery of instruction could draw lessons from the methods used for the integration of technology in education in Mexico (Estrada, 2003; Calderoni, 1998) and Brazil (Herrán & Rodríguez, 1999).

Mexico’s Telesecundaria was developed about three decades ago in response to teachers’ unwillingness to teach in rural schools, particularly at the middle school level. This model for the deployment of technology in rural schools
in Mexico was initially characterized by the delivery of instruction through television with the support of a teacher on site. After three decades, the methods of instructional delivery have become more sophisticated to include satellite connectivity that beams over a wider range of people in the country. In addition, the networks have been developed such that distance learning programs are available not only for students but for teachers as well for their professional development.

In contrast to Mexico’s Telesecundaria, Brazil’s Telecurso utilizes similar strategies to target adult learners who dropped out of school, and those who would like to return to school by delivering instruction through television and radio. The objective was to use television and radio as instructional tools to assist the adult learners to gain skills for the job market. The success of these two models in rural communities has been impressive. Research indicates that students enrolled in the Telesecundaria have improved significantly in their test scores although it is not yet at the level of those in conventional classrooms in urban settings.

Drawing lessons from these two successful models, the community ICT center needs to tailor services it offers to the needs of the patrons: students and community members who visit it. The objective will be to prescribe a method, which when modified can be applicable to different types of
content. It should also entail a lesson plan which will outline the objective of the lesson to be learned and how the material will be delivered. Also it will describe how students will be evaluated to ensure that the material that was delivered achieved its stated goals.

Twifo Praso secondary school could also improve community-school relations by providing technology related services to the community at a small fee. This will enable the school to get community support, including funds for the maintenance of the school’s computer facility. The school can generate extra income through Internet access at a fee. It can also offer services like photocopying, scanning, desktop publishing for a fee. The center could provide such services to the community through skills acquired by the students and this could be seen as diversifying the careers available in the community. For example, a rural school in Grenada developed and provided computer classes for community members in the evenings and on weekends. This program increased technology literacy in the community and also helped generate funds for the maintenance of equipment in the school and the salary of the computer teacher (Bosch, 1994). The outcome was improved relations between the school and community. Such an approach at Twifo Praso secondary school could provide opportunities for teachers, community members and the school to interact while community members
receive services from the school through student workers with the support of teachers.

To make the Twifo Praso secondary school computer lab a facility that supports computer technology integration, the school’s effort to integrate computers and related technology in the school curriculum should have the following characteristics: 1) community members, teachers and students should work towards a shared vision as partners working towards the same goal. 2) There should be a coherent curriculum that empowers students by emphasizing creativity through technology and projects relevant to the Twifo Praso community. 3) And, there should be a system for evaluation and monitoring to ensure continuous improvements in learning experiences.

A Model for the Integration of Educational Technology

Having had the opportunity to study the use of computers and related technologies at the Twifo Praso secondary school, I propose a model of planned action that could be used to systematically improve the use of computers and related technologies in a rural school curriculum using my experience at the school as the basis of my proposal. Although the Twifo Praso district administration has commendable initiatives to improve access to technology, this model should be considered as a model for intervention that could change how teachers perceive computers, provide them with resources and training and motivate them to
innovatively use computers and related technologies in their teaching.

Most of the interviewees identified the link between education and development, and were quick to identify some of the social and economic factors that impede education. Indeed, no single solution exists, but it is crucial that any new approaches to improving education must include the development of cognitive abilities, encourage collaborative learning, and provide learners with tools to compete in an increasing global world. While most of the interviewees as well as research as reviewed in chapter 2, acknowledge the importance of computer and related technologies for education, it is important to recognize that technology is not the solution to all educational problems. Technology can only assist and provide innovative approaches that may be used to address educational problems. Models are always useful for the provision of a framework within which changes in education can be addressed. Kohl (1996) asserts that without the guidance of models things remain unchanged and people are left directionless.

For a school like Twifo Praso secondary school to be able to fully integrate computers and related technologies in its curriculum, a model for the integration of such technologies is necessary. This could ensure that district education administrators as well as school administrators and teachers are well informed and follow procedures for
implementing the integration of computer technology in the school. This is necessary because any initiative to change the style of school instruction and management always involves complex processes during the implementation. So, the idea of a model is to provide a graphic conceptualization of the complex process of implementing computer integration into the curriculum of a school like Twifo Praso secondary school in a simple manner so that it will ease the process of implementation especially by school administrators and teachers as they deal with their numerous complex tasks as educators.

