Integration of Emerging Learning Technologies in Secondary Schools:

A Burkina Faso Case Study

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Dedication

This thesis is dedicated to my uncle Tambi Kabore, who is my greatest inspiration for unending work and love.

Abstract

The purpose of this dissertation was to document the perspectives and attitudes of secondary education teachers and administrators about the perceived benefits and challenges of integrating new Emerging Learning Technologies (ELTs) in the classroom. Education has become one of the biggest challenges in the African nation of Burkina Faso where teachers are routinely confronted with material shortages, lack of curriculum, lack of equipment, and lack of opportunity for self-conducted learning. To overcome these challenges, educators are using Emerging Learning Technologies (ELTs) to help improve the quality of teaching and to increase student access to these learning opportunities.

This study examined three core questions that specifically focused is on the ways in which ELTs are perceived as different from previously used technologies in Burkina Faso (i.e., radio and television).

1. What are the perspectives of secondary level educators and administrators regarding the use of ELTs in Burkina Faso?
2. In the local educational contexts of cities and rural areas, how do educators and administrators experience the use of ELTs in education?
3. What are the benefits and challenges of using ELTs for educational purposes in Burkina Faso?

Study findings indicated that the pedagogical use of ELTs in secondary education was not contributing to teaching and learning in secondary schools at this time. Analysis of the collected data found that the added value of the use of ELTs in education depended mainly on their daily adaption by students, teachers, and administrative staff. However, the use of ELTs in secondary education in Burkina Faso is infrequent and not widely embraced by school administrators and teachers. Future adoption of ELTs may someday impact educational outcomes but it will take more than top-down political directives to achieve this outcome.

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CHAPTER 1

INTRODUCTION

Africa's economic and social issues are often a central topic at gatherings of world leaders. This focus is driven by reports from global agencies that indicate a lack of basic individual necessities such as access to education, healthcare, sanitary drinking water, food supplies, and roads. These startling facts, when presented in global forums, force world leaders to acknowledge the deprivation and poverty that are part of people's daily lives in this part of the planet.

In response to this reality, African countries, collectively and individually, try to organize in order to meet the challenges of the 21st century; a period of time marked by significant technological advances. The proliferation and impact of these emerging technologies are often most evident in educational institutions across the continent (Ertmer 2005; Ismail, Abdulwahed, Ghaleb, & Al-Mekhlafy 2010; Steel 2009). This study presents one way in which these emerging technologies have been applied to a broad range of educational processes and tools in existing educational systems in Africa, and how these technologies have helped facilitate improved teaching and learning opportunities.

First introduced in industrialized Western countries, the field of learning technologies has grown and expanded over the past three decades to every corner of the globe, eventually making its way to poor and impoverished countries including those located on the African continent. For the countries of Africa, the introduction of emerging learning technologies is a major cultural disruption that can have a profound impact on the different economies, societies, and cultures spread across the continent.

These technologies, when used by emerging nations, accelerate the process of globalization so much that the organization of work, the systems of training and education, as well as social relations are affected by their presence. Due to these dramatic potential benefits and realistic complications, African nations have long struggled to embrace and implement them in educational systems at various levels.

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

It is worth noting that Information and communication technology (ICT) is also a widely used term and is defined by Howe (2010) as an umbrella term that includes any communication device or application. In addition to the subjects included in Information Technology (IT), ICT encompasses areas like radio, television, mobile phones, computer and network hardware and software, satellite systems, as well as the various services and applications associated with them, such as videoconferencing and distance learning. The term ICT is often used in a particular context, such as ICT in education, health care, or libraries. It is more commonly used outside of the Unite States. It is also often associated with technologies that provide access to information through telecommunications, similar to IT, but focused primarily on communication technologies which include the internet, wireless networks, mobile phones, and other communication mediums.

Thought out this study, the term Emerging Learning Technologies (ELTs) will be used, to emphasize the technology in the learning and teaching context.

AIMS AND OBJECTIVES

Technological progress has resulted in the creation of wholly digital tools and environments that have, in turn, been the basis for new literature and research that examines how these emerging technological resources impact education in developing

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countries (Kozma, 2005). In a broader sense, educational technology is the effective use of technological tools in learning and teaching. Emerging technology, distinct from conventional technology, explores new ideas in some significant ways, defined by Veletsianos (2010) "as tools, concepts, innovations, and advancements utilized in diverse educational (including distance, face-to-face, and hybrid forms of education) to serve varied education related purposes (e.g., instructional, social, and organizational goals)" (pp. 26–27).

This study focuses on the learning and teaching elements commonly referred to as emerging learning technologies (ELTs). ELTs represent a new technological field that results from the technological convergence of different systems evolving toward similar goals. Convergence brings previously separate technologies such as voice, data, and video together, enabling the sharing of resources and interactions to create new efficiencies. Rist and Hewer (1996) defined learning technology as "the application of technology for the enhancement of teaching, learning and assessment. Learning technology includes computer-based learning and multimedia materials and the use of networks and communications systems to support learning" (p.3). According to the Association for Learning Technology, "Learning technology is the broad range of communication, information and related technologies that can be used to support learning, teaching, and assessment." This organization defined learning technologists as "people who are actively involved in managing, researching, supporting or enabling learning with the use of Learning Technology" (para.1-2). In this study, I define ELTs as encompassing a broad range of technological tools that can be created, developed, innovated, and adapted to support learning, teaching, and assessment. Through my dissertation research,

I attempt to better understand the various considerations that determine the successful integration of ELTs into secondary schools in Burkina Faso, particularly focused on the benefits and challenges of the integration process.

GLOBAL CONTEXT

In Sub-Saharan Africa, despite the low penetration of ELTs, educators are introducing the idea of using technology as an educational and developmental tool. With the proliferation of the Internet, one of the leading drivers of technological progress globally, developing countries may finally have a resource that can help close the technological gap with developed countries. In Africa, educators experience a growing urgency to use ELTs as a tool for cultural, economic, and scientific development, and technology in general is becoming an essential element of the organization and operation of daily life (Kozma, 2005).

Many stakeholders seem to share the ambition to achieve increased economic growth in Sub-Saharan Africa through the advancement of technological progress in various sectors. This growing interest helps explain multiple initiatives currently undertaken in the education sector of African nations, making it one of the top development priorities at both international and regional levels. This focus has increased the need for a more comprehensive analysis of the factors challenging developing countries' education systems.

On the eve of the World Conference on Education for All, held in Jomtien in 1990, Ki-Zerbo, a Burkinabe historian, politician and writer, warned developing countries that they must increase their efforts in education. High-quality education must be accessible to all and the goal of achieving universal education has been on the agenda in developing

countries since the Universal Declaration of Human Rights in 1948. To achieve this longstanding goal, the integration of technology in education must become imperative, a fundamental requirement of nations around the world (Kozma, 2005). Schools must prepare new generations for living within a complex emerging information society.

Faced with this enthusiasm for education in Africa, it is important to examine how educators implement ELTs in this region of the world. Additionally, I worked to discern how the dynamics of external and internal influences impact achievement and expectations from technology, particularly in education, focused primarily on the benefits and challenges of technology use. Specifically, in this study I analyzed the integration of these technologies into secondary schools in Burkina Faso.

BURKINA FASO
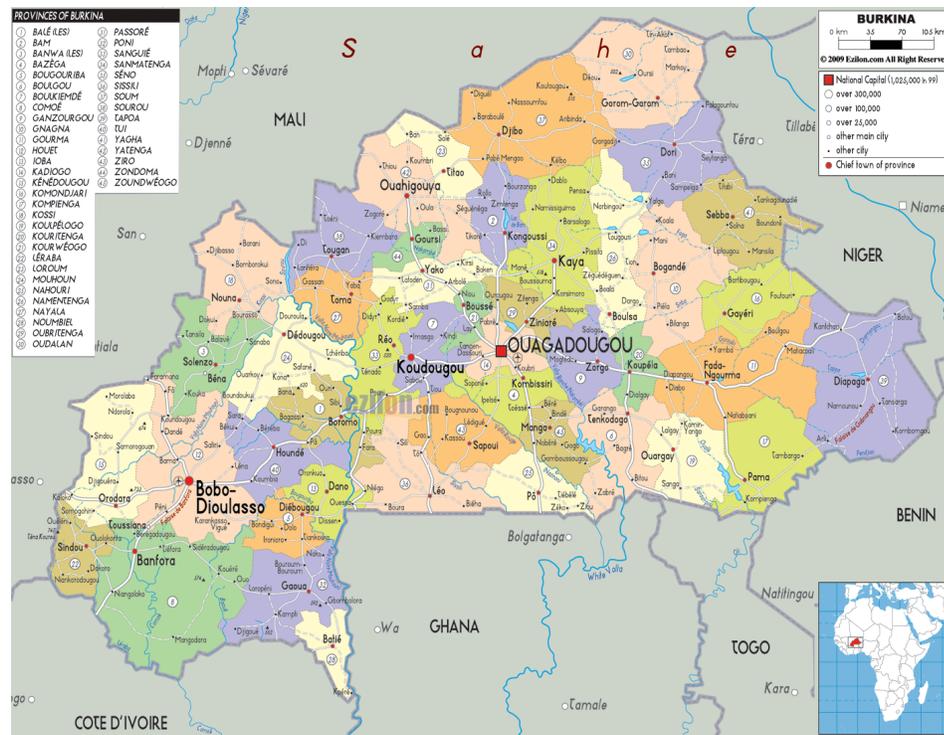
Figure 1. Burkina Faso administrative departments and location map

Burkina Faso is a landlocked country with an area of 274200 km^2 (105 869 mi^2) located in the middle of West Africa. According to the Institut National de la Statistique et de la Demongraphie (2015), the population of the country is 18,450,494. It shares borders with six other countries: Mali to the north, Niger to the east, Benin to the southwest, Togo and Ghana to the south, and Côte d'Ivoire to the southwest. The capital city is Ouagadougou. More than half the population is younger than 25 years with a literacy rate for individuals aged 15 and older estimated at 36%. Burkina Faso is one of the poorest and least educated populations in Africa with a per capita GDP estimated at USD 684.00 in 2013. Education demographics for Burkina Faso indicate a gross enrollment ratio in 2011 of 3% in preprimary education, 79.4% in primary education, 22.6% in secondary education and 3.9% in tertiary education. The average amount of time children spend in school (primary to tertiary education) is eight years for boys and seven years for girls (World Factbook, 2015). The 2010 education expenditure for Burkina Faso was 3.4% of GDP (World Data Atlas, 2013). This ranked Burkina Faso 128th in the world placing it between Lesotho at 13% and Equatorial Guinea.

In light of such statistics, and after the failure of previously introduced educational technologies such as television and radio (Criticos & Tomaselli, 1987), the question arises whether the promise of ELTs in resolving education problems in this poor part of the world is warranted when other technologies have failed repeatedly. Are these ELTs a valid solution, or should we rather conclude that their emergence is merely new packaging for previously failed initiatives? The risk is not understanding the failures of previous technologies; a risk with the potential to sow the seeds of future disappointments.

BURKINA FASO EDUCATION PROFILE

Two ministries manage Burkina Faso's education system: the Department of National Education and Literacy (MENA) and MESS. Burkina Faso's education system is comprised of two primary systems, the formal and the non-formal. Formal education includes basic education, secondary education, and higher education. Non-formal education includes early childhood education, literacy training, and evening classes.

The foundation of education in Burkina Faso is the development of personal identity, cultural identity, and universal diversity (MESS, 2013). Curriculum policies give priority to the acquisition of general knowledge, technical skills, and fundamental essentials for work or the pursuit of graduate studies. French, the official language in Burkina Faso, is the teaching language along with local languages used particularly in bilingual schools, satellite schools, and non-formal basic-education centers.

The education system is divided into the following subsectors: pre-school education, primary education, secondary education, and a tertiary sub-sector. Pre-school education is limited to a few private kindergartens generally located in major cities. Primary school comprises a cycle of six grades of education that ends with completion of the primary school leaving certificate *Certificat d'Enseignement Primaire* (CEP). Secondary school consists of the junior high of four years cycle, culminating in the junior high certificate BEPC (*Brevet d'Etudes du Premier Cycle*); and the senior high of three years cycle, which successful students complete with the attainment of the Baccalaureate (BAC). Tertiary education comprises the formal post-secondary sub-sector. Technical Vocational Education and Training (TVET) is provided at the secondary and tertiary levels of education.

Post-primary education is the level of formal education in Burkina Faso for a period of 3 or 4 years aims to consolidate the achievements from primary education and prepare learners to pursue studies in secondary education or in professional life. Post-primary education is intended for those who have completed primary education, and is the second level of compulsory school attendance. Schools award learners a degree upon completion (MESS, 2011).

Primary education is the level of formal education of normal duration, lasting 6 years with a curriculum designed to impart elementary knowledge. Primary education is intended for children of at least 6 years of age and is the first level of compulsory school attendance in Burkina Faso; schools award learners a degree at the end of this cycle (MESS, 2011). According to the law, education is compulsory from 3 to 16 years old. However, not enough schools exist to accommodate all children in this age range. Thus, officially, schools recruit children at 7 years of age into first grade. If there is remaining space, schools add children who are 6 years old. At 3 years old, children go to kindergarten and remain there for a minimum of 3 years. Not all children at age 6 and age 3 will attend school because of a lack of infrastructure.

Secondary education is divided into two main parts: the junior high and the senior high.

1. The junior high (ages 12-15) education consists in a four-year study program. Admission is open to any student who has completed primary school and obtained a certificate. Curricula mainly include general studies in Letters and Languages (French, German, Arabic and Spanish), Geography and History, Sciences (Biology/Geology/Zoology, Physics and Chemistry) and Mathematics. At the end

of this four-year junior high study program, students take an exam that entitles them to the junior high school completion diploma. After that, if a student chooses not to attend a senior high school for further general studies, he is authorized to compete for entrance in junior high level vocational schools for two or three-year professional training as primary schoolmasters, nurses, midwives, police, customs or public administration clerks.

2. The junior high (ages 16-18) education is a three-year study program and aims to ensure graduates the possibility to pursue general, technical, or professional education and concludes with the baccalaureate exam. Upon obtaining this diploma, the student can enroll in a university. The majority of the teaching staffs at the junior and senior high schools are national citizens who have normally graduated from African and European universities, and a few European expatriates and U.S. Peace Corps volunteers.

- General secondary educators prepare students to pursue university studies. After a period of 3 years, schools award learners the degree of baccalaureate of general secondary education.

- Technical secondary educators prepare students to pursue education in higher technical-education schools. After a period of 3 years, schools award learners the baccalaureate of secondary technical education.

- Professional secondary educators prepare students for professional life or university studies. After a period of 2 to 3 years, schools award learners a diploma of professional studies (MESS, 2011).

University education currently occurs in three established institutions of higher education: the University of Ouagadougou, the Polytechnic University of Bobo-Dioulasso, and the Teachers Training College of Koudougou (MESS, 2011):

a. Created in 1974, the University of Ouagadougou is currently composed of five teaching units:

- the Faculty of Languages, Letters, Arts, Humanities and Social Sciences

- the Faculty of Science and Technology

- the Faculty of Economics and Management

- the Faculty of Law and Political Sciences

- the Faculty of Health Care Sciences

b. Established at the beginning of the 1995-96 academic year in the second largest city known as the economic capital city of the country, the Polytechnic University of Bobo-Dioulasso is composed of three teaching units:

- The University Institute of Technology which trains students in Business Administration and Secretarial Work;

- The Institute for Rural Development which is a college of Agriculture, Forestry, and Environmental Studies; and

- The Higher School of Computer Sciences which provides a study program for computer software and hardware technicians.

c. The Teachers' Training College of Koudougou, is based in the third most important city of the country. It offers a two-year postgraduate training program for secondary school teachers, teacher trainers, curriculum developers and inspectors of secondary school education.

That system of faculties, institutes and schools prevailing in the Burkina Faso educational structure is the result of reorganization initiated by government authorities in 1991. That reform aimed at establishing more appropriate groupings, by reducing the number of teaching units, and making university education accessible to a greater number of candidates. Admission to university is limited to students who have obtained the baccalaureate degree after seven years of secondary education. Like most francophone and African universities, the institutions of higher education work according to a three-academic cycle system of training in all academic fields and disciples:

- In all the faculties, except for that of Health Care Sciences, the first academic cycle consists in a two-year study program offering the first cycle diploma. Only students who obtained this diploma are authorized to continue their university studies.

- The second academic cycle consists in another two-year study program. At the end of the first year, students receive a diploma that is approximately equivalent to a Bachelor's degree in the U.S. educational system. Upon completion of the second year, another degree is awarded, which might be equal to final honours in the British system.