The integration of technology in education involves the actual process of using computers and related technologies for learning activities that support the curriculum. Often, this is confused with the infusion of technology which is merely the physical presence of computers (Lockard, Abrams & Many, 1997). At Twifo Praso secondary school and indeed at the Twifo Praso ICT center, what has happened is largely the infusion of computer technology in the school and community, and the effective integration of these computers in the activities of the school and the people is yet to be realized. Although I do not seek to generalize my observations at Twifo Praso secondary school, it appears that the Twifo Praso reality could be experienced in most rural schools and communities in Ghana. This model of computer technology integration is applicable to the Twifo
Praso secondary school’s effort to help implement government policy of computer integration in the school curriculum but, I will cautiously argue that the model may be applicable to almost all rural schools in Ghana.

The objective of integrating computers and related technologies in schools is to improve learning. Such a model for Twifo Praso secondary school will emphasize a development approach to computer technology integration with an emphasis on context, content and the use of prior knowledge. Additionally, this model focuses on the monitoring and evaluation of instructional practices which could lead to the development of an evolving system that meet the needs and changes in a context. The objective is not to replace existing models but to complement those models by assisting in addressing issues in a particular context, taking the needs of a school and community into consideration.

Refer to Figure 2 for a model for the integration of computers and related technology in a rural school like Twifo Praso secondary school. The model summarizes the recommendations outlined earlier. This model has unique features in that the district administration of the Twifo Hemang Lower Denkyira district (THLDD) is also involved in increasing access to technology in the community.
Figure 2: Model for computer technology integration in the Twifo Praso secondary school curriculum

**Ghana Education Service (GES)**

**Functions**
- Communicate national policies and goals to schools
- Provide school syllabi
- Monitor schools
- Evaluate technology programs in school to ensure they follow national standards

**School**

**Oversight**
*Technology Manager/Leader*
- The Principal/Headmaster

*School Technology Committee*
- Principal, teachers, student representative

**Functions**
- Assess school technology needs
- Procure software and hardware needs of the school
- Develop strategy to implement syllabus
- School technology budget
- Develop user guides & tutorials
- Internal evaluation system

**District Administration (DA)**

**ICT center**
- Access to computers and Internet to community
- Technology training programs for schools (primary and secondary)

**Distance learning program**
- Provide access to education to teachers and students

**Collaborative initiatives between GES, School, DA to provide**
- Professional development of teachers
- Funding sources for technology programs in school, i.e. school technology fee, government subsidies
- Access to distance learning programs
- Ensure training for schools at ICT center follows national syllabus
In examining how computers and related technology can be integrated in rural schools like Twifo Praso secondary school (TPSS), I argue that the relational model that describes how data are represented and shared between databases could be adopted to ensure the successful and effective integration of technology in the curriculum. The relational model represents data or information in tables (Luce, 2001). According to Luce (2001), a table could be an organization, person, event; it could be anything about which information is collected. Each item or feature in a table represents information related to a specific organization. The arrows between the tables represent a collaboration or relationship between the various organizations.

I use the relational model to illustrate how computers and related technologies can be integrated into the school curriculum at Twifo Praso secondary school because it could help the school to systematically plan and acquire the needed resources for the integration process. The model will help Twifo Praso secondary school and perhaps similar schools in streamlining their computer related programs because of the following reasons:

1. There are various entities involved in the process of implementing policies and programs aimed at the integration of computers and related technologies in the school’s curriculum; the school, the district Ghana
Education Service and the THLDD administration. Each is represented by a table and there needs to be collaboration between them. The involvement of each entity that is, Ghana Education Service (GES), Twifo Praso secondary school and the district administration, could increase access to computers and related technology. And, the more access people have to the technology and materials that could assist them with using the technology, the higher the likelihood of integration of computers and related technology into the curriculum.

2. It provides a method for addressing redundancy in the system. The activities of each organization are unique and that prevents redundancy.

3. It provides room for flexibility within the system.

4. It permits evaluations within an organization and of the entire system. Since there is a division of functions based on the expertise of an organization, it would not be difficult to identify areas that need to be assessed and evaluated.

Ghana education service (GES) is a division of the Ministry of Education whose primary responsibility is pre-tertiary education in Ghana. The primary functions of the district GES as planned by this model are to:
1) Communicate national policies and standards to schools at the district level.

2) Ensure that schools receive the required syllabi and materials to ensure that teachers are successful in the classroom.

3) Monitor school activities.

4) Evaluate technology programs in the schools to ensure that they follow national requirements.

The headmaster or headmistress is considered to be the administrative head of a school. In a school like Twifo Praso, the headmaster could initiate the establishment of a technology committee comprised of teachers, GES officials, community members (members of the parent-teacher association) and student representatives to assist in the planning and implementation of the technology curriculum. Such a committee will be charged with

1) Assessing the technology needs of the school in terms of hardware, software and security. In their assessment, they need to determine what equipment and resources (financial, human and technical) are needed to ensure an effective integration of technology in the curriculum.

2) Work on the school’s technology budget. Twifo Praso secondary school has already established a technology fee of ¢50 000 (app. $5.15 US) per term for three terms of the year. On average, each student pays ¢150 000 per
academic year. The purchasing of the initial hardware with the monies they had collected was a step in the right direction. However, the school could consider other technology purchases based on the school’s needs as outlined by the school technology committee.

3) The development of strategies to successfully implement the policy of computer integration in the school’s curriculum. Having established the school’s technology needs and acquired the necessary equipment, the technology committee could develop strategies to ensure the successful and effective integration of computers and related technologies in the curriculum.

4) The development of user guides and tutorials, and the establishment of an electronic resource center for the school. Twifo Praso secondary school does not have any materials that teachers or students could use to learn about computers on their own. The Japan International Cooperation Agency (JICA) volunteer had developed a two page Microsoft Word user guide which he used to teach the students. The few copies he had were the only ones available. If the school had electronic copies, these copies could be available to teachers and students on demand, and having electronic copies will enable the technology committee to modify and update user guides
to ensure the availability of current information at all times.

5) Evaluating school technology needs and materials. Technology evolves, and the proposed national curriculum may also change occasionally. It is therefore important that the school technology committee establish an internal evaluation system to keep up with the latest technologies and curricula.

The school-community relationship at Twifo Praso presents an opportunity for the district administration, the schools and the community in general to collaborate. The THLDD is involved in two main education related initiatives; the establishment of the Twifo Praso Information and Communications Technology (ICT) center and facilitating the national distance learning program. A collaborative relationship between GES, the school and the THLDD administration could produce outcomes, as shown by the collaboration table. The arrows from GES and the school to the collaboration box indicate the relationship between GES and the schools. The arrow from the district administration indicates collaboration between the district administration, the school and GES that could positively impact the THLDD’s distance education facilitation program and the ICT center training program for the schools in the district who use the ICT center periodically.
Such a relationship and collaboration between the three entities could result in the removal of redundancy and lead to a more efficient system for implementing government’s policy on integrating technology in education. For instance, the district administration is working on a distance learning program for teachers and students within the district. GES, in collaboration with World Vision is developing a teacher training program to begin in primary schools in the district. The GES officials I spoke to were aware of the district administration initiatives, but none of the district administration officials I spoke with were aware of GES teacher training initiatives. The district administration already offers training at the ICT center. However, the type of teacher and student training that was offered was very basic. Therefore collaboration between the district administration and GES could lead to a training program for teachers and students that is grounded in pedagogy. This will provide an accessible training program and concentrate efforts in one training program.

Some of the possible outcomes of collaboration between the school, GES and the district administration are:

1) A continuous teacher training program on the uses of computers and related technologies in school curriculum could be established. Teachers at Twifo Praso secondary school acknowledged that they had prior computer training but the training was insufficient to make them
comfortable in using computers in their subject areas. The workshops I conducted indicated that teachers were willing to participate in technology related workshops, if they were available. Equipped with materials from a technology expert or the materials developed by the school technology committee, teacher training programs could take place at the ICT center at no cost to the teachers. The Twifo Praso ICT center also provided training to schools from neighboring communities. Through collaboration between GES and Twifo Praso secondary school, the ICT center could use the materials developed by the technology committee or contract the services of the Twifo Praso secondary school technology committee to develop training and support materials that are relevant to the national curriculum.

2) The establishment of a district education technology fund could be realized. Although teachers were eager to attend computer technology workshops, they were unwilling to pay for them. Twifo Praso secondary school had already put in place a technology fee to pay for the technology needs of the school. In addition to the school technology fees, the availability of government grants to supplement school technology budgets and programs would go a long way to support school technology integration efforts.
3) Collaboration between these three players; the school, GES and the THLDD administration, could enhance the district administration’s distance learning program. By tapping into the resources and technical expertise that will be established in the school, the THLDD administration could enhance its role as a facilitator of national distance learning programs with other materials and resources at the ICT center, that are not only relevant to the national curriculum but also appropriate to the rural context.