- The third academic cycle, which consists in a research training program and leads to the diploma of doctorate, takes three years after the previous degree. At the end of the first year of this cycle, the student may receive either a post-graduate diploma that may correspond to a Master's degree in the U.S and British systems.

Since 1994 only the Faculty of Health Care Sciences awards doctoral degrees in Pharmacy after six years of study, and medical doctorates after a seven-year study program. All the other faculties and teaching units have been offering study programs for the doctorate degree since 1998. A study program for the "doctorat d'état", the highest

degree in the francophone educational system, is now offered in the following academic fields: Economics and Developmental Socio-Economics, Chemistry, Mathematics, Linguistics, Applied Biological Sciences, Private Law and Tax System, Business Law, International Economic Law, and African History and Archaeology.

PURPOSE OF THE STUDY

The purpose of this study is to document the perspectives and attitudes of secondary-education teachers and administrators about the perceived benefits and challenges of integrating ELTs into secondary education. A specific focus is on the ways in which ELTs are perceived as different from previously used technologies in Burkina Faso (i.e., radio and television).

RESEARCH QUESTIONS

There are three core questions that form the basis of this study:

1. What are the perspectives of secondary-level educators and administrators regarding the use of ELTs in Burkina Faso?

2. In local educational contexts of cities and rural areas, how do educators and administrators experience the use of ELTs in education?

3. What are the benefits and challenges of using ELTs for educational purposes in Burkina Faso?

These central questions of the study are augmented with additional questions as the study progressed and the need arose for greater clarification. The study's focus is on teachers and administrators of secondary education, and each question or concern is examined from their perspectives. In addition, I examine the nature and purpose of secondary education and the role of educational institutions in Burkina Faso.

Throughout this research, I examine a number of factors that impact the experience of Burkina Faso's teachers and administrators through the perspective of technology integration in secondary education. Finally, I base this study on the assumption that those secondary-education teachers and administrators who are interested in technology integration in education are already familiar with previous, failed educational initiatives in the country.

To best understand the results of this study, one must understand a brief history of the evolution of ELTs and their rapid growth as a driving force in society, including education sectors. What is today called ELTs began in the 17th century. During that time, Schickard, considered the initiator of the computer age, built humankind's first automatic calculator in 1623; Babbage also designed the first automatic computing engines during this period. Others pioneers in communication technologies include Pascal, Leibniz, Jacquard, Hawkin, and Hollerith, all forbearers of the modern computer (Computer History Museum, 2014).

The first complete, modern computer appeared in 1946 with Eckert and Mauchly A giant machine occupying a 20 ft x 40 ft room, the computer consisted of 18,000 vacuum tubes. Technologists later replaced these vacuum tubes with transistors, building on the work of Bordeen, Brattain, and Schockly who developed a computer named UNIVAC. In the late 1950, the creation of ARPANET (Advanced Research Projects Agency) introduced a proto-Internet intended to protect the flow between military installations by creating a network of geographically separated computers that could exchange new information (New Media Institute, 2014).

As communication technology grew, the extension of connected networks fostered growing computer and software markets. The development of the Internet spurred a succession of emerging technologies that started with the first generation of computers built in 1950 and1960 (New Media Institute, 2014). In the 1970s, a true computer revolution started with the invention of microprocessors, turning building-sized machines into compact microcomputers. The newly named personal computer, or PC, disrupted all sectors of society as their use become part of everyday business operations (Woodford, 2015).

The United States and Norway established the first international connection with ARPANET in November 21, 1969 (New Media Institute, 2014). Simultaneously, the rapid development of software allowed societies to integrate computers. In the 1980s, the development of commercial software burgeoned with the introduction of the IBM PC, running Microsoft software, and with the launch of the Apple computer (Philipson, 2004). With the advent of these technologies, communication networks were poised to go beyond the military sphere into all sectors of society.

The development of ELTs soon came to be known as computer science; a subject of study that Wiener helped establish. Recognition of computer science as a discipline began with the creation in 1950 of a programming language that allowed for communication between people and machines. As ELTs emerged in society, they changed the relationship with time and space and, with satellite telecommunications, fostered digital information transmissions around the globe. These advancements mark the beginning of cable, telephone networks, digital networks, and communication protocols such as mobile phones, all of which have greatly impacted society (John, 2010).

Today, ELTs provide a framework for telecommuting that allows workers to do office work at home. ELTs also make it possible to work continuously with partners without traveling. In addition, the computerization of business has led to the creation of local area networks to connect all computers in a given company, allowing individuals to easily share, track, and transfer files (wikibooks, n.d.)

ELTs are also used for educational purposes including distance learning. In classrooms, educators often use ELTs to supplement teacher-based instruction.Computer-based learning has become an emerging focus of educational institutions with ELTs now replacing conventional tools (blackboard and chalk). For teachers, ELTs such as word-processing software, alleviate basic problems such as grammar and spelling correction, research, and knowledge acquisition. In these instances, the teacher becomes more of a guide in the learning process than the sole arbiter of instruction (Roblyer and Doering, 2012).

Distance education, at its most basic, refers to teachers teaching students who are not in a central location. For example, distance education enables learners to take courses or attend foreign universities from home. The geographic location of the classroom is no longer a barrier to receiving instruction. With individuals pursuing education from the comforts of home, the need for computer software to facilitate this desire grew accordingly. Compared to previous versions of the home computer that were often used to play games, the home software of today has evolved with increased utility mind. The computer becomes, like television, radio, and VCR, a new mode of information consumption in the family (Nestor & Schutt, 2011). Today, ELTs are less bound to the

technical limitations of the past, as the Internet has truly revolutionized the world of communication with its flexibility and inclusiveness.

EMERGING LEARNING TECHNOLOGIES IN BURKINA FASO

Computing made its entry into Burkina Faso with the creation of the National Centre for Information Processing in 1970 (African Commission on Human and Peoples' Rights, 2003). The objective of this center was to ensure control and dissemination of technology tools. In 1989, researchers at the Office of Scientific and Technical Research Overseas (ORSTOM), located in Ouagadougou, used a UNIX server and a TCP/IP network of five computers to connect to a global network through a modem. This mininetwork later gave birth to the Intertropical Computer Network. In 1991, the National Telecommunications Office (ONATEL) procured a data-transmission network, called FASOPAC, allowing the Institute of Research for Development (IRD; formerly ORSTOM) to have electronic message (e-mail) capability. In 1993, IRD and the Institute of Computer Science created the top-level domain, .bf, based in Bobo-Dioulasso. In 1994, researchers could connect to the Internet from ORSTOM headquarters during the Second African Conference of Computing Research (Hegener, 1996).

Foreign players drove the development of the Internet in Burkina Faso, including IRD. This situation is not unique to Burkina Faso, and is common in many African countries. As indicated by Ducasse, Akam, Kua-Saffo, Anate and Tudesq (2000), the Internet has entered some countries in Sub-Saharan Africa not as part of public policy or under the pressure of national telecommunications operators, but by outside entities, operationalizing strategies arising from the scientific and technical cooperation of networks of universities and nongovernmental organizations.

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These networks of cooperation have brought technology, operation modes, and protocols. These networks have also established architectural frameworks in African countries (such as Burkina Faso, Mali, and Senegal), allowing the use of information among members of the scientific community. Therefore, when telecommunications operators were interested in the Internet in countries like Burkina Faso, local skills, expertise, and strategies were already present in the academic and scientific community. This community was able to appropriate technology and management tools and the regulations of national services.

The first IP connection between Burkina Faso and the Internet was made by Sylvain Zongo on April 9, 1996 in South Africa, using an X25 connection type to access a database hosted at IRD in Ouagadougou. The official opening of the Internet to the public was official on March 19, 1997 in Ouagadougou (Hegener, 1996). Today, the Internet is available to Burkinabe through the Canadian TELEGLOBE operator. In 1997, the management of the top-level domain transferred to ONATEL, but remains the responsibility of the General Delegation for Computing (DELGI), a public body created in 1997 to support government decision, execution, and control of Information Technology policy (Laroix, 2002). In March 1998, the first dedicated line was installed between the ONATEL, the University of Ouagadougou, and the IRD (Hegener, 1996).

The first national ELT plan, from 1990 to 1995, allowed the development of microcomputers, with growth in technology-tool investments in the order of 16%. This period saw the increase of computers in Burkina Faso from 1,000 to nearly 2,700. This number rose to 10,000 computers by the end of the year 2000 (Faso-deve, 2008). This

rapid growth enabled Burkina Faso to be one of the first African countries to benefit from access to the Internet.

Since 2005, Burkina Faso has been connected by 1,000 km of fiber optics along the Ouagadougou-Bobo Dioulasso-Orodara-Mali border. This connection is direct to the SAT-3 cable installed in Senegal through Mali (Faso-deve, 2008). This optical network allows the transport of a wide range of information. It increases the country's capacity in telecommunications, television, and data transmission through the Internet.

THE CURRENT STATE OF ELTs IN BURKINA FASO

Dedicated to the digital economy, the government of Burkina Faso cleared the way for the so-called "information society," aiming to allow ELTs to play significant roles in accelerating economic growth in a world that is increasingly digital (Laroix, 2002). One sector most impacted by ELTs is the post office, which acts as a strategic tool to leverage good governance, economic growth, and human-resource development. In management and regulation, the Ministry of Development of the Digital Economy and post offices provide administrative management, technically supported by structures such as the Regulatory Authority of Electronic Communications and Posts, the Commission for Computing and Liberties, and the National Agency for the Promotion of Technology (International Telecommunication Union, 2013). People's skills in using the technology, the number of households with a computer, the number of Internet users, and literacy rates indicate ELTs proliferation within Burkina Faso.

Burkina Faso has three operators of electronic communications networks that are open to the public: ONATEL, with its mobile network; Airtel Burkina Faso; and Telecel. These operators account for 9,976,105 subscribers; a mobile teledensity of 59.45

telephones per 100 inhabitants as of December 31, 2012. Those with access to continuous low-speed connections constitute 52% of the population with a notable disparity between urban and rural areas. Broadband Internet is still not widely accessible to the public (Dalberg Report, 2013). During 2012, the Regulatory Authority recorded three new ISPs. As of December 31, 2012, 43 Internet service providers have registered as providers of service in Burkina Faso (Internet World Stats, 2009). However, of these providers, only Faso.net, Connecteo, IPSYS, and Alinkare are active in this market with what is considered high-speed connections that range from 128 kbps to 2 Mbps, dedicated or shared.

As with most social practices, one may have difficulty estimating the use of ELTs by the people of Burkina Faso. The use of ELTs is most visible by observing young people using public Internet-connected computers (cyberspaces) to conduct professional activities, although the relationships as well as type of use varies from one individual to another. Access to technology tools and Internet-connection difficulties render the use of technology in Burkina Faso informal. People engage in social networks (e.g., Facebook, Twoo, Twitter, Badoo, and LinkedIn) in cyberspaces and on mobile phones that are expanding rapidly in number (Internet World Stats, 2013). Mostly used by young people, these networks serve as channels of communication, professional collaboration, and a means to create relationships.

DEFINITIONS OF TERMS

This section provides conceptual and operational definitions for key words or phrases that are either important or may be unclear to the reader. These definitions anchor this dissertation research.

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Education. Regarded as all activities aimed at developing a human being's physical, intellectual, and social potential. Education ensures one's autonomy, self-fulfillment, and participation in cultural development. Education is a systematic process through which a child or an adult acquires knowledge, experience, skill, and a sound attitude (Parankimalil, 2012). However, providing a practical definition of education is complicated because no clear consensus exists about what is important about being and becoming educated. Rather, identifying jobs opportunities is the main concern of many people in developing countries.

Formal education. A systematic, institutionalized education system structured and administered according to a given set of laws and norms, planned with a particular end in view. Formal education confers degrees and diplomas based on a strict set of regulations. Teaching and learning are based on a rigid set of curricula aligned with particular purpose, objectives, content, and methodology. Teachers and students are aware of the strict program, so they engage themselves in the process of teaching and learning. Students take intermediate and final assessments to advance to the next learning level (Dib, 1988).

Higher education. Formal postsecondary education taking place in a university or related institution enables students to acquire knowledge at a higher level. Higher education aims to provide high-level education, develop a scientific and technological culture, and disseminate scientific and technical information. It includes three cycles, each sanctioned by a diploma, degree, or certificate, except in special cases (Ministry of Secondary and Higher Education [MESS], 2011).

Informal education. Any form of unstructured education resulting in the training of individuals and their integration into society. Informal education is incidental and

spontaneous. It does not correspond to an organized and systematic view of education. It is an educative activity that is neither preplanned nor deliberate (Dib, 1988).

Information and communication technology (ICT). Derived from earlier terms like information technology (IT), ICT reflects the growing importance of the communication aspects of technology. ICT is the technologies used to access, gather, manipulate, and present or communicate information. Technologies may include hardware (computers and other devices) or software and connectivity (access to the Internet, local network infrastructure, videoconferencing) (Anderson & Glen, 2003).

Internet. The term Internet, also referred to as the Net or the Web is a vast interconnected computer network of devices that span the globe and facilitates the transfer of volumes of information between computers. Initiated as a U.S. military project, the Internet transmitted its first message on Friday, October 29, 1969. It experienced its largest growth in 1993 (Computer History Museum, 2014.).

Learning technology. Also called educational technology, learning technology is the application of a broad range of processes and tools to facilitate teaching and learning processes. Learning technologies emphasize applying the most current digital and informational tools to increase the effectiveness and efficiency education systems (Roblyer & Doering, 2012).

Literacy. All educational activities and training given to young and adults to ensure the acquisition of basic skills in a given language, aiming to enhance learners' autonomy. Literacy is a component of non-formal education (MESS, 2011).

Non-formal education. Midway between formal and informal education, non-formal education encompasses all structured and organized education activities and training in nonacademic settings (Dib, 1988).

Teacher professional development. Teacher professional development is defined as a systematized, initial and continuous, coherent, and modular process of education for educators in accordance with skilled-competency standards and frameworks. This term also includes training in adapting to change for teachers and managers of education systems (Shafika, 2006). All activities aimed at ensuring the acquisition of knowledge, skills, and abilities necessary to perform a professional function.

This study calls attention to the differences in technological progress between developed countries and developing countries. Historically, technology integration in education studies has focused at the basic and primary-education levels and on professional development for teachers. This study borrows from that existing framework and incorporates perspectives of participants in the context of this particularly poor country. The growing body of literature addressing technology integration in developing countries (Okojie, Olinzock & Okojie-Boulder, 2006) acknowledges the following:

> Common excuses for the limited use of technology to support instruction include shortage of computers, lack of computer skill and computer intimidation. While these could affect the success of technology integration, it should be acknowledged that the degree of success teachers have in using technology for instruction could depend in part on their ability to explore the relationship between pedagogy and technology… Technology integration should be considered along with issues involved in teaching and learning… Technology used for teaching and learning should be considered an integral part of instruction and not as an object exclusive to itself. Viewing technology integration from a wide perspective will provide teachers with the necessary foundation to implement technology into the classroom more successfully (p. 1).

The above statement served as the background for this study.

OVERVIEW OF CHAPTERS

This dissertation is divided into six chapters and an appendix section. Chapter 1 introduces the study. In this chapter I present the main ideas and the primary objectives of the study. This chapter features the background of the study and narration of what will drive the study, including purpose and aims of the dissertation. Chapter 2, the review of the literature, gathers information related to the topic: the integration of ELTs in secondary schools in Burkina Faso. Information comes from books, articles, and other helpful sources.

Chapter 3 provides the research methodology, providing a narrative of the methodology and methods used to obtain the desired information. This chapter establishes the way I gathered needed information to complete the study. Chapter 4 specifies a general overview of the data, explaining, in a broader sense, the data collected during interviews to give readers a preview of the potential impact that ELTs may have in society in general and in Burkina Faso in particular. Additional information includes the current state of ELTs in Burkina Faso's education system, data on gender inequality observed during interviews, and thoughts on the inequality in schools and locations where interviews took place.

Chapter 5 includes the data analysis, giving meaning to the acquired data. Here, I present and explain the collected data and offer a summation of the study. Chapter 6 offers overall conclusions to the study as well as implications for the integration of ELTs in secondary schools in Burkina Faso. This chapter highlights the various important findings from this study that would be beneficial for further study and provides recommendations that can be useful in improving ELTs in education in Burkina Faso.

The chapter highlights the most important benefits of ELTs in secondary schools in

Burkina Faso while incorporating the limitations to the conducted study.