The aforementioned outcomes of collaborations between GES, the Twifo Praso secondary school and the THLDD administration lay the foundation for the type of implementation interaction that should be developed in order to achieve the national goals and objectives regarding ICT integration in education. Prior to implementation, a pre-assessment of this model should be conducted to determine the specifics of the process such as what pre-requisites need to be or have been completed and what is it that educators know about the integration of technology in education to prevent duplication of efforts. Also, a pre-assessment may determine what implementers at the schools may not understand or know what they have to implement.

Monitoring and evaluation are crucial to the integration of computers and related technologies in a
school's curriculum. Monitoring and evaluation involve summarizing the integration process by giving a synopsis and description of the delivery of technology and determining whether the technology has achieved its intended objectives, in terms of its impact in the short and long term. There are two types of evaluation; formative and summative evaluations that are relevant to computer integration as proposed by Morrison, Ross and Kemp (2001).

A formative evaluation should be conducted to determine the specifics of the process. It should be conducted early on in the process to allow for the revision of the initial plan to make it more adaptable to national objectives, and also allow for flexibility in other local contexts. Also, such an evaluation will assist the instructional design process by examining the delivery of the technology being introduced, the quality of its implementation and the assessment of the context of the implementation of the technology. This approach will assist in improving the system of delivery or find alternative delivery processes should the initial process fails.

Similarly, a summative evaluation should be conducted. As an outcome evaluation it will determine whether the integrated technology had an effect on the intended population by addressing the targeted problems. Such an evaluation could help determine the overall effects, both intended and unintended outcomes of the implementation of
the technology integration model. It could incorporate a secondary analysis using existing data to address concerns that were not initially addressed. Such evaluations could be done both at the district and school level. A summative evaluation at the district level should include a comprehensive analysis of the process of integrating technology in the curriculum to compare the findings in other parts of the country to determine the overall outcome of the implementation process.

An efficient and effective model for the integration of technology in education is one that will enable those in charge of education and delivery of instruction to make decisions that are optimally adaptable to diverse communities of learners at the school level. This model makes room for continuous evaluation and improvement, and offers a way of promoting a flexible implementation process that explores the use of various resources and support to introduce technology in education that may be used to address the needs of a school and community.

A Critical Social Examination of Computer Technology Use at TPSS

The discussions I had with teachers at Twifo Praso secondary school indicated that teachers were generally dissatisfied with their conditions, with regards to their involvement in the planning and executing of educational
policies. The discussions I had with them created spaces of enlightenment, which is sometimes referred to as the raising of consciousness (Fay, 1987; Agger 1998). In his discussions on the enlightenment, Fay (1987) argues that enlightenment is the beginning of process of emancipation, in this case, empowerment. To have the practical force it requires, critical theory must become “an enabling, motivating resource for its audience – it must empower them. This empowerment has emancipation as its goal” (Fay 198, p27-29).

From my discussions with teachers, local district administrators, GES officials and document analysis, it appears that teachers have almost always been excluded from discussions surrounding educational reform and the uses of computers and related technologies in education. Teachers were of the perception that they are insignificant and are only there to implement educational reform but not be part of the planning process. Also, with regards to computers and related technology use in the curriculum, teachers acknowledged the importance of such technologies but could not express how they would use it or apply it to their various subjects and the rural context.

Secondly, CST raises the issue of people’ dissatisfaction with their condition. Rural communities are often associated with the lack of basic amenities and infrastructure. Teachers expressed that their rural context made their profession unsatisfactory. They complained about
the lack of incentives in rural schools, the lack of access to the latest technology and current information for the classroom. They were of the perception that they were sacrificing by being in the rural community and therefore the Ministry of Education had to reward them substantially.

Third, CST addresses the issue of enlightenment though education. The discussions I had with teachers were a form of educational process. Also, the workshops I organized were a way of demonstrating how computers and related technologies can be used not only in the school and classroom but to address some of the economic issues in the community. The workshops were a hands-on demonstration to indicate to teachers that the use of computers and its applications to the curriculum was not an abstract concept but something that they could do themselves. It was evident, from the workshops, the interviews and discussions around computer technology use the in the curriculum, that teachers were motivated to use computers and related technology to enhance their classroom experiences.