CHAPTER 2

LITERATURE REVIEW

The purpose of this study is to document the perspectives and attitudes of secondary-education teachers and administrators about the perceived benefits and challenges of integrating Emerging Learning Technologies (ELTs) into secondary education in Burkina Faso. The study focuses on the ways ELTs are perceived as different from previously used technologies in Burkina Faso's education system such as radio and television. Due to my interest in understanding the ways literary, economy, and policies impact ELTs integration, I begin by describing the rational for use of Learning Technology in developing countries. Next, I explore the education system of Burkina Faso, with special attention to technology in education policies, and previous failed tentative of technology such as radio and television use in education in Burkina Faso, which is one of the primary motivations for my research. Then I outline the scope of my interest in ELTs integration into secondary education in Burkina Faso and review the literature on Learning Technology integration in education with rise of the Internet in Burkina Faso. The goals of this chapter are to provide a framework and rational for my research on the benefits and challenges of integrating ELTs into secondary education in Burkina Faso.

TECHNOLOGY IN SOCIETY

The role of technology in education must become an imperative, a fundamental requirement of nations around the world (Kozma, 2005). One of the primary purposes of schools is the preparation of new generations for survival within a complex emerging information society.

The integration of technologies into education was first outlined by Lerner (1958), the father of the modernization theory of development. Lerner viewed communication as a vehicle with the potential to bring about social change and, consequently, development. Similarly, Freire (1970 & 1972) felt that communication should awaken a critical self-awareness in societies, making a starting point for the educational process or for cultural action of a liberating character.

 With the inventions of radio and television technology in the mid-20th century, educators employed educational broadcasting quite enthusiastically. Modernization theorists such as Schramm (1963, 1964) viewed this type of media as playing vital parts in future societal developments. Schramm (1963, 1964) also believed that mass media would eventually act as a substitute for the in-classroom teacher, stating that one textbook used by one teacher on radio or television could suffice for a multitude of students across the country. Due in large part to this type of thinking, several countries in Africa adopted the use of radio and television within formal and non-formal education during this period.

The emergence of the Internet in the 1990s had a massive impact on teaching and learning around the world, starting with the "Web 1.0" initiative, which allowed individual users to access information on the Web. However, Web 1.0 was limited much the same way as radio and television had been previously in that it only allowed one-way communication with other users. This limitation changed with the development of Web 2.0, which allows online applications, empowering users with control over their own content and facilitating collaboration and sharing of information (Herrmann, 2009; O'Reilly, 2007). Coinciding with this advancement of Internet-based learning tools, the use of mobile and smart phones (ELTs) in education is rapidly expanding in developing

countries (International Institute for Communication and Development [IICD], 2013). As these ELTs emerge and mature, new mobile-communication platforms may help teachers and students organize and foster individual learning while also promoting regular communication between parents, teachers, and students in ways that were previously unimaginable.

RATIONALE FOR THE USE OF LEARNING TECHNOLOGIES

The need for both economic and social development within developing countries is often the rationale used to justify investments in educational reform generally and in technology integration in education specifically. Learning technologies play a major role in all aspects of the national life in developing countries including politics, economic, and social and cultural development (Kelles-Viitanen, 2003). Thus, these learning technologies are rapidly transforming the way people do business, access information and services, communicate with each other, and entertain themselves in these societies.

In 2000, the United Nations Economic and Social Council put forth a Ministerial Declaration suggesting that urgent and concerted actions relating to technology integration should occur at international, national, and regional levels. Several years later, Microsoft Corporation (2007) conducted an inquiry into learning technologies within Africa. One of the of findings of this inquiry is that 300 million Africans live on less than $1 per day, which directly impacts the use and incorporation of learning technologies. This report concludes and advocates for the use of learning technologies within Africa, as technologies offer opportunities for growth and innovation in local settings, thus allowing individuals and institutions to interact more productively within a global economy (Rogers, 1962). However, caution is needed because although these new tools have the

potential to offer great benefits to developing countries, technology alone does not drive development; its merely enables it (Kozma, 2005).

In addition, the Microsoft Corporation Report (2007) suggests that in order to take advantage of ELTs, "resources must be matched by resourcefulness—combined with other initiatives by local leaders, educators and entrepreneurs to achieve individual and institutional objectives" (p. 4). In other words, the formulation and implementation of a national strategy and policy is a vital first step when attempting to integrate new technologies in a society. To effectively integrate technology, a strategy focused on learning-technology opportunities must also simultaneously consider the realities of the scarce resources of different stakeholders. In Burkina Faso, this strategy resulted in the formulation of national policies to guide learning-technology implementation. The following section highlights key elements of the country's education policies.

EMERGING LEARNING TECHNOLOGY GLOBAL PERPECTIVE

Dewey (1916) warned that if educators teach today what they taught yesterday, they rob children of tomorrow. His warning is still relevant today, over one hundred years later. More than ever before technology impacts all aspect of daily lives including the educational sector. The proper use of technology has the potential to support the development of higher order skills, adaptability, and collaboration in students; these skills are essential for success in a rapidly changing information-access and -acquisition age.

Although discussions about integrating technology in Burkina Faso's schools are a recent phenomenon, many educational systems in more developed countries began introducing computers into schools as soon as they were commercially available (Bork, 1980). Technology-integration proponents such as Paper (1980) argued that computers

should support teaching and learning. The debate continues today among educators and policy makers on the roles of technology in education and the expectations of improvements in teaching and learning.

The popularity and accessibility of the Internet made the 1990s an era of rapidly expanding computer-communications and information-technology growth. Today, schools and educational institutions use a broad range of communication, information and related technologies that can support learning, teaching, and assessment. Thus supporting every day learning and teaching activities (Association for Learning Technology, n.d.) As society has integrated technology more deeply into daily functions, educators question how computers can help students, teachers, and administrators most effectively, when they should be used in the classroom, and how computer use will aid teacher preparation, professional development, and the ability of students to learn in and outside the classroom (Blaschke, L. M., 2014); Kearney, M., Schuck, M., Burden, K. & Aubusson, P., 2012; Means, B., 2010; Smeets, 2005; Wainwright, n.d.).

Current discussions regarding technology integration in schools highlight the link between schools, learning, and technology. The United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2011) organizes Learning Technologies as a competency standard for teachers, focused on ensuring access to information, education, training, and continuing professional development. Learning Technologies is a new area of ongoing development for learning communities like those located in Burkina Faso. However major barriers exist to the adoption of Learning Technologies in less-developed countries such as a need for a technology national strategy, connectivity issues, lack of formal accreditation, a need for more acceptable quality learning materials, and financial

constraints that prevent these countries from realizing their full potential (World Bank, 2015).

Computer literacy is largely a component of technology education, which is distinct, but aligned with technologies such as computer systems to support learning and teaching processes. Broadly referred to as learning technology/ies (also called educational technology/ies) it applies to a variety of technologies such as blackboards, chalk, pencils, books, slide-rules, radio, television, facsimile machines, and computers (Marshall, 2002).

Technology integration into the curriculum involves the instructional design of learning objectives, content, technology standards, teaching methodology, and specific technology tools into a learning activity (Okojie, Olinzock & Okojie-Boulder, 2006). Educators should view technology as a tool to enhance a learning activity, as a conveyance of the curriculum, not as the focal point of the learning activity. Educators shape student learning by providing optimal instructional conditions; planning for technology integration involves content and technology standards, teaching methodologies, and appropriate technology tools. Technology and curriculum interconnect, with technology use determined by the intended curriculum.

Learning technologies is not a new concept. In the past it was identified as use of any media to communicate learning. Learning technologies often results in changes to the curriculum to better integrate and accommodate new learning methods, made available by new tools For example, the invention of the radio resulted in new, radio-centric curriculum whereas the calculator made the use of logarithms for calculation obsolete.

Similarly, the invention of the computer has led to the development of new methods of teaching and learning not possible before its invention (Bazyomo, 2009).

Instructional designs that integrate emerging technologies include not just the technology device itself, but the application of that technology as a tool to enhance a planned instructional event or learning activity related to a content standard. Gardner (2000) explained that today's learners are visual learners and have grown up with visual devices such as televisions, hand-held games, and computers. Thus, traditional classroom cultures were organized in the 19th century, long before these technologies existed. Students learning in traditional ways may be bored or disengaged as the environment lacks the multisensory inputs they need to process ideas and form new concepts.

Technology affects the curriculum in content and methodology in several ways. In this digital age, the content and objectives of the curriculum in educational systems are changing to include the role of computers. With the wide availability of databases, information, and knowledge acquisition on the Internet, educators are challenged to understand how to retrieve and manipulate information, rather than remember the information itself. Students and teachers must decide the role of computers in the curriculum and where that curriculum can best be enhanced through the use of computer technology.

Learning technologies have been in use for centuries, primarily in the form of non-interactive tools such as the pencil, charcoal, and blackboard. Unlike those foundational learning technologies, using a computer in the classroom disrupts the learning environment itself by, among other things, taking up physical space, requiring

electricity, and forcing teachers and students to learn new skills to make the computer useful.

According to UNESCO (2013), the integration of technology into classrooms across sub-Sahara Africa remains insufficient to meet the needs of the 21st century labor market. The most pervasive barrier is the lack of electricity, especially in remote, rural areas. Computers are more likely to be found in urban schools, where access to electricity and the Internet enable computer-assisted instruction and on-line learning. In addition, computers need maintenance and technical support, requiring an IT professional, whereas teachers must also obtain at least basic technical support skills to operate the class properly.

In any learning activity, several different variables exist: the teacher, pedagogy, learner, content, and technology. Finding ways to isolate the effect of technology can be difficult to discern. Educators today questions if a student can learn a concept if the teacher is good, but without using technology. Conversely, educators question if a student can learn if engaged with technology but the pedagogy is weak. The impact of technology has to be considered on an individual basis as well as part of the total learning experience.

> Using technology to enhance the educational process involves more than just learning how to use specific piece of hardware and software. It requires an understanding of pedagogical principles that are specific to the use of technology in instructional settings. … Pedagogy-based training begins by helping teachers understand the role of learning theory in the design and function of class activities and in the selection and use of instructional technologies. (Diaz & Bontenbal, 2000, pp. 2 & 6)

Technology can motivate students because it provides an interactive, hands-on environment for students to develop knowledge. In today's world, the use of technology

exists in all careers and in everyday life. Students develop technology skills that transfer outside the classroom and into future careers. Technology helps prepare students to live in today and tomorrow's world. Specific technologies can also improve learning for students with special needs and provide learning at the learner's pace.

For the teacher, technology in education can provide a more productive teaching environment. The teacher can electronically prepare classroom resources, providing varied learning activities. Targeting multiple intelligences, educators can provide students with tools to efficiently organize information, maintain electronic recordkeeping procedures, and provide students with alternative assessment opportunities. Learning activities integrating technologies can be designed to focus on higher order thinking skills. Information is readily available in today's world through books, media, and the Internet. Technology provides an efficient means for students to transform information into knowledge.

Before preparing to integrate technology into education, one must consider some issues technology presents to the educational environment. Stakeholders must consider technology from a societal, cultural, legal/ethical, and technical perspective to understand the issues technology presents in a classroom setting.

Societies include those with wealth and those without. Educators must ask about the impact of technology on those without wealth. Do economic conditions affect people's access to technology such that children are placed at a disadvantage if a learning environment is technology oriented? Do children continue to be at a disadvantage because they don't have access to technology to fully participate in learning experiences

in their home environments? The term *digital divide* describes the division of people based on access to technology.

The use of technology has raised legal and ethical issues through cyberspace and the existence of digital data. Schools need to provide guidance and information-literacy skills to students who can use digital media in a legal and ethical way. Information-literacy skills address the quality, accuracy, and sharing of information found on the Internet. Problems arise when people share information, download software and music, and experiment with viruses and electronic entry. The 1998 Digital Millennium Copyright Act passed by the U.S. Congress provides the legal framework for the use of electronic copyrighted materials. Issues that affect schools in particular relate to students' access to research papers online.

Privacy concerns are issue as people's private information is now stored in electronic databases rather than locked in filing cabinets in locked offices. Personal-identity fraud arises when people can create fraudulent identification for themselves through electronic access to birth records, driver licenses, and other documents. The world has become global, just as classrooms have become wall-less. Educators must understand the responsibilities placed on educational institutions to develop electronic citizens that uphold the integrity of technology use.

Due to the cost of technology, schools must take security measures to ensure that technology resources are not vandalized, stolen, or misused. Schools today require that students sign user-acceptance-policy documents that state how a student may use the school's technology resources. Students must understand the penalty for violation and the extent of e-mail privacy.

SCHOOLS, LEARNING, AND TECHNOLOGY IN BURKINA FASO

According to (Kobiane, 2009), education, particularly basic education is globally

viewed as a prerequisite for developing countries to meet the many challenges they face.

Kobiane (2009, 2014) also acknowledges that education is viewed by economists as an

essential investment to economic progress; for sociologists, it is an important factor

family and societal changes; for demographers, education is a key variable standards and

behavior whether in the study in marriage, fertility, migration, mortality and health.

> Burkina Faso has made enormous progress in education since 1960, when the
> country gained independence. The primary-education rate has gone from almost 7
> percent in 1960 to more than 81 percent in 2012/2013. Progress has been made in
> reducing gender inequality, with nearly equally female and male primary
> education rates. The progress seen especially in the last decade may be attributed
> to the Ten Year Plan for Development of Basic Education, put in place from 2002
> to 2011 (Kobiane, 2014, p.1).

Burkina Faso has initiated various reforms during the last decade and has

committed to a new form of management for its education system. The main education

reforms focus on the legal framework for education, the improvement and updating of

subjects and curricula, and the restructuring of training programs. For secondary

education, the national objective is to develop science education along with vocational

and technical education by boosting student-intake capacity while improving the internal

and external efficiency of the system. One strategy is to rectify the inequality of access

between girls and boys education opportunities themselves. In the past, Burkina Faso has

adhered to and been guided by many policies including the Convention on the Rights of

the Child in 1980, the Jomtien Declaration in 1999, the Dakar Declaration in 2000

(Jyotsna, 2011; Leach, 2008), the International Agreement on Economic, Social and

Cultural Rights in 1966, and the African Charter on the Rights and Welfare of the Child

in 1999. Article 18 of the constitution of Burkina Faso recognizes the right to education,

to the schooling and training of all Burkinabe.

According to Kobiane (2014), statistics indicated that children's demographic and

socioeconomic characteristics and the households in which they live show a disparity in

completion rates for different levels of schooling:

> The low school enrollment of girls compared to boys, of children in rural areas
> compared to urban areas, of children in poor households compared to privileged
> households, of orphans compared to those who are not, and of handicapped
> children compared with nonhandicapped children. Geographic disparities are
> particularly important. Living in a rural area, for example, **is more damaging to a
> child's schooling than is being a girl. Being an orphaned girl without both
> parents and living in a rural area considerably limits one's educational
> opportunities. Similarly, a handicapped girl living in a rural area faces major
> obstacles to education.** At the national level, regardless of residence, orphans
> attend school less regularly than nonorphans …In contrast to school enrollment,
> an indicator based on a fixed point in time, is the school life expectancy (SLE), a
> synthetic measure that accounts for enrollment conditions at one point in time and
> also in the past (pp.1-2)

According to the Central Intelligence Agency World Factbook, the national

school life expectancy (primary to tertiary education) is 8 years total for Burkina Faso in

2013; 8 years for males and 7 years for females which indicates 1 year of gender disparity.

Social, economic, and cultural factors contribute to the low levels of schooling among

girls and disadvantage children in Burkina Faso. Traditional concepts of male and female

roles influence family and community choice of investments in children in education.

PERSISTING CHALLENGES

Despite the progress made by recent changes to the Burkina Faso educational systems to improve access, many challenges persist. The World Bank (2015) Report No: PAD1044 reported the following information, which I share in verbatim from the report:

Inadequate access to Primary Education

The country has made significant progress in expanding access to primary education and improving completion rates over the past decade. The primary gross enrollment rate (GER) improved from 72 percent in 2008 to 81 percent in 2013; 93 percent of the age group enters the first primary grade on schedule. However, although the primary completion rate has improved significantly, it continues to remain relatively low at 59 percent. Progress in expanding access to primary education is constrained by supply and demand factors. On the supply side, inadequate school infrastructure, overcrowded schools, the long distances many children must walk to school, and an inappropriate school calendar adversely impacts access. Due to perceived greater risks accruing to girls who have to travel long distances on isolated roads, proximity to schools is a significant obstacle to girls' education in rural areas

Demand for primary education is constrained by high direct and indirect costs. Primary education is free, but the subsidies provided by the GoBF are inadequate to cover the costs of good quality education. As a consequence, schools continue to impose unregulated fees on parents to supplement government transfers. These top-up fees when combined with the cost of textbooks and other teaching materials, as well as the high opportunity costs associated with enrolling a child in education, makes primary education unaffordable for many poor families.

Limited Access to Secondary Education

Progress in improving access to primary education over the course of the last ten years has exacerbated already significant pressure to further develop the secondary level of education, particularly in rural areas. In 2013, 259,000 students completed a full course of primary education. Of these learners, only 66 percent continued to the lower secondary cycle, meaning that 88,000 qualified students, predominantly from rural areas, missed the opportunity to enter secondary education. The secondary GER has increased slowly since the early 2000s reaching 28 percent in 2013 (37 percent in lower secondary and 14 percent in upper secondary) with significant rural/urban, income and gender inequity. Several factors act as barriers to entry and perpetuate unequal access. An inadequate supply of accessible schools especially in the rural areas is a significant challenge, with many secondary institutions located far from households. Available data show that parents are reluctant to send their children

to schools located more than 20 kilometers from their homes. This is especially pertinent with regard to security concerns which disproportionately impact girls who may have to walk long distances or live away from home in uncertain conditions.

Demand for secondary education is weak. Direct and indirect costs to households associated with both cycles of secondary education increase following the completion of primary education, negatively impacting the education of poorer children. For many families, costs associated with tuition and textbooks are prohibitively high, and this is compounded by the perception of greater opportunity costs to households associated with the enrollment of older children in education. In a recent survey, students cited the high cost of secondary education and parental reluctance to permit enrollment in secondary education as reasons for staying out of the system. The practice of parents keeping girls at home while sending boys to school is more pronounced at the secondary level. Even when parents decide to send children to school, they are often withdrawn before the end of the cycle to assist with productive activities in an effort to mitigate household poverty. Girls, moreover, are often withdrawn from school due to marriage or because of early or unwanted pregnancies. Some parents prefer early marriages as a form of insurance against unwanted pregnancies. Constraints on access to education vary significantly by region and interventions will need to be tailored to address the constraints specific to particular areas.

Limited Access to Tertiary Education

Given the size of the general population, a total enrollment of 61,000 in higher education, translating to 388 students per 100,000 inhabitants in 2010/11, is fairly low. These figures disguise substantial growth in enrollment (82 percent) between 2006/07-20110/11, which has led to the over-crowding of tertiary institutions and a high ratio of students to academic staff (on average 116 to 1 in public institutions). Higher education is negatively affected by high rates of repetition (15 percent on average), particularly among those enrolled in the second and third years, where students repeating years of study reach 21 and 23 percent, respectively. A national 10-year action plan addressing the weaknesses of the tertiary education sub-sector was prepared in 2013 (*Plan National Action de Développement de l'Enseignement Supérieur - PNADES*). It includes proposed investments aimed at addressing limited access, improving the quality of education delivered, increasing support for university research and improving systems of governance. The GoBF has allocated resources in its higher education budget to commence implementation of the plan. To date construction of amphitheaters has begun at the University of Ouagadougou and *Institut de Développement des Sciences – IDS,* and funds have been allocated to increase student bursaries.

Low Quality of Education

The quality and internal efficiency of primary education will also require further improvement if the MDGs are to be met. The quality of teaching and learning system wide is low largely due to a scarcity of appropriate and up to date educational materials, poor teaching practices, and inadequate learning environments. Quality education is further constrained by weak pedagogical and administrative management in primary education.

Inappropriate Curriculum

Poor and inappropriate curricula contribute to the low quality of education and limited learning achievement of students in the first three sub-cycles of the education system. Programs implemented in many ECD centers do not focus sufficiently on the development of social and psycho-motor skills, and do not adequately establish a foundation for literacy and numeracy for further development in primary education. Improved curricula complemented and supported by appropriate and relevant materials and training, must ensure that children are ready for primary school enrollment, enabling higher achievement of learners in the education system. There is a sharp discontinuity between the curricula for primary and lower secondary education: students who enter grade seven often find that they must learn new concepts for which they lack required preparation. As a consequence, many students do not perform well in their end-of-year examinations. This contributes to the already high repetition rates. For those who bear high opportunity costs associated with education, school repetition are prohibitive. They dropout of schools. The overall attrition rates diminish the number of graduates from secondary school.

Implementation of the basic education curriculum reform was launched in March 2014 and is expected to be completed by the 2020-2021 academic year. The revised curriculum has two principle objectives: The first is to ensure a smooth transition between primary and the first cycle secondary education, with a focus on reducing failure rates in the first grade of secondary education. The second objective is to provide pre-TVET induction to students to better prepare them for further skills development and to improve their prospects in the labor market. To date, the following activities have been implemented with support from the national budget and development partners (DPs): (a) the curriculum reform framework document which describes the curriculum and education goals, targets and objectives by subject area for the different levels of education, and the new pedagogical approach and the expected new graduate profile, both of which have been approved; (b) the description and organization of basic education; (c) the organization of the content of the curricula by sub-cycle and subject area, and (d) the arrangements for piloting the draft curricula. The project will focus on the key remaining activities, including the development and approval of teaching programs and materials for the piloting of revised curricula, the training of teachers and teacher supervisors to effectively implement new curricula and the

revision and development of textbooks and other teaching materials complementary to the new curriculum.

Low internal efficiency and poor quality

The internal efficiency of secondary education remains low. For the period the 2006-2012 annual lower-secondary dropout and repetition rates averaged 13 to 15 percent and 25 to 29 percent, respectively. Alarmingly, the annual grade 10 repetition rate was much higher at 40-49 percent. Similar patterns can be observed for the upper-secondary level, with annual dropout and repetition rates for grades 11 and 12 of 5 to 15 percent and 14 to 21 percent, respectively. An annual repetition rate of 35 to 40 percent for the final Baccalaureate examination year (grade 13) is even higher. Low levels of internal efficiency lead to unnecessarily high unit costs per graduate and make expansion of the system more expensive, compromising sustainability and low returns to investments. Low internal efficiency and limited access, moreover, impact various socio-economic groups inequitably, with higher numbers of students from poor families failing to complete these cycles of education, undermining the impact of education on poverty reduction.

High repetition rates in grades 10 and 13 are exacerbated due to the high stakes and the perception of life-changing implications associated with the BEPC and Baccalaureate examinations that determine access to upper-secondary and higher education. Many students who do not pass their examinations the first time repeat the grade in an effort to pass on their second try; thereafter, if students fail to pass again, many will drop out. Increased opportunities for training and employment, especially after grade 10, would help reduce the weight of importance of the BEPC and BAC and ease the associated costs to government and parents who currently finance students who repeat grades, often only to fail again and exit the system without any qualifications. Further opportunities for training and employment after grade 10 would also help produce graduates suitable for training in the mid-level tier of skills required by the economy.

Low level of learning achievement

In addition to challenges associated with access to education and low levels of internal efficiency, a particularly pertinent challenge at the level of secondary education relates to low levels of learning achievement. The student learning assessment carried out by the Central Office for Secondary School Examinations (*Office Central des Examens et Concours du Secondaire* - OCECOS) in 2013 found that the majority of students in secondary education did not demonstrate minimum proficiency in French, mathematics, life and earth sciences, history and geography; and that achievement levels have been in decline since 2007. Although these are useful and concerning measures, the quality of test administration and design requires further improvement to enable reliable

monitoring of learning achievement over time, and effective identification of weaknesses. Improved testing and data analysis will help improve the design of appropriate interventions to improve learning outcomes. Toward this end, the capacity of OCECOS and the department responsible for administration and oversight of the BAC will need to be strengthened, and coordination improved.

Low learning achievement is attributable to inadequate and poorly qualified teachers, a poor learning environment and weak management at the school level.

Limited availability of qualified teachers

An inadequate supply of math and science teachers contributes to poor learning outcomes. Data demonstrates that some schools operate without a single teacher for math and science. When teachers are available, they are often unqualified and use inappropriate or outdated teaching methods. The inadequate supply of qualified teachers is partly attributable to limited training capacity and inappropriate teacher-training methodologies. The two institutions responsible for secondary teacher training have a combined annual output of only 1,400 teachers, significantly below the projected annual requirement of 2,000 teachers. Addressing these issues at the secondary and higher education levels will require a multi-pronged approach to effectively address short, medium and long-term challenges.

Poor educational environment

Poor and limited physical educational infrastructure and materials, and suboptimal organizational arrangements also contribute to low levels of student achievement. These factors include delayed availability and limited distribution of quality educational materials, over centralization of management in the sub-sector, and the inadequate utilization of the results of student learning assessments to improve quality. While much has been done to improve and increase the availability of textbooks, further strengthening of national capacity to author and publish textbooks will help to reduce reliance on external publishing houses.

Inadequate development of local level management of schools

Administrative and management capacity at the level of secondary schools focused on increasing student participation and learning outcomes are not well developed. This is especially pertinent with regard to School Based Management Committees (SBMCs) - *(Comités de Gestion Scolaire* – COGES). Recent evidence demonstrates that a school-based management approach can be effective in increasing parental participation in school decision-making, with positive implications for student achievement and a reduction of dropout, repetition and failure rates. However, there is no authorizing instrument at the level of secondary education (such as the Presidential Decree of 2010 which enabled the establishment of SBMCs in all primary schools nationwide by 2015) to enable to

the establishment of SBMCs. There is, therefore, a need to build similar systems at the secondary level for the establishment of SBMCs that would support the preparation of School Improvement Plans (SIPs) and management of resources at the school and community levels. The introduction of incentive systems to promote quality would help strengthen this system.

Weak planning and data management systems

Despite progress in developing and implementing the Education Management Information System (EMIS) under the previous interventions (Post-Primary Education Projects 1 and 2 – [PPEP1 and PPEP2]), EMIS management capacity for collecting and analyzing data remains weak at the decentralized levels. These weaknesses affect the quality of data available in the sector, and limit the use of data in local planning. Capacity at the decentralized levels of education needs to be strengthened to support the introduction and use of new tools such as school report cards to monitor school operations.

Given the realities outlined in this report, the general and current focus of educational policy in Burkina Faso is to achieve greater quality of student learning through the training of professionals so they can further integrate curriculum into the social and professional life of Burkinabe. In this regard, the Government of Burkina Faso and its partners are addressing access and quality issues in the country education system.

TECHNOLOGY IN EDUCATION

Using technology in education is not new to Burkina Faso's educational institutions as it already had previous experiences with radio and television which was first outlined by Lerner (1958, 1963, 1964), the architect of the modernization theory of development. Lerner viewed communication as a vehicle with the potential to bring about social change and, consequently, development. Similarly, Freire (1970, 1972) believed communication should awaken the critical awareness of oneself. With the advent of radio and television technology in the mid-20th century, many institutions enthusiastically initiated educational broadcasting. Modernization theorists such as Schramm (1963, 1964) viewed this type of media as vital in the efforts toward development. Schramm

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(1963, 1964) opined that mass media would substitute for a teacher where there was none and one textbook used by a teacher on radio or television could suffice for a multitude of students across the country. Due in large part to this type of thinking, several countries in Africa used radio and television in formal and non-formal education during this time period.

Although Burkina Faso embraces radio technology as an educational tool in its educational system, educators have not used television as a tool for education in Burkina Faso because most of the country lacks access to electricity. In other nations, the television has served as an instrument of adult-literacy education for those geographic locations with television access, mostly in large cities. This television-based learning, after a number of years, failed, as a majority of people turned off their televisions during adult-literacy-education broadcasting time.

The history of educational radio broadcasting in Burkina Faso arose from the learning method of the French language, with which educators experimented in primary schools. After a period of experimentation in the 1967–1968 school years, which consisted of simply listening to recordings on tape recorders, educators extended the so-called "French Sound Bath" which objective is to talk about, and listen to music, with particular emphasis on the human vocal instrument, in an informative, educational and questioning manner to 50 classrooms in the cities of Ouagadougou and Bobo-Dioulasso with two-way receptors placed in these classrooms. In 1969–1970 educators expanded the program due to the allocation of radio receivers in more than 150 classrooms, allowing teachers and students to tune in to broadcasts from the Volta school radio at the time.

The idea of educational radio broadcasting as government policy in Burkina Faso goes back to October 1970 (the official launch date of the project). In November 1970, educators presented the project at the constitutive conference of the Agency for Cultural and Technical Cooperation in Niamey. In December of the same year, initiators presented a note giving details of the project, including details on setting up an educational radio broadcasting in Upper Volta (now Burkina Faso), to the Joint Committee Upper Volta–France for higher education.

The country undertook an initial assessment project in May–June 1971 and by 1974–1975, the Voltaic Educational Radio Broadcasting was operational, supported by Upper Volta and hosted by the Center for Documentation and Educational Development. The so-called National Educational Radio Broadcasting, at the time of its creation, targeted the following objectives:

- Provide educational support for teachers in all disciplines of education;

- Ensure their continuous and ongoing training with a view to raising their intellectual and professional level;

- Serve as a support vehicle to adult-literacy training and extension of para- and post-education activities; and

- Serve the generalization of learning with sound support (i.e., Sound Bath).

From the start, educational radio broadcasting was producing 10 broadcasts per week including the following: educators tuned, information and culture, the educational listening club, parents and school, parents and educators tuned, youth futures, the magazine for children, your English time (broadcast in English), and the sound bath. All told, this programming represented over 280 hours of content per year.

Production is conducted in the national language, focused on literacy and non-formal education programs. Programs align distance learning with on-site staff according to a transmissions schedule broadcast on radio Burkina on frequency 99.9 Mhz. For various reasons, most of these programs have been discontinued with only the following programs maintained:

- *Information and Culture*: Tuesday at 6:30 pm

- *Child Frequency*: Thursday at 12:20 pm

- *Educators Tuned*: Friday at 9:50 pm

The Office of Audiovisual Production houses technical equipment under the auspices of the Department of Research and Educational Development and occupies an area of about 130 m^2 divided as follows: a recording studio of 15 m^2, a sound control studio about 12m^2, a sound library, 4 offices, an image management system.

The Office of Audiovisual Production's primarily focuses on raising-awareness among parents and partners of formal basic education, non-formal and literacy educational policy and innovation, the strengthening of public and teacher educational abilities, informational, entertainment, and educational content for children in primary school.

Several difficulties abound. They include lack of transportation, sound archives (sound library) that are in a state of disrepair, lack of staff training in radiophonic and audiovisual production, and insufficient numbers of staff. Programming is produced in a decentralized manner with a focus on local and regional radio stations, resulting in productions that better align to the local populace and are of better quality (better sound quality, locally produced programs, and production exchanges between educational

areas). Production is conducted in the national language, focused on literacy and nonformal education programs.

The emergence of the Internet in the 1990s had a massive impact on teaching and learning, starting with the Web 1.0 initiative, which allowed access to information on the Web. However, Web 1.0 had similar limitations to previously introduced radio and television, only allowing one-way communication with users. This changed with the development of Web 2.0 which allowed applications that provide users with control over content and facilitated collaboration between users (Herrmann, 2009; O'Reilly, 2007). Coinciding with this advancement of Internet-based learning tools, mobile-phone usage in education is expanding in developing countries (IICD, 2013). As these technologies emerge and mature, mobile-communication platforms will help teachers and students organize and foster individual learning while also promoting regular communication among parents, teachers, and students in ways that were previously unimaginable.

TECHNOLOGY AND CURRICULUM

As a teaching tool, Burkina Faso's ELTs are not formally included in the curriculum of primary- and secondary-education sectors. However, some technical and private schools provide introductory computing and technological tools. According to MESS, ELTs are mostly used in private secondary schools that have 1559 computers of 2056 total computers present in the country's schools (MESS, 2013, pp. 303–305). Thus, on average, of the four computers used in secondary education, three belong to private institutions. Historically, prior to the failure of radio and television in Burkina Faso's education system, the introduction of ELTs raised great hopes in the country. However, because these previous ELTs ultimately failed, the education system in Burkina Faso

today bases learning almost entirely on books, paper documents, and other physical media. The only visible government initiative to introduce ELTs in schools are the presence/establishment of professional training schools for secondary school teachers.

Currently, ELTs primarily serve as a teaching support, whereas in some secondary schools, through the personal initiative of some teachers, technology tools are used to facilitate teaching. In primary schools this practice does not exist whereas in universities one may take a training program. Ideally teachers would begin to use video projectors and interactive white boards for course presentation habitually. Similarly, all students should acquire the introductory skills in ELTs for licensure, master, and doctoral programs. Other examples exist of ELTs used as a teaching module or as medium of instruction in private schools, but are not included in official educational institutions' programs (Zahonogo, 2010).

In Burkina Faso the only institution that has taught and organized testing using ELTs is the Higher Institute of Informatics and Management. However, today many institutions provide this service with high school and university degrees. Following the growing interest of the government and institutions, more and more of Burkina's businesses integrate ELTs into core operations.

In the process of integrating ELT in education, the tools themselves must be accessible and then integrated into a teaching and learning module. ELTs must be integrated into daily teaching practices. Accessibility persists as a major barrier to success, despite growing political pressure to overcome this barrier. As stated in the September 24, 2014 ministries meeting report, the ministries planned a project called

"ieducations" that the Ministry of Development of the Digital Economy and Posts will implement for a more significant contribution to the current education system.