Finally, CST offers a framework for the development of a detailed plan for change. The proposed model for the integration offers some suggestions on a plan of action to ensure the participation and involvement of all affected parties; teachers, students, parents, district administrators. If the affected people are not involved in their own plans for developments, such plans are less likely
to succeed. Planning and executing educational reform is a process. Empowerment is also a process. Teachers involved in the planning, implementation and evaluation of computer technology initiatives have to undergo a process of critical self examination as they transform their teaching practices and address how to innovatively and effectively integrate technology in their teaching practices.

Although there is no single solution to address issues related to the effective use and integration of computers and related technologies in the curriculum at Twifo Praso secondary school, it is evident that without addressing the issues that affect the implementers of the technology, such initiatives are less likely to succeed. What is needed is for the Ministry of Education in Ghana, particularly Ghana Education Service (GES) to develop two-way communication channels between them and the schools, since the top-down approach to policy implementation has not yielded favorable outcomes. Also, they need to promote participatory models that will ensure that teachers (the implementers) have the opportunity to acquire the necessary skills that will enable them use computers and related technologies to address the social and economic issues that affect rural communities.
Suggestions for Future Research

This research raises issues that need to be addressed with regard to computer technology in Ghanaian rural schools, and how national education policies aimed at integrating computers and related technologies can be effectively implemented in a school like Twifo Praso secondary school. Given the success of the Telecurso and Telesecundaria models, a study of how similar communication technologies can be linked with Internet technology to provide access to education for all Ghanaians could be explored. Instructional radio and television are currently in use in Ghana for adult education.

Another area of possible research is an analysis of the information technology (IT) and educational policies to assess the feasibility of integrating the current educational system in Ghana and emerging ideas and models on how to integrate technology in school curricula. This research addressed the lack of studies in Ghana on how a rural secondary school is using computers and related technology. As a case study, this research was limited to one school. It would be interesting to duplicate such a research in other rural schools with similar circumstances to determine if there is a pattern across the country.

A comparative study of urban and rural schools regarding their use of technology would be interesting. Various studies on Ghanaian secondary school have indicated
that rural schools lag behind their urban counterparts (Parthemore, 2003; Mfum-Mensah, 2003). However, this case study has revealed that, there could be some rural schools that have the same or similar infrastructure and technological infrastructure as urban schools in Ghana. A comparative study could assist in determining key factors that lead to the use of computers and related technologies for instruction in Ghanaian secondary schools. It would also be interesting to examine technology training programs for teachers and how they prepare the Ghanaian teacher for a technology enriched classroom. Most of the interviewees indicated that they could not remember what they were taught, and for those that had taken computer training classes, their knowledge of computers was limited to basic word processing.

Finally, a follow-up study of this case would be interesting to determine the effect of the model school project by studying computer use in the Twifo Praso secondary school curriculum after the school moved to the new site in accordance with the implementation of the model school project. It would also be interesting to study the impact of teacher training programs on the use of computers for instruction, and how that has impacted student learning in the rural context in Ghana.

This research provided insight into how computers technology is being used at Twifo Praso secondary school in
the Twifo Hemang Lower Denkyira district. It also revealed a unique relationship between the Twifo Praso district administration and the school. The data indicated that the district administration is interested in promoting the use of technology in the community. Through their initiatives, and the cooperation of the Twifo Praso headmaster, the Twifo Praso secondary school was selected to participate in the model school project. Although this study was conducted at the initial phases of the model school project at Twifo Praso secondary school, it is clear that it is a step in the right direction. The findings also suggest that there is a need for teacher training in the effective use and integration of computer technology at the school.
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Appendix A: Interview Guide 1

INTERVIEW GUIDE FOR TEACHERS, HEAD TEACHER(S)

1. What are the problems that you face in the school and community?
2. What are the possible solutions to the problems?
3. Are there computers in the school and how were they acquired?
4. Do you have any computer training?
5. How are you using the computers?, how would you apply technology to the curriculum?
6. What would be your role in a class using computers?
7. What efforts are underway to use computers at the secondary school?
8. What could be done to increase participation and use of computers at the school?
9. What can be done to ensure sustainability of the computers in the school?
Appendix B: Interview Guide 2

INTERVIEW GUIDE FOR DISTRICT EDUCATION ADMINISTRATORS

1. What are your impressions of the school?
2. What problems are the secondary school facing and what has been done to address those issues?
3. Ghana has a vision to connect all secondary schools and training colleges to the Internet – why secondary schools?
4. What is the process of connecting the secondary schools to the Internet? And, what is the progress at Twifo Praso secondary school?
5. How will the computers be used at the school?
6. What should be done to improve accessibility to all students at the secondary school?
7. What strategies have been put in place to ensure participation, community awareness and involvement in the bringing of computers to the school?
8. What training programs are in place for teachers and or parents?