CONCLUSION

Developing countries such as Burkina Faso have a rapidly growing youth population. This population usually has low literacy levels combined with high drop-out rates in schools. The cost of education is often too high for children to continue with their education after a certain point. Low educational investments, caused by a low GDP, typically manifest in limited educational facilities and a shortage of qualified teachers in Burkina Faso, as it does in most developing countries (UNESCO, 2008). However, in order to participate in the global economy and ensure sustainable national development, developing countries such as Burkina Faso must develop a vibrant education system. ELTs can enhance the quality of education at primary, secondary, and tertiary level schools and support teachers' professional development. ELTs contribute to a more conducive environment through its integration in education (IICD, 2007).

In Burkina Faso, as in all societies, the quest to improve the day-to-day lives of individuals often results in the development of new technologies to solve problems in productive ways. National learning-technology policies can serve several important functions (Jones, 2003). First, learning technologies provide a rational set of goals and a vision of how education systems work when ELTs are introduced into teaching and learning. ELTs can benefit students, teachers, parents, and the population in general. Learning-technology policies may provide guidance. Failure means individual school and classroom innovations would be unsustainable. Individual efforts are less likely to be felt

across the country unless stakeholders share a clearly laid vision as national policy (Hennessy et al., 2010).

Researchers identified education as one of the public sectors most influenced by technological developments (Kozma, 2005). Improvement in educational systems and the resulting increase in educational attainment by individuals produce dramatic impact when emerging countries reorient their focus to prepare for global, technology-based changes in all sectors (Organization for Economic Co-operation and Development, 2002). In education, the formation of comprehensive learning-technology policies, like those embedded in the national learning-technology policies of Burkina Faso, become crucial in preparing individuals in school for the workplace (Were, Rubagiza, Denley & Sutherland, 2007). Furthermore, if educators carefully integrate technology into education, they may realize the potential to facilitate the acquisition of relevant life skills that support the development process in prevailing economic and information infrastructures (Kozma, 2005). According to the IICD (2007), all countries in Sub-Saharan Africa intend to establish e-learning, e-government, and e-commerce.

As stated previously, the collaboration of the education sector is crucial to develop the human capital (Erosa, Koreshkova, & Restuccia, 2010) of countries like Burkina Faso. The need to innovate and find solutions for sustained and equitable growth can serve several important functions: improving the quality of education by enhancing educational content development, supporting administrative processes, and increasing access to education for teachers and learners (Jones, 2003). Learning-technology policies will provide guidance on implementation practices because individual efforts are less likely to have impact across the country (Manuelli & Seshadri, 2010). However, due to

scarce resources and the level of investment needed, regional schools or training centers should maximize the use of those scarce resources (Tamukong, 2007).

In this ever increasing digital world along with a rapid expansion of the Internet creates an irreversible global network. A world in which children are growing up with social media, mobile technology and social media as a fundamental part of how they communicate, learn, and develop.

CHAPTER 3

METHODOLOGY

In conducting this research, I attempted to capture the views of education stakeholders about the challenges and benefits of technology integration and their perceptions about its future in secondary schools within Burkina Faso. Due to my interest in rural development and the possible role technology can play in enhancing education as well as the social and economic development of Burkina Faso, I used an interpretive methodological stance in tandem with qualitative methods. I based this choice on my interest in eliciting qualitative data that offers insights from the attitudes, perceptions, concerns, and opinions of participants.

In this study, I examined the integration of technology in Burkina Faso's secondary schools. I developed the study using a participatory approach involving stakeholders within the educational system of Burkina Faso to gain a comprehensive understanding of both the challenges and the benefits of technology integration in secondary schools. Thus, I collected data at three secondary schools within Burkina Faso: one in a big city, one in a small town, and one in a rural area. This study was guided by the following core questions:

1. What are the perspectives of secondary educators and administrators regarding the use of ELTs in Burkina Faso?

2. In the local educational contexts of cities and rural areas, how do these secondary educators and administrators experience the use of ELTs in education?

3. What are the main issues (benefits and challenges) regarding the use of ELTs for educational purposes in Burkina Faso?

RESEARCH DESIGN

This study used a qualitative research approach. Qualitative research takes place in natural settings employing a combination of observations, interviews, and document reviews with emphasis on interpretation (Creswell, 1994; Erickson, 1986). The context is important to the interrelation of data. This approach requires researchers to focus on the attempt to achieve a sense of the meaning that others give to their own situation (Smith & Eatough, 2006).

Evaluating the quality of research for assuring the utility and reliability through rigor or integrity is essential for assuring the credibility of findings in qualitative research. Concepts such as reliability, credibility, and generalizability are typically associated with quantitative research. Qualitative research is frequently criticized for lacking scientific rigor due to weak justification of the adopted methods, lack of transparency in the analytical procedures, and the findings seeming to be a collection of personal opinions that are subject to researcher bias (Rolfe, 2006; Smith and Noble, 2004). For the novice researcher, demonstrating rigor and credibility when undertaking qualitative research is challenging because there is little consensus about the standards by which such research should be judged (Rolfe, 2006).

Although the tests and measures used to establish the quality and reliability of quantitative research cannot be applied to qualitative research, there are ongoing debates about whether terms such as validity, reliability, and generalizability are appropriate to use in evaluating qualitative research (Long & Johnson, 2000; Rolfe, 2006). Many

scholars agree that in the broadest context these terms are applicable, with validity referring to the integrity and application of the methods undertaken and the precision in which the findings accurately reflect the data, while reliability describes consistency within the employed analytical procedures (Long & Johnson, 2000). However, if the researcher believes that qualitative methods are inherently different from quantitative methods in terms of philosophical positions and purpose, then alternative frameworks for establishing rigor are appropriate (Sandelowski, 1993). Lincoln and Cuba (1985) offer alternative criteria for demonstrating rigor within qualitative research such as truth, value, consistency and neutrality. Maxwell (2005) described the data collection and analysis as demanding and rigorous processes in which researchers continually test and revise images and conceptions. The data collected in a qualitative study may consist of interviews, transcripts, field notes from observations, a variety of records and documents, and memoranda, which are treated to rigorous ongoing analysis. Three processes are blended throughout the study: collection, coding, and analysis of data. This approach gives some flexibility to qualitative researchers who can change a line of inquiry and move in new directions as they acquire more information and better understanding of relevant data (Erickson, 1986). Maxwell (2005) stressed the need for qualitative studies to capture the fullness of experience and the richness of living, and also encouraged the use of qualitative studies to test assumptions and theories. These important perspectives highlighted by qualitative researchers provide the foundation for the use of the qualitative research methodology for this study.

RESEARCHER BACKGROUND INFORMATION

Because the researcher is considered an important part of the study itself within qualitative research paradigms, sharing my background information could help the reader better understand my choice of Burkina Faso as the research location. I grew up in Burkina Faso where I attained primary, secondary, and professional training in computer programming and analysis. I also worked with Plan International in Burkina Faso as an Information Technology Director. I moved to the United States with my family in 2000. Since arriving in the United States, I have pursued my education while working. Thus, I have an A.A.S degree in computer science, a B.S. degree in business management, and an M.S. in education and human resource development with a focus on information media. Although my main interest is in learning technologies, I view education as a cornerstone of the social and economic development of nations like Burkina Faso.

During 2011 I was also involved as a team member in the Earthducation Expedition Project which spent 3 weeks in Burkina Faso (http://lt.umn.edu/earthducation/expedition1/). Led by Dr. Aaron Doering, participants in the expedition focused on sustainability and education and travelled throughout Burkina Faso. During this project, I served in the role of Continent Expert and language/cultural liaison. We interviewed dignitaries, national and local education authorities, teachers, students, and elders about their opinions regarding the impact education can have on sustainability practices in Burkina, and specifically how education can help address solutions to the continued issue of lack of access to fresh water. I worked on planning the visit to Burkina Faso for almost a year before the project began, reaching out to contacts at international embassies as well as in local villages. It was during this project that I

began to make connections with teachers, and administrators about my future dissertation research centered on technology integration in secondary schools within the country. As someone who grew up in Burkina Faso and attended the country's school system, I learned first-hand about the education system. My interest for my dissertation research was to gain a comprehensive understanding of the challenges and benefits related to technology integration in secondary schools in Burkina Faso, the history of its integration, its present state, and its future.

ROLE OF THE RESEARCHER

Researchers are the primary instruments of qualitative research (Eisner, 1991; Merriam, 1988) and are an inescapable part of the social world they research. Researchers bring their own biographies to the research situation, and participants behave in particular ways in their presence. Thus, qualitative researchers should acknowledge and disclose themselves in the research. Highly reflexive researchers understand the ways in which their selectivity, perceptions, backgrounds, and inductive processes and paradigms shape the research (Cohen, Manion, & Morrison, 2000, p. 141).

As a researcher and human being, I became enmeshed in this research. Therefore, I made an effort to recognize my beliefs, values, stances, and history to recognize them during the analysis processes and honestly examine them in the writing and sharing of this research. My social, professional, and student life in the United States has been spent in many avenues of education from undergraduate to graduate experiences as a master's and doctoral candidate. I am also an entrepreneur and a world traveler. I deeply believe in the possibilities of education in general and ELTs in particular to transform societies, but am deeply troubled by the challenges and benefits related to its integration in education.

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Burkina Faso, for decades, has struggled to find the right education path for its people, in order to build a sustainable society.

By acknowledging my passion and excitement for technology integration in education, I had to consciously remind myself to bracket my enthusiasm and ascertain the limitations my views could have on the research as well as consider other explanations for inferences. I questioned my ideological understanding as well as revisited literature that troubled and extended my interpretations.

In qualitative research, the researcher is directly involved in and not removed from the research process (Eisner, 1991; Merriam, 1988). The orientation of the researcher to the subject is critical to the success of the study and is inescapably part of the social world that they are researching (Bogdan & Biklen, 1992; Maxwell, 2005). Erickson (1986) stated that the privilege of being an observer or an interviewer is a gift presented to the researcher by participants. Awareness of this "gift relationship" helps the researcher address possible personal biases or prejudices. The "lone researcher" can minimize potential problems by thoughtful review and self-examination throughout the process of data collection and analysis (Creswell, 1994). Thus, I was aware of and honored my role in this research, and constantly sought to minimize my biases by remaining natural and avoided sharing my opinions.

METHODOLOGICAL FRAMEWORK

I situated this research in the methodological framework of interpretive research; a paradigm that assumes that reality is constructed rather than objectified, that meaning can assume multiple "truths," that people construct meaning rather than it being inherently present, and that a subject–subject relationship exists between the researcher

and the participants (Cohen, Manion, & Morrison, 2000, pp. 137–138). This interactive relationship is a strength of interpretive research. Researchers conduct interpretive research in naturally occurring settings rather than creating research in laboratories. I embraced these assumptions of interpretive research and incorporated them into all facets of this research.

METHOD

Within the broad framework of interpretive research, I employed a case-study method. Dyson and Genishi (2005) maintain that "it is the messy complexity of human experience that leads researchers to case studies in the qualitative or interpretive traditions" (p. 3). The case study is an ideal method when researchers require a holistic, comprehensive investigation (Feagin, Orum & Sjoberg, 1991), which is the goal of this dissertation research. Yin (1984, 1989, 1993, 1994, 2003), Stake (1995), and others who have extensive experience in case studies have developed procedures for researchers to follow, including using multiple sources of data.

Yin (1993) identified some specific types of case studies: explanatory, and descriptive. Stake (1995) included three other types: intrinsic, when the researcher has an interest in the case; instrumental, when the researcher uses the case to understand more than what is obvious to the observer; and collective, when a researcher studies a group of cases. Case study researchers triangulate multiple sources of data as a research strategy in order to ensure accuracy of interpretations and provide alternative explanations (Stake, 1995). Triangulation can occur with data, investigators, theories, and even methodologies (Snow & Anderson, 1991). In case studies, researchers can accomplish this end by using

multiple sources of data (Yin, 1984) to establish complex descriptions and interpretations of the case as well as to address concerns of credibility.

This dissertation is an interpretive case study, characterized by Merriam (1988) as one that contains rich, "thick" descriptions that are "used to develop conceptual categories or to illustrate, support, or challenge theoretical assumptions held prior to the data collection" (p. 38). Qualitative case-study researchers recognize, accept, and expect that similar phenomena will look and sound different in different cultural and social contexts, as well the meanings people make of their experiences. This aspect of case study is important to this research because of the purpose of my research, which is situated in a specific cultural, political, and social context.

STUDY CONTEXT

As noted in Chapter 1, the setting for this research took place is Burkina Faso, a land-locked country located in West Africa. There are three specific locations incorporated into this case study with the purpose to document the perspectives and attitudes of secondary-education teachers and administrators about the perceived benefits and challenges of integrating ELTs into secondary education in Burkina Faso. A specific focus is on the ways in which ELTs are perceived as different from previously used technologies in Burkina Faso such as radio and television.

While a brief description of the three high schools is shared in this chapter, additional details of each school are provided in Chapter 4. Burkina Faso is a Francophone-speaking country, so the school names are provided in French in parenthesis along with the English translation:

- Departmental High School of Cassou (Lycée départemental de Cassou)

- Riale Provincial High School of Tenkodogo (Lycée Provincial Riale de
  Tenkodogo)

- Marien N'Gouabi High School in Ouagadougou (Lycée Marien N'Gouabi)

Figure 2. Map of Burkina Faso with the three high schools noted

The following pictures have been included to provide context to readers who are
unfamiliar with Burkina Faso. These photos that were taken during my data collection
visit in (May, 2014).

Figure 3. Typical Ouagadougou street scene

Figure 4. Street side fruit stand in Ouagadougou

Figure 5. Typical transportation on National Road 4 to Tenkodogo (RN4)

Figure 6. Typical village on the route to Cassou

Departmental High School of Cassou (Lycée départemental de Cassou)

The Departmental High School of Cassou is located in a rural area. Cassou is the department of Ziro province located in the south of Burkina Faso. At the departmental high school of Cassou, I interviewed four teachers and two administrators (see Table 1).

Table 1

Role of Participants at Departmental High School of Cassou

Title	Number	Percentage
Teachers	4	66.66
Administrators	2	33.33
Total	6	100.00

Table 2

Gender of Participants at Departmental High School of Cassou

Title	Number	Percentage
Female	0	0.00
Men	6	100.00
Total	6	100.00

Riale Provincial High School of Tenkodogo (Lycée provincial rialé de Tenkodogo)

Riale Provincial High School of Tenkodogo is located in a semi-urban area. Tenkodogo is the department of Boulgou province located in the center-east of Burkina Faso. At this school, six people were interviewed, one of whom was female. Thus, 17% of respondents were female and 83% were men (see Tables 3 and 4).

Table 3

Role of Participants at Riale Provincial High School of Tenkodogo

Title	Number	Percentage
Teachers	3	50.00
Administrators	3	50.00
Total	6	100.00

Table 4

Gender of Participants at Riale Provincial High School of Tenkodogo

Title	Number	Percentage
Female	1	16.66
Men	5	83.33
Total	6	100.00

Marien N'Gouabi High School in Ouagadougou (Lycée Marien N'Gaoubi)

Marien N'Gouabi High School is located in Ouagadougou, the capital and the largest city of Burkina Faso. In this high school, located in the urban city of Ouagadougou, the capital of Burkina Faso, I interviewed six volunteers, all men (see Tables 5 and 6).

Table 5

Role of Participants at Marien N'Gouabi High School

Title	Number	Percentage
Teachers	3	50.00
Administrators	3	50.00
Total	6	100.00

Table 6

Gender of Participants at Marien N'Gouabi High School

Title	Number	Percentage
Female	0	0.00
Men	6	100.00
Total	6	100.00

Gender Disparity

For these three sites, 17 of 18 participants were males (94%). The low number of female participants in this study could relate to general gender issues present in Burkina Faso. This gender inequality is described in detail in Chapter 4. One potential reason for the lack of women at these schools is that women in Burkina Faso, even though they represent 52% of the total population, have a relativity low school attendance rate and mostly work in non-formal employment sectors such as selling goods in the market, keeping house, and working as domestic household staff. Recently, Burkina Faso's government declared recognition of women's work a priority with a goal to foster increased female school attendance and increased numbers of women working in all sectors of the economy (MENA, 2012).

DATA SOURCES AND COLLECTION

This case study followed a qualitative research approach focused on identifying secondary teachers and administrators' perceptions and perspectives of technology integration in education, particularly in secondary education. Data collection was completed during a visit to Burkina Faso that was partially supported by an International Thesis Research Travel Grant award sponsored by the Graduate School at the University of Minnesota. The main data-collection devices in qualitative methodology are observation, interview, and documents; all three strategies were used in this study.

> Absolutely essential parts of a data-gathering plan are the following: definition of case, list of research questions, identification of helpers, data sources, allocation of time, expenses, and intended reporting. There are far more things we will do than will ever actually get pre-allocation of time, such as socializing with case actors and watching for relevant stories in the newspaper—yet it is good periodically to remind ourselves of some of those nuances (Stake, 1995, p. 51).

The primary data sources for this study are interviews and surveys. Secondary data sources consisted of observations and resulting field notes, and document collection, including images of schools and classrooms.

For this research, I chose interviews as the primary data collection method for the several reasons. First, interviewing provides the opportunity to gather rich data. Next, the language (French) used by participants was essential in gaining insight into their perceptions and values and also provided contextual aspects that were significant to understanding others' perceptions; and using the local language helped establish me as a trusted insider.

Interview data was collected in person at each of the three schools during May 2014. All interviews were conducted in French by me and recorded by a team member, with interviews ranging in length from 30 to 90 minutes. I followed Patton's (2002)

advice about purposeful sampling for interviews, the primary data source, and kept the interview time between 1-2 hours. Due to the realities of time constraints and national teacher examination scheduling, I conducted the interviews in a group setting at each school. Questions were asked to each participant which each had the opportunity to answer. Volunteer interview participants were provided with $20 in compensation for time at the end of the interviews.

I took memos before, during, and after the interviews and conducted follow-up interviews, observations, and casual encounters with subjects during my extended stay in Burkina Faso. In addition to the interviews and follow-up interviews, I obtained comments from participants' colleagues, policy and school documents, images, and videos throughout the study. These data are considered secondary sources, to assist with the credibility and complexity of the primary data. This secondary documentation also aids in the interpretation, the voice, the meaning of interview comments and analyses. I also believe in the power of images to help further illustrate this research to Western audiences, and hold on to the familiar saying, "a picture's worth a thousand words" thus, during this research, photography and video were part of the data collection approach in each site.

Semi-structured interviews. I used semi-structured interviews as the primary method to gather participants' perceptions and perspectives about technology integration in secondary schools in Burkina Faso. As Maxwell (2005) noted, "the strengths of qualitative research derive primarily from its inductive approach, its focus on specific situations or people, and it emphasis on words rather than numbers" (p. 22). The intent of these semi-structured interviews was to bring forth qualitative data that offers insight into

attitudes (Krueger 1994) and experiences. A semi-structured interview seeks to capture the perceptions, motivations, concerns, and opinions of participants (Patton, 2002, p. 385), which is the goal of this research.

Ritchie and Lewis (2003) note that face-to-face interviewing is appropriate where depth of meaning is important and the research is primarily focused on gaining insight and understanding. The researcher choosing to interview face-to-face recognizes the importance of context, which is paramount in this study. The focus of the study was on using face-to-face interviews to discern the attitudes and experiences of teachers and administrators about the perceived benefits and challenges in integrating ELTs into the secondary education system. Situated in the local educational contexts of cities and rural areas and adopting a case-study approach, my aim was to positively affect the public space, encompassing and acknowledging the importance of context in understanding teachers' and administrators' perceptions.

Semi-structured interviews are in-depth interviews and are the middle ground between structured and unstructured interviews. The unstructured interview is closer to an observation, whereas a structured interview uses a series of closed questions, similar to a questionnaire. The methodology used in this study, therefore, was semi-structured in nature. I knew what I wanted to ask in the interviews, but I also wanted to allow interviewees the freedom to take different paths and explore different thoughts and feelings about the topics of technology integration and schooling in general within the country.

The purpose of the interviews was to use conversation, discussion, and questioning of teachers and administrators to provide insight into the research questions. I

designed an interview guide and grouped questions thematically to serve as references, including subject prompts, if they became necessary during interviews. I hoped that by preparing these prompts beforehand, I could use them more spontaneously in the interview without the need to refer to them explicitly. An independent group of volunteer teachers and administrators reviewed the interview guide prior to the interviews to ensure the language and terms of reference were clear (see Appendix A).

Initial contact with the schools began in 2013, about six months before my scheduled visit to Burkina Faso. I shared the interview prompts with the principal at each selected secondary school during the initial contact. The superintendent of each school sent my request for research to the national education department for approval. Once this department approved each school's participation, a formal acceptance letter was sent back to the school. This letter of approval was then sent to me so that we could continue making plans for the timing of my visit and the consent processes. Based on this contact and information, interview participants individually volunteered to take part in the research. I hoped that participants' willingness to participate in interviews indicated interest in the topic of technology integration. Self-volunteering proved to be a factor in terms of gender composition of the participants as well as in the nature and the depth of comments.

METHODS OF ANALYSIS

Qualitative research takes place in natural settings and uses a combination of observations, interviews, document reviews, field notes, videos, and photographs. Erickson (1986) asserted that the primary characteristic of qualitative research is it emphasis on interpretation.

Through analysis we are not on the trail of singular truths, nor of overly neat stories. We are on the trail of thematic threads, meaningful events, and powerful factors that allow us entry into the multiple realities and dynamic processes that constitute the everyday drama of language use in educational sites. (Dyson & Genishi, 2005, p.111)

Using these perspectives of qualitative analysis and interpretation, I employed multiple lenses and tools to facilitate my case analysis. There are many ways of establishing credibility include member checking, interviewer corroboration, peer debriefing, prolonged engagement, negative case analysis, audit ability, conformability, bracketing, and balance (Lincoln & Guba, 1985).

We have ethical obligations to minimize misrepresentation and misunderstanding. We need certain triangulation protocols or procedures which researchers and readers alike come to expect, efforts that go beyond simple repletion of fata gathering to deliberative effort to find credibility of data observed (Stake, 1995, p. 109).

I used multiple data sources to inform my case, as previously mentioned, to ensure that descriptions and interpretations in this research are robust, comprehensive and well-developed. For example, I used photographs to accentuate and make more "real" the contexts, situations, and stories in which the participants share during the interviews. The blackboard shown in Figure 7 was the most used and available technology at Cassou High School, and it was used for direct instruction.
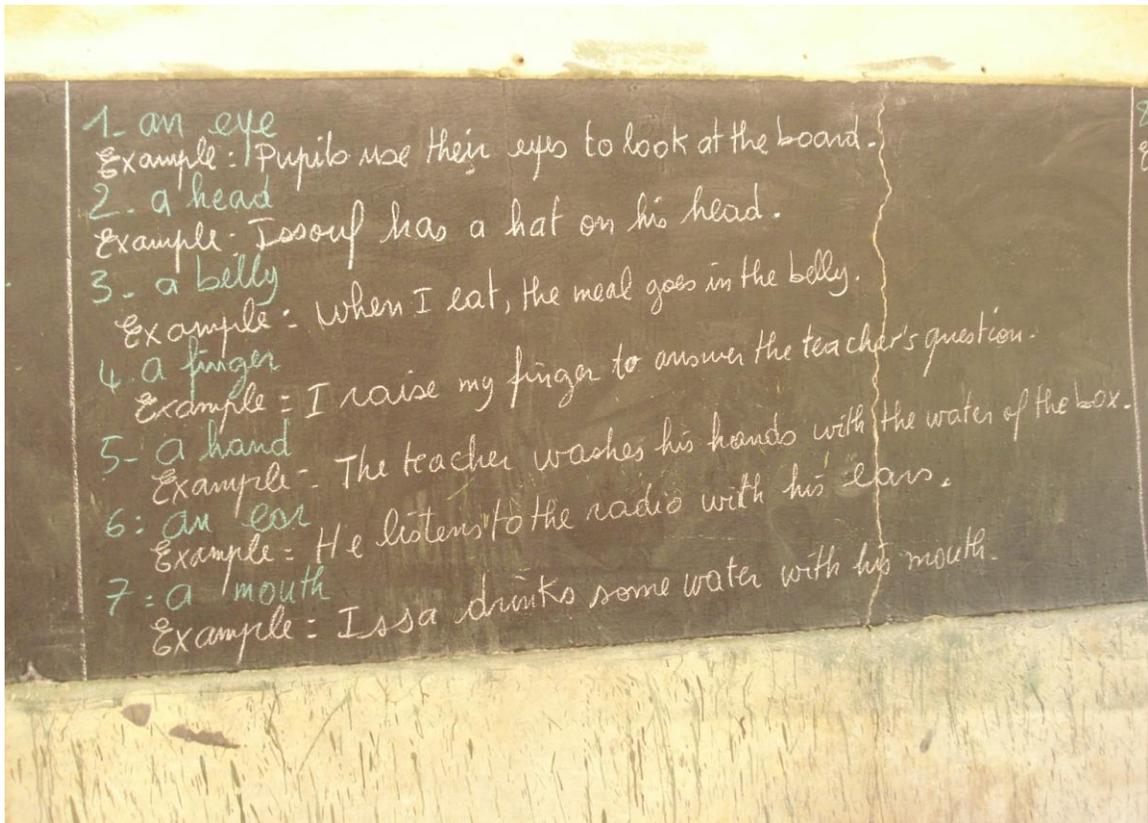
Figure 7. Blackboard in English class at Departmental High School of Cassou

Data analysis in qualitative research is an ongoing and iterative (nonlinear) process. "Analysis begins during a larval stage that, if fully developed, metamorphoses from caterpillar-like beginnings into the splendor of the mature butterfly" (Patton, 2002, p. 432). My analysis process reflected this metaphor. It also fluctuated between small and large focuses, from analyzing data at one school to analyzing data across the three schools. Data analysis was grounded in technology integration theories, with grounded theory (Glaser & Strauss, 1999) serving as the primary analysis framework. Grounded theory involves the construction of theory through the analysis of data. Grounded theory enables researchers to develop a theory which offers an explanation about the main

concern of the researcher and how that concern is resolved or processed (Glaser & Strauss, 1999).

I began to analyze transcribed interviews as soon as transcriptions were available. I also paired the transcripts with the images I took of each context (and reviewed them side by side) in order to remind myself of the details of the school. The initial coding of the transcript data was organized using Wiersma's (1995) code types:

1. *Setting or context codes.* These codes describe the setting or context descriptors of the phenomenon under study. Given that copious field notes are taken, codes for specific or regularly occurring characteristics contribute to efficient and effective field-note production.

2. *Perception codes:* These codes accurately record participants' reported perceptions and understandings about relevant people, circumstances, or things.

3. *Process codes:* Qualitative research involves naturally occurring system change. These codes note events or process evolution and factors that cause or contribute to that evolution. (p. 217)

Next, I reread the interview transcripts and the associated codes, and attempted to streamline, consolidate, and name the perception and processes codes more accurately, and to open code and group them into categories, which then developed into themes (Strauss & Corbin, 1999). This process was recursive and took much time. Once I was confident in my coding analyses, I then used my memos, observation field notes, photographs, videos, and additional commentary to triangulate my findings. I used the interview questions (see Appendix B) as a guide to keep my analyses focused. This was

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also a back and forth process that also required me to go back to the interview transcripts for rereading, additional analysis, and, as a result, refined understandings.

The research methodology outlined in this chapter was appropriate and valuable in collecting the data I needed to address my research questions while on the ground in Burkina Faso. By relying on the core principles of the qualitative methodology as well as the semi-structured interview process as the primary research method, I was able to collect, record, and interpret key data as well as collect secondary documentation while working in many different environmental settings.

The next chapter is a description of the case comprised of the three research sites related to their geographical locations, infrastructures, and technology accessibility.

CHAPTER 4

CASE DESCRIPTION: TECHNOLOGY INTEGRATION IN BURKINA FASO'S SECONDARY SCHOOLS

When analyzing technology integration within Burkina Faso's secondary schools it quickly becomes apparent that the level of infrastructural development (i.e., electricity availability, school buildings, etc.) at the three research sites varies greatly depending on geography. This variation amongst the school facilities creates a differing baseline of general technology use that was reflected in the interviews conducted with staff members. This scenario means that any discussion regarding the use of Emerging Learning Technologies (ELTs) in the classroom is directly impacted by the differing infrastructure baselines of the facilities themselves.

GENDER INEQUALITY AMONG STUDY PARTICIPANTS

Among the 18 participants interviewed for this study, I interviewed only one female. There are many reasons for this gender disparity in the teaching and administrative staff within Burkina Faso's secondary schools:

- Traditional customary factors in Burkina Faso families include forced marriage,

- Woman may not inherit land,

- Women typically leave the family to join their male spouses. Thus, families make little effort to educate women. This factor also explains the low enrollment rate of girls in school and the low numbers of female teachers.

Due to these factors, women are typically considered a lost investment in education because their primary roles revolve around duties to family.

The enrollment rate of girls in post-primary education and secondary schools during the school year 2012–2013 was 25.9% compared to 32.1% of boys, with a gross enrollment rate of 28.9% overall (MESS, 2013, p. i). Of a total of 8,971 teachers working within post-primary and secondary education in Burkina Faso, only 1,780 (19.84%) are women (MESS, 2013, p. 112). The two large centers of education—Ouagadougou and Bobo-Dioulasso—have respectively 462 and 117 female teachers for a total of 639 female representing 35.9% of teachers in these two regions.

This study took place only in three of the 13 regions of Burkina Faso. In the other 11 regions, the overall population is 64.10% female, with 5.8% of teachers being female (MESS, 2013, pp. 110–112). This low number helps explain the lack of females among the participants who took part in this study, as two of the schools were outside of these two large centers of education. Factors such as desertification and inadequate urbanization in semi-urban areas and departments causes an increasing number of requests for relocation of teachers and staff to urban centers, especially for female, despite the policy of regionalization of government jobs.

DESCRIPTION OF INTERVIEW PROCEDURES

The data collection for this study took place in three secondary schools in Burkina Faso:

- Departmental High School of Cassou (Lycee Departemental de Cassou)
- Riale Provincial High School of Tenkodogo (Lycee Provincial Riale de Tenkodogo)
- Marien Ngouabi High School in Ouagadougou (Lycee Marien Ngouabi)

Departmental High School of Cassou

On Wednesday, May 7, 2014 at 6:00 am, the research team and I met at The Rec Center, also known as American Rec Center located in Ouagadougou, the capital of Burkina Faso, to prepare for the trip. The team consisted of the following people: Lookman who took responsibility of transporting us to each of the three sites; Hamadou, the note taker; Mahamadi, the tape recorder and still photograph; Madi, the video-man, and myself the principal investigator, who left an hour later. The streets of Ouagadougou were already crowded with people on the way to Sapouy the first main town on our route. Before embarking on a dirt road to Cassou, we stopped at a gas station to fill up the old Mercedes 190 which I had rented for the trip. From there we left on our 400 km (248.5 miles) round trip.

Once on National Road 6, we saw a patrol of police vehicles. On the periphery of the city, we encountered men and women transporting clay pottery jars to the capital to sell. As we travelled through the rural area, we could see fields ready for their owners to start planting. Trees and grass had been burned by bushfires. Savannah trees and shrubs were scattered between villages. To maintain the long travel schedule, we spent most of our time discussing subjects unrelated to our main topic for the trip.

We arrived around 8:50 am in Sapouy, capital of the province of Ziro. We crossed the market divided by national Road 6. We could see, on our left and right side, vendors selling fruits and vegetables on the outskirts of the market. Sapouy is at the end of the paved road to Cassou. We travelled on a dirt road for about 30 km (18.64 miles) to our final destination.

From the courtyard of the Departmental High School in Cassou we could see an apparently nonfunctioning generator left in an open field. The school now uses solar panels to power the computers and printers installed in its offices along with its Internet connection. We chatted with the friend before leaving for Cassou on a bumpy road with potholes that were hard to avoid. A few kilometers from Cassou, we saw an abandoned bridge that appeared to be under construction but deserted by the workers.

At 10:10 am, we arrived at the entrance of Cassou. We passed a dam where we could read a sign indicating crocodiles crossing. Then, we saw a sign telling us to turn left for the Departmental High School of Cassou. At 10:25 am, we arrived in the courtyard of the school crowded with students. The school was divided into five blocks of buildings, which included teachers' housing. In the courtyard were mango, shea, and eucalyptus trees and a communications tower. The school which was built in a sparsely forested area included a cafeteria on the periphery of its courtyard. While making our way to the administration office two members of the team took pictures (see Figures 8,9,10, and 11).

Figure 8. Students awaiting class to begin at Departmental High School of Cassou

Figure 9. Exterior of classrooms at the Departmental High School of Cassou

Figure 10. Departmental High School of Cassou's students entering classroom

Figure 11. Departmental High School of Cassou typical classroom

After meeting with the superintendent, we gathered in a classroom to interview the volunteer participants. In the room we counted 11 people - four teachers and two members of the administration, a student who volunteered to hold the microphone, and four team members.

At 11:25am, with all participants present, the interviews began with the traditional presentation. As the principal investigator, I introduced myself and explained the reason for our presence and each of the other men in the room introduced themselves. The atmosphere was adequate for starting the interviews.

First, I explained the merits of the mission of the day, invited participants to take a look at the consent form, and asked them to sign. At 12:10pm, we began interviews with six participants. We put all participants in the same room for their interviews due to time constraints. The school was in the process of preparing for the national examination for the end of the cycle students, and professional examinations for teachers.

All six participants sat on chairs around the table. We numbered participants from 1 to 6 for coding reasons and respected the order when administrating the interviews,

which lasted 1 hour and 36 minutes. The interviews ended around 2:00pm. At the end of the interviews with participants I spoke with the superintendent, who is also the supervisor of the school, to thank him for the warm welcome and allowing me to do my work in the institution with volunteers.

Virtually every participant had a mobile phone. I asked them how they charged their mobile phones. One participant answered saying they use the energy stored in their moped batteries. A demonstration began. A charger adapted for charging the mobile phone and laptop computers from moped batteries was made especially for this purpose. The charging can take place while the moped is parked or in circulation (see Figure 12).

Figure 12. Departmental High School of Cassou-cell phone being charged through a motor cycle battery

Participants invited us to a room where vehicle batteries were setup and charged by solar panels installed on the roof of the building. When there is no electrical grid in place, people use all available technologies, as at this remote rural school in Cassou (see Figure 13).

Figure13. Departmental High School of Cassou-electronic devices being charged through a solar power system

After the demonstration from our hosts, we went to the café /restaurant next to an abandoned well for lunch before departing for Ouagadougou. We sat under a tree next to the café/restaurant booth. We left around 3:00pm for Ouagadougou, and arrived at The Rec Center around 5:30pm. Everyone left for home in order to prepare for our trip to Tenkodogo on the next morning, May 8, 2014.

Riale Provincial High School of Tenkodogo

At 6:00am on Thursday, May 8, 2014, the team met at The Rec Center in preparation for departure to Tenkodogo, a town located in the center-east of Burkina Faso. We stopped at one of the older high schools in Burkina Faso (Lycee Bogodogo) to pick up a team member who was a former high school English teacher. This team member left the classroom to work as an office administrator for the National Education Department and helped organize the meeting at the school in Tenkodogo.

This time, with a 4x4 vehicle and the team on board, our driver left at 6:30am driving east toward Tenkodogo. The roads in Ouagadougou overflowed with people as

the sun came over the horizon. At the city limits of Ouagadougou, we stopped at the gates

to pay the road toll round trip, 600 FCFA (about $1). National Road 9 goes to the border

with Niger, Togo, and Benin and was busy with people and animals crossing without

paying much attention. At 8:20am, we stopped for breakfast in a town located at the

intersection of the road to Fada, Niger's border, and the road to Tenkodogo, Benin, and

the Togo border. We passed villages, bicycles, motorcycles, trucks, cars, and donkeys,

arriving at the Riale Provincial High School of Tenkodogo around 9:30am, when we

made our way to the principal's office for greetings and to notify participants of our

presence (see Figure 14 &15).

Figure 14. Entrance to the Riale Provincial High School of Tenkodogo

Figure 15. School and classroom scenes at Riale Provincial High school of Tenkodogo

We received a warm welcome from the principal where we met in his office supplied with a desktop computer. The traditional greetings started between team members and potential participants who volunteered for the interviews. We started the interview process around 10:10am with three participants. After this first wave, we continued with the second wave with one participant, and the third wave with two participants. We always explained the consent form and participants signed it before the interview began. We interviewed a total of six participants at this school.

After the interviews, we were directed to a nonfunctional computer lab where we could see outdated disassembled computers laying on dusty tables (see Figure 16). We also stopped to greet the librarian and took pictures of the library (see Figure 17). I noted that during the interviews with participants, the school had a computer lab, but it was not functioning and stored old, outdated computers. Compared to Cassou, Tenkodogo is a big city with electricity and communication services, I was surprised to find a nonfunctional computer lab and to see computers that were so old. I was expecting to see a functioning computer lab with not the most current but somewhat more updated technology.

Figure 16. Riale Provincial High School of Tenkodogo-Nonfunctional computer lab
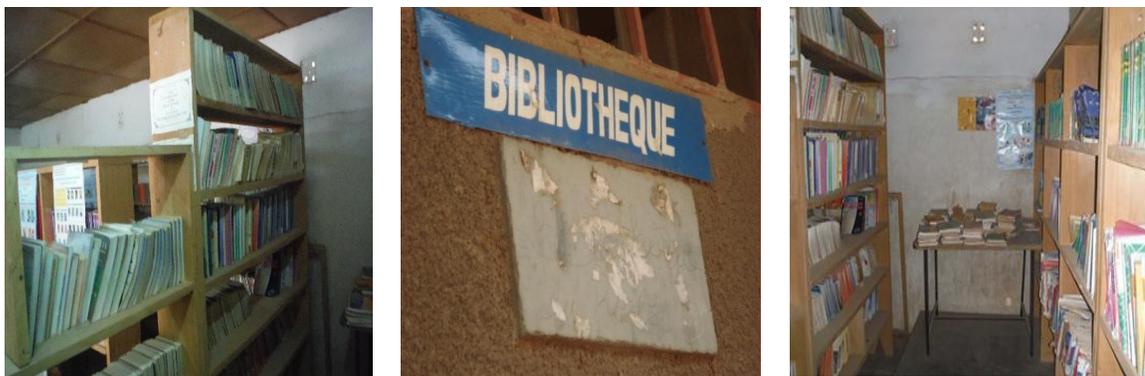
Figure 17. Library of the Riale Provincial High School of Tenkodogo

After visiting the library and the nonfunctional computer lab, we thanked our host and left around 2:00pm for Ouagadougou, stopping for lunch in the town of Koupela where we had eaten breakfast earlier in the day. After lunch we continued driving without stopping and arrived in Ouagadougou around 6:00pm.

Marien N'Gouabi High School in Ouagadougou

Unlike previous research outings that required a lot of travel, this interview took place in Ouagadougou, the capital of Burkina Faso. It was Friday, May 9, 2014. All team members lived in Ouagadougou, which made the transportation easy. Each member went

to Marien N'Gouabi High School, which is a high school I used to attend. By 8:30am we were all in the courtyard of the school. After briefly chatting, we headed to the administration office to meet with the principal (see Figure 18).

Figure 18. The entrance and view of Marien N'Gouabi High School in Ouagadougou

Upon arriving we waited for the principal's secretary to announce our presence to the principal; the secretary returned to let us into the principal's office. After we greeted the principal, introduced the team, and explained the reason for our visit, the principal called the superintendent and together they welcomed the team and reiterated their approval of the interviews. They appreciated that as a former student of the school, I chose it as my site for collecting data to fulfill my Ph.D. degree requirements.

The principal and school supervisor volunteered to be the first group of interviewees. I explained the procedure of the interview to them and the purpose of the consent form, which they read and signed. Interviews lasted about 20 minutes. After this initial interview we realized that the individual who was to lead the second group interview had an unexpected meeting and was unavailable to participate. I approached the superintendent to ask if he would volunteer to assist in our interviews, as he was already aware of the purpose of our visit. He welcomed us enthusiastically into his office. He

asked us to be seated while he sat behind his desk with his computer and printer. I gave

him the consent form and explained the purpose of our visit and the purpose of the

consent form, which he read silently and signed. We then started the interview, which

took more than 30 minutes. Upon completion, I thanked him for volunteering to support

the project.

While awaiting our third group, composed of teachers, we went to the

supervisor's office to see the type of technology used. The supervisor had only an old

monitor on the desk; the supervisor brought in a personal computer and keyboard from

home to use in the office when necessary to work on documents, saving work on a flash

drive to print in the secretary's office. The supervisor had no computer for office work.

After chatting with the supervisor for about 15 minutes, our last group of volunteers was

ready to be interviewed.

Our last interviews took place in the principal's office. I explained to the three

teachers the purpose of our visit and the purpose of the consent form. I was pleased with

the data-collection process. Teachers were very busy as it was the end of school year.

During this time, each teacher has to complete a certain number of assignments and

programs for those who are at the end of their academic cycle and prepare to take a final

examination. The interview session with our three participants started around 10:30am.

Among the three teachers were an English teacher, a history/geography teacher, and a life

sciences and earth science teacher. The interviews took about 30 minutes to complete.

At the end of the interview session, we visited the computer room. Marien

Ngouabi High School in Ouagadougou is one of the best public high schools in

Ouagadougou and was furnished with a computer lab, electrical power source, and

Internet connection. The school's computer lab was a donation from the Congo Brazzaville's Ambassador to Burkina Faso during a visit in October 2013 to the school that carries the name of the former president of his country. The computer lab was equipped with 15 computers connected to the Internet and a centralized computer network server with wireless capacity.

According to the computer lab's supervisor, frequent connectivity issues arise and a low bandwidth capacity often impacts users. The school also has an insufficient number of computer network cables, network connection outlets for laptop computers, and cell phones for the 2,975 students, 105 teachers, and 45 members of the administration (see Figure 19). We took pictures, chatted with the lab's supervisor and went back to the principal's office. The principal had left, but we were able to reiterate our gratitude to the secretary before leaving.

Figure 19. Marien N'Gouabi High School in Ouagadougou-Computer lab

The differences between the interview sites was by design. In order to capture a true picture of ELT integration across Burkina Faso, the interview subjects had to represent the true diversity of the country. From the rural, to the provincial, to the urban the experiences of interview subjects were based, in part, on their geographic location.

Though the educational system is national, the ways in which actual learning is

conducted on the ground varies greatly from location to location. Once the interview

subjects began sharing their experiences, the role that geography plays in their use of

ELTs quickly became apparent. Chapter 5 will explore those differences and, though the

voices of the participants, provide a first-hand account of how and why ELTs are being

adopted in the classroom.

CHAPTER 5

DATA ANALYSIS

I conducted this study on the integration of ELTs in secondary education in Burkina Faso at three schools representing urban and rural contexts in the country:

- Departmental High School of Cassou (Lycee Departemental de Cassou), with a population of 756 students, 26 teachers, and 5 administrative staff

- Riale Provincial High School of Tenkodogo (Lycee Provincial Riale de Tenkodogo), with a population of 1662 students, 41 teachers, and 9 administrative staff

- Marien N'Gouabi High School in Ouagadougou (Lycee Marien Ngouabi), with a population of 2975 students, 105 teachers, and 45 administrative staff

There were many commonalities and differences between these schools that provide insights into the realities of schooling and ELTs use in the country. The first common thread between the sites was that all three high schools were similar in appearance. The schools' grounds were covered with mango trees, planted in the courtyard, along with shea, eucalyptus, and nere trees. Each institution offered the same setup for teachers and students with classrooms arranged to facilitate direct instruction with the teacher at the front of the room. There was no in-class digital technology at any of the sites.

Next, all participants in the study had similar levels of education. In Burkina Faso, all teachers and administrative staff of secondary schools have at least a Baccalaureate (BAC) which is equivalent to United States' high school diplomat (Burkina Faso's high school diploma) plus a two- or three-year university degree, regardless of their place of

employment. This educational homogeneity of teachers and administrative staff ensures all students across the county receive the same courses and instructional pedagogy.

Finally, all three institutions shared the same academic program. At the time of data collection teachers were busy administering end-of-the-year examinations. All students at the end of their four-year junior high and at the conclusion of their three-year senior high cycle are required to take these exams. The former culminates in the receipt of the junior high certificate, *Brevet d'Etudes du Premier Cycle (BEPC), and the latter represents the attainment of the Baccalaureate (BAC).* During the time the study was conducted some teachers were also preparing to take an in-service professional exam for the *Certificat d'Aptitude au Professorat des Collèges d'enseignement Général (CAP/CEG)* which is an in-service professional advancement exam.

While all sites had many things in common there were also number of differences present at each location. The first difference between the sites was their relative geographical locations, which ranged from rural to urban. For example, Cassou secondary school, located in a rural part of the country, had all the features of a typical country village, including unpaved roads, slash-and-burn fields, trees, savanna, and hut houses. In contrast, the secondary schools in Tenkodogo and Ouagadougou shared features with other African cities. Both these urban sites have paved driveways, walls dividing school spaces, billboards, higher density populations per square kilometer, land development, traffic lights, and pharmacies.

The second difference was the availability of energy sources, which varied among the three locations. In rural Cassou, solar energy was the main source of energy. Teachers' houses near the school facility has solar panels and solar powered satellite

dishes. This school also used motorcycles batteries as a source of energy and a well with a manual pump. This type of mesh-network utilities posed a challenge at this site with a resulted of the school having limited access to a consistent electrical connection — impacting what types of devices could be used in the classroom. In contrast, the urban secondary schools in Tenkodogo and Ouagadougou had grid based electricity and water faucets for drinking. The stability of these utilities meant that there were no limitations on the types of electrical devices that could be used in the classroom.

The final difference between the interview sites is the availability of technology at each school. The high school in Cassou had no computer lab for students or teachers, while the high school in Tenkodogo had no functional computer lab and only a few non-working computers on site. The high school in Ouagadougou had a functional computer lab with 15 computers.

This comparative analysis of the three secondary schools also considered the different ways the schools communicated. In the secondary school in Cassou, communication was primarily by mobile phones. In the secondary school in Tenkodogo, people used landline phones as well as mobile phones, whereas in the secondary school in Ouagadougou, people communicated using landline phones, mobile phones, and the Internet.

The use of mobile phones at each site is important to note. In Cassou the mobile phones are easier to recharge using the limited electrical resources and are not limited by the lack of telecommunication infrastructure. While Tenkodogo had access to more advanced utilities, the lack of working computers resulted in communication occurring almost exclusively by either landline or mobile phones. Even in the urban Ouagadougou

site where functional computers and Internet access is available, the use of mobile phones remained a constant for every subject interviewed.

The disparity in computer access between the three sites illustrates one barrier that exists when trying to determine what type of ELTs are feasible for all schools. When interview subjects were asked: "Do you use the school's computer lab or Internet cafe in an educational context," the responses helped define what that barriers looked like.

For people working in the rural Cassou's school, the lack of infrastructure quickly became apparent. "There is no electricity here to equip a computer lab," one teacher noted. "Because of our location there is no computer lab where we can go to." Another participant at this site agreed. "I do not use a computer lab in the school because there are no technology tools here. Similarly, in our location, the lack of technology is a reality due to the fact that there is no electricity."

The high school in Tenkodogo, where a nonfunctional computer lab was comprised of old and broken computers participants also found it difficult to integrate technology into their daily lives. "For my daily tasks, I do not use the computer lab within the school, since there is no a functional computer lab. There is a computer lab, but the computers are old, not functional and not connected," a participant said.

At the high school in Ouagadougou, which had a functional computer lab with wireless Internet available, participants could more easily access technology. "I do not go to the Internet Cafe. I use the school's computer lab. I supervise students and monitor their attendance in the computer lab," a teacher said. Another teacher used the computer lab as a replacement for the outdated books in the library. "I use the school's computer

lab to check my emails and for school related activities to complement the content of my courses because the books are outdated."

When looking at the varying responses it became apparent that the communication activities of participants varied widely by location. It is also important to note that for a majority of participants it wasn't a lack of interest that kept them from embracing technology but a lack of compatible infrastructure that required them to adapt to the situation as it existed in both their schools and homes.

ANALYSIS OF INTERVIEWS

In this analysis of interviews, I analyzed participants' responses according to each interview question (see Appendix B). I asked participants about the meaning of ELTs and perceptions about their contributions to secondary education in Burkina Faso. According to the majority of participants, ELTs are a set of tools designed to improve data handling. Educators and students need them to learn and communicate in a world that has become a global village. In general, participants have a strong awareness of ELTs.

All participants believed that technology tools contributed to improving the quality of secondary education in Burkina Faso. Their responses to the question: "Do you think that technological tools contribute to improving the quality and enhancing the level of secondary education in Burkina Faso," showed a common sentiment that was shared by most participants. The response to this question from a teacher in Cassou is a good illustration of this general viewpoint:

> Technology tools contribute much to quality improvement and enhances the level of secondary education. With technology tools, students can go look for the information, look for information they did not understood in class, and it is up to the teacher to guide them in their research.

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Generally, educators in rural settings like Cassou and in provinces like Tenkodogo did not use computer lab in their school because none are available, the computers on site are nonfunctioning; or, in case of Cassou, there was no electricity to operate them. Two participants, one in Cassou, and one in Ouagadougou, said they do not use technology tools because they do not have basic training in this area. Another participant in Tenkodogo did not go to the computer lab because he has his own laptop computer with a modem for Internet use, while a participant in Ouagadougou used his mobile phone to conduct research.

Students at all three sites used ELTs in the same manner as the teachers and staff for the most part. For instance, in Cassou, students, like school staff, did not use the Internet because there were no computers and/or electricity available. In Tenkodogo, students accessed the Internet in Internet Cafes in town because the school did not have a functional computer lab. Students in Ouagadougou, having access to both the infrastructure and the technology often used the computer lab in school and also went to the Internet Cafes in town. At all sites, Cassou, Tenkodogo, and Ouagadougou students also used their mobile phones to connect to the Internet. (Researcher note: computer lab in the school of Ouagadougou has a limited number of computer which make access to the school computer lab difficult for teachers and students).

Regardless of whether a school had access to the Internet or not, participants often shared their views on the potential benefits and issues students faced when accessing and using the Internet. "For me, the Internet can be a tool that can promote learning in students especially regarding research," a Cassou participant said. This sentiment was also reflected at the Tenkodogo site. "The Internet is essential for the students of our

school because we have so few library books. It allows students to access books remotely," a teacher there recalled.

At the sites with access to more advanced infrastructure, Tenkodogo and Ouagadougou, desktop computers were used by administrative staff for word processing and Internet access, while the majority of teachers used laptop computers for word processing and Internet access, or mobile devices for Internet access. In rural areas like Cassou, there was a lower level of computer use due to the previously mentioned combination of factors including the lack of electricity, the high cost of computers, and, to a lesser extent, people not having computer skills. However, a majority of Cassou's administrative staff had access to non-Internet connected desktop computers for word processing tasks. To access the Internet in Cassou participants used computers in the local Internet Cafe because they had no access to a computer at home or school.

While participants unanimously recognized that the Internet is a tool that encourages student learning in research they also believed educators must support and guide students in their research so they do not rely on misinformation or spend their time on inappropriate websites. "Often, students fail to make sense of things on the Internet. In the search for information, they can fall into misinformation," a participant in Cassou warned. In addition, according to some participants, students spent more time surfing on the Internet than working on their school lessons. "Social networks found on the Internet may produce false information. There are sites where instead of seeking school information students are tempted to go to non-educational sites," another Cassou teacher explained. Many participants also stated that the Internet promotes cheating through the use of mobile devices. "Internet use by students is a good thing because students are more

educated, but students are cheating and are accessing other non-beneficial information," a teacher noted.

In rural areas such as Cassou, all participants recognized that students do not use technology tools to improve their academic performance, due to accessibility issues and the lack of electricity. In urban areas such as Tenkodogo and Ouagadougou, where access and electrical coverage was relatively good, students used technology tools to improve their academic performance.

Figure 20. Marien N'Gouabi High School-Computer training cost sheet

TRANSLATION OF THE COST SHEET:
Computer Training
Training: Word
Date and Time: Monday to Friday from 1:00pm to 2:00pm
Cost for staff: 10 000 F (about 20 USD)
Cost for students: 5 000 F (about 10 USD)

In the case of Cassou, the school had no computer lab and no electricity supply. Participants at this site frequently compared their lack of technology to what was available in urban schools. "In a big city, I think the use of technology tools is significant, but not significant in smaller centers such as rural communities," on participant noted. "I know that in the city people go to Internet Cafes and they try to have their own laptop computer or a desktop computer at home."

In Tenkodogo, a non-functional computer lab existed but some offices also had computers with Internet and an electrical supply. Participants there described the challenges they face in accessing technology. "In provincial capitals [like Tenkodogo] technology is limited because there is a lack of Internet Cafes and the cost of accessing technology tools is very high," one participant observed. Despite having access to basic utilities like electricity, many participants in Tenkodogo also cited weak broadband connections and a lack of Internet Cafes as a barrier to greater use of technology both in the schools and at home.

In contrast, the urban-based Marien N'Gouabi High School in Ouagadougou had a fully functional computer lab that students and faculty both could use to access the Internet and for word processing tasks. In general, participants at this site agreed that the use of technology tools in urban areas was common but that use decreased in rural areas, mostly due to access issues and lack of electricity. "I believe that the use of technology tools in urban schools [like this one] is extensive," one teacher participant commented.

The attitudes and actions of the administrators and teachers at each site was another important variable that appeared to have an impact on the use of technology at

each site. At Cassou, administrators and teachers faced the difficult task of finding alternative ways to use technology that was not readily available in either the school or the surrounding area. "I tell students every time that if they have the opportunity, they should ride into town to receive computer training," one teacher said. Another teacher described encouraging his students to use other, available technologies in place of Internet connected computers. "A few days ago my students had to make a presentation in my biology class, and given that there is no library, I advised them that instead of using their phones to connect to social networks it would be beneficial for them to go to some sites to look for useful information."

At the provincial Tenkodogo's school, teachers and administrators also described an everyday struggle to provide students with adequate access to classroom technology. "We are doing our best to promote technology tools in our schools," one teacher noted. "Unfortunately teachers training is not as encouraging as it should be." Teacher participants at the school described a flawed administrative plan that focused on providing computer training to students while neglecting to offer any training to the staff. "The administration promotes technology tools in our schools by training students. The difficulties are due to the lack of teachers training. I had to pay for my own training in a private computer training center in town."

In the urban Marien N'Gouabi High School, located in the capital city of Burkina Faso, where there were less barriers to technology integration, teachers were generally positive when describing the support of administrators. "The administration supports the promotion of technology tools in our schools by acquiring more computers for our lab," one noted. However, the actual acquisition of computers for the school were dependent

on the resourcefulness of the administration which, according to teacher participants, was lacking at times. "The school should include in its budget funds reserved for technology equipment and make a request to the Department of Education for a more equipped computer lab," a teacher said.

Despite having the highest barrier to integrating technology at their school, participants at the Cassou site retained a positive view of how ELTs could be used in their classrooms. One teacher envisioned the benefits of more connected classroom could have on his students:

> Technology tools are a must for teachers today. Even if you have all the information in textbooks, how many textbooks would you need? A lot, a whole library. However, we cannot always find textbooks. For example, you can search for textbooks in libraries in Ouagadougou and you cannot even find them. With technology tools you can find information while sitting at home. It has become essential. Technology can be used to show students in geology phenomena such as volcanoes. This image will greatly improve the knowledge of the student as well as the teacher. There are teachers who teach about volcanoes who have never seen images of volcanoes. When the teacher and student can have a visual image of it, it facilitates learning at the student level.

In Ouagadougou, teachers took a more practical, day-to-day view of how best to integrate technology into their school. Since ELTs were more attainable in urban schools, participants' ideas on the best way to facilitate integration reflected this situation, with one teacher stating:

> As a key player in education, my vision for the use of technology tool in my daily tasks in the short term is to master this tool. For the medium term, I envision training for teachers, students, and staff in technologies tools. In the long-term, I envision equipping all department with computers, printers, and Internet connection to improve the accessibility to technology tools.

Despite broad local interest in integrating technologies into the classroom, the need for supportive government policies was also a key component. No matter the site, rural, provincial, or urban, participants had little or no information in regards to the government policies on ELTs integration in secondary education institutions. "I learned from the media (radio and television) about a policy of the Ministry of Secondary Education for the promotion and use of technology tools in secondary schools in Burkina Faso," one Tenkodogo participant recalled. This idea was echoed by a teacher in Cassou, "I have no idea of policies conducted by the Ministry of Secondary Education for the promotion of the use of technology tools in schools."

The lack of a clearly outlined policy from the government left participants to speculate on things they had heard from other sources. "MENA (Ministry of National Education and Literacy) promised to donate tablets to primary school students, but I have seen no evidence of this policy being put into place," said a Cassou participant. Even at the Ouagadougou site, which was equipped with a fully functional computer lab, participants didn't feel fully supported by the government. "Our computer lab was equipped and installed with donated technology by the Ambassador of Congo Brazzaville only because the school carries the name of the former President Marien N'Gouabi of Congo Brazzaville," noted a participant.

Participants unanimously recognized that the government needed to continue to exert effort to provide electricity to all localities in Burkina Faso. They agreed that the government also needed to update all secondary schools with well-equipped computer lab that would serve all users in educational institutions. They were unanimous in believing that using ELTs in education was essential to bringing Burkina Faso up to international

parity. However, some participants believed that training efforts, especially for teachers, needed to come first. "We must strengthen the training modules on computers for teachers first because they need more than 25 hours of training before they go into the field," one Cassou participant stated. "Teachers and staff must continue training to update their computer skills. The introduction of computer education modules in secondary education should be a national policy," said another Cassou participant.

One of the goals of the study (questions 9 and 10) was to determine the technological skill level of participants and determine if they have received training. Since the early 2000s, computer-training modules have been integrated into teacher training schools in Burkina Faso and into professional-development programs for teachers, trainers, and administrators in institutions like the National School of Administration and Magistracy, Ecole Normale Superieure in Koudougou, and the Institute of Sciences.

My findings indicate that despite conditions unfavorable for accessing technology, most participants did receive formal technology education. Some were trained while at teachers' training schools and others were trained at vocational training schools; others received training at their own expense. A total of 5 out of the 18 participants did not receive computer training at all. The technology training itself was basic, focusing on keyboard skills, Microsoft Office tools (Word, Excel, and PowerPoint), and Internet use.

Finally, participants were asked to share their opinions on what can be done to enhance effective and efficient use of ELTs in secondary schools in Burkina Faso. Participants were asked also about the challenges they must overcome, and to make any

appeals to donors, government, and bank authorities. A teacher participant in Cassou

offered some suggestions:

> We need our decision makers to review the modules in the teachers' training
> schools, increase the number of training hours for these courses, and support these
> teachers after graduation so that each teacher has at least one computer to do their
> daily tasks. In terms of administration, there must be a policy to equip schools in
> IT tools to facilitate their work. Students must be allowed to use the computer
> because, in my experience, local students finish 6th grade without having touched
> the mouse of a computer. Imagine the student who goes to the city to the
> university where you have to do research. He must be familiar with computers
> before he can do research. So, learning in computer labs in the lower grades
> makes it easier to do research at university level. It must be our decision makers
> to set up this policy.

Many participants believed that the government needed to provide technology

tools such as a well-equipped computer lab and support teachers, administrative staff, and

students training. Ultimately, however, most participants stated that it was equally, if not

more important, for the government to focus on training of all those involved in

secondary education in the use of ELTs and to work continuously to make technology

tools available to all those involved in education. This viewpoint was articulated by a

teacher in Cassou:

> I remember when we were at training school, we had 25 hours of training in
> computer science, which is very insufficient. It is necessary for teachers to master
> computer skills and be supported once in the field. Students must also have a
> well-equipped computer lab and take computer classes. So, if the teacher is not
> well trained and he does not know how to use the computer tool, how will he train
> students?

BENEFITS AND CHALLENGES IN USING ELTS IN EDUCATION WITHIN

BURKINA FASO

In the Mayan civilization, communication was transmitted through relay races with the message contained in a knotted vine that runners passed to one another (World History, n.d.). Today, this ancient message transmission method has been replaced by ELTs that beam our messages around the globe almost instantly. This study attempted to find out if these new technologies, including the use of ELTs in secondary education in Burkina Faso, have the potential to bring forth new opportunities for people or if they were merely a dead end. That is, no more useful than a message knotted in the vine of the past.

"Training modules in technology tools must be part of students and teachers' training. Technology tools must be made accessible to all education stockholder," a participant said early in an interview. I learned that, in Burkina Faso, the process of teaching in schools contains three primary steps that have the potential to positively impact students through the use of ELTs. These steps include the introduction of technological tools and the exchange of best practices, the role of technology to deepen students' learning, and the role of technology in after-school work.

According to participants, technology tools are of great help during the preparation phase of the courses. Teachers, through the use of ELTs, improved the content of their courses. This improvement is made possible by research and the exchange of best practices between teachers. For example, one participant stated: "They help me as a teacher to check for scientific errors." Another added, "I think technology has become a very essential tool which we use to prepare our lessons, store data, do

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research, and to present themes that are not found in textbooks. Technology tools, if we had them, should be the focus of our teaching today."

In the course delivery phase, participants shared that teachers with access to technology can help deepen students' learning by embracing the educational support offered by technology tools. ELTs can also facilitate the delivery of information during class. In this regard, one participant stated, "technology tools are a must for teachers today. Even if you have all the information in textbooks, how many textbooks would you need?"

Participants shared that ELTs could also impact the afterschool phase. Through technology tools, students could complete their homework using ELTs to research information that supported their presentations or course work. Also, teachers could use ELTs after school to seek information to support and update their course content. For administrators, ELTs helped them in the faster processing of administrative documents. Furthermore, ELTs could help students in remote areas get access to the same information as those in urban areas. For example, a participant said, "A few days ago, students in junior high had presentations, and because there is no library [at our school], I advised these students that instead of using their phones to connect to social networks (Facebook and others), it would be beneficial for them to go to some sites to look for useful information."

Identifying and harnessing the potential of ELTs in low-income countries like Burkina Faso is challenging because stakeholders must consider that the vast majority of people may not benefit from their use, at least initially. Efforts to develop the knowledge and use of ELTs requires the involvement of several stakeholders across the country,

including the government, technical and financial partners, private sector players, nongovernmental organizations, and the media. This is easier said than done at a national level. One simply needs to look at Burkina Faso, where the lack of a coherent and publicized policy on the use of ELTs makes the wide adoption of new technologies nearly impossible.

The experience of countries such as Senegal and Mali, where there is a more favorable environment for the broad adoption of educational technology tools, is relevant when examining how ELTs might work within Burkina Faso (Traore, 2007). The choice of Senegal as a comparison is justified because this country is currently one of the most advanced nations in Africa in promotion and access to ELTs (OPTIC, n.d.), whereas Mali's authorities have been very active since the early 2000s on the African and international levels in the promotion of ELTs (Agence de Technologies de l'Information et de la Communication, 2012). In these two countries, dedication to ELTs illustrates the engagement of a nation's government in advocating for these technologies. Furthermore, successful implementation of ELTs typically requires governments to have a well-defined strategy that focuses on the deployment of ELTs in secondary education. The focus on the secondary education level is key because that level has the highest potential to bring significant opportunities in sustainable development with a broader vision on different development projects.

In conclusion, the added value of the use of ELTs in education depends mainly on its daily adaption by students, teachers, and administrative staff. ELTs can help overcome the reality that in Burkina Faso, most education still conducted using textbooks that are often outdated. However, focusing on ELTs in the classroom also illuminates the need for

an expansion of key infrastructure like electricity and broadband Internet connections.

Overall the need for ELTs, even when the barrier to access remains high, will drive their

adoption no matter the circumstances. This idea is supported by one participant who

stated, "I sometimes frequent Internet Cafes and the computer lab within the school to

check my email or for a specific activity because the books are outdated."

TWO MODELS OF ELTs INTEGRATION FOR BURKINA FASO

To deepen the analysis of the integration of ELTs within secondary education in

Burkina Faso, I used two models of ELTs integration in schools – the Concerns-Based

Adoption Model and the Raby Model – to frame and develop my survey and research

questions.

The Concerns-Based Adoption Model

The Concerns-Based Adoption Model holds that those considering and

experiencing change evolve through self-questioning their use of the innovation (Hall &

Hord, 1987, 2001) According to Loucks-Horsley (1996),

> Earlier questions are more self-oriented: what is it? And how will it affect me?
> When these questions are resolved, questions emerge that are more task-oriented:
> How do I do it? How can I use these materials efficiently? How can I organize
> myself? And why is it taking so much time? Finally, when self-and task concerns
> are largely resolved, the individual can focus on impact. Educators ask: Is this
> change working for students? And is there something that will work even better?
> (para. 2)

The concerns model identifies seven levels of concern which I regrouped into

three stages as follow:

Stage 1: Level 0 to Level 2. After a period of nonuse (Level 0), a person informed

about the innovation looks for more information in order to decide to enter into

the adoption process (Level 1). A wise choice on a first use of innovation can encourage earlier adopters to seek training (Level 2).

Stage 2: Level 3, people realize success through trying tasks related to the innovation.

Stage 3: Level 4, the dedicated person is more independent and frequently uses the innovation. At Level 5, people work in synergy with colleagues. At the terminal Level 6, users determine the degree of use of the innovation and can offer ideas for improvements (see Table 7 and 8):

The concerns model identifies and provides ways to assess the seven stages of concern of ELTs integration.

Table 7

Typical Expressions of Concern about an Innovation

Stage of Concern	Expression of Concern
6. Refocusing	I have some ideas about something that would work even better.
5. Collaboration	How can I relate what I am doing to what others are doing?
4. Consequence	How is my use affecting learners? How can I refine it to have more impact?
3. Management	I seem to be spending all my time getting materials ready.
2. Personal	How will using it affect me?
1. Informational	I would like to know more about it.
0. Awareness	I am not concerned about it.

Table 8

Levels of Use of the Innovation: Typical Behaviors

Levels of Use	Behavioral Indicators of Level
VI. Renewal	The user is seeking more effective alternatives