The following questions will be asked if there are computers at the school

9. What was your involvement in bringing the computers to the school?
10. What training took place for the users of the computers, especially educators?

11. What can be done to ensure sustainability of the program?
Appendix C: Research Consent Form

**Title of Research**: The perceptions of a Ghanaian rural community towards the uses of computers in the school

**Principal Investigator**: Beatrice Boateng

**Department**: College of Education, Instructional Technology, Ohio University

Federal and university regulations require signed consent for participation in research involving human subjects. After reading the statements below, please indicate your consent by signing this form.

**Explanation of Research**

**Purpose of the research**

The purpose of this research is to understand the perceptions of a rural community towards the use of computers in the classroom.

**Procedures to be followed**

The data collection method would be to interview participants using the interview guide prepared for this research. The duration of your participation would be a 30 – 45 minute interview. Your comments would be recorded using an audio recording device for analysis.
The audio tapes would be kept confidentially until they are transcribed.

**Confidentiality and Records**

The information collected would be used solely for the purpose of academic research and would not be used for other purposes. Participants have the right to express any concerns during the interviews. Circle the appropriate place.

1. **Anonymity**: Do you want your real name to be used in the report, please indicate Yes or No
2. **Do you want to be audio taped**: Yes or No
3. **Would you like to have a copy of the summary of the research**: Yes or No.

**Contact Information**

If you have any questions regarding this research, please contact:

**Researcher**: Beatrice Akosua Boateng at 740-589-7900 or bk144501@ohiou.edu

**Advisor**: Dr. Teresa Franklin at 740 - 593-4561 or franklit@ohiou.edu
If you have any questions regarding your rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, 1 + (740) 593-0664.

I certify that I have read and understand this consent form and agree to participate as a subject in the research described. I agree that known risks to me have been explained to my satisfaction and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this research. I certify that I am 18 years of age or older. My participation in this research is given voluntarily. I understand that I may discontinue participation at any time without penalty or loss of any benefits to which I may otherwise be entitled. I certify that I have been given a copy of this consent form to take with me.

Signature____________________________________ Date___________________

Printed Name______________________________________________________
Appendix D: IRB Approval

A determination has been made that the following research study is exempt from IRB review because it involves:

Category 2: research involving the use of educational tests, survey procedures, interview procedures or observation of public behavior.

Project Title: Exploring the Possibilities of Computer Technology for the Improvement of K-12 Instruction in Rural Schools: A Model for the Integration of Computer Technology in Rural Schools in Ghana

Project Director: Beatrice Akosua Boateng

Department: Education (Instructional Technology)

Advisor: Teresa Franklin

Rebecca Calé, Associate Director, Research Compliance
Institutional Review Board
Appendix E: List of Interviewees

1. J. S. Effah, project coordinator of the district ICT center
2. Y. Adu Asamoah, coordinating director of the THLDD.
3. R. V. Longdon, Director of GES in the Twifo Hemang Lower Denkyira district
4. GES official 1
5. GES official 2
8. M. Honma, JICA volunteer working at Twifo Praso secondary school.
13. J. Effih, Assembly man (local council representative) at Wamaso West and teacher at Abuabo primary school.
14. A. D. Odoom, Chief Executive of the THLDD.
15. O. Ockran, male student from Twifo Praso secondary school who took us to headmaster’s house.
16. E. Essel, community member
17. Focus group of six teachers (with R. A. Fianko).
18. Focus group of 10 students
Appendix F: **Model School Facilities**


Senior secondary school facilities, as currently proposed by the Government, are divided into common and specific.

**Common facilities comprise:** (i) at least 6 standard-sized (40 students) well-ventilated and well-secured classrooms each complete with furniture; (ii) headmaster’s office with office furniture and furnishing; (iii) staff-common room with office furniture; (iv) library and bookstore; (v) adequate toilet facilities; (vi) potable water; (vii) hostel (viii) land for school farm; (viii) playing field; and (ix) living accommodation for headmaster and staff.

**Specific fields facilities comprise:** (i) a workshop for technical areas; (ii) a computer room for business education; (iii) a science block including labs for Physics, Chemistry, Biology, Agriculture Science; (iv) a home economics block including a model room, a laundry room, a cookery, a sewing room; (v) visual arts facilities including a loom room and a painting room; and, (vi) general arts facilities including books for various subjects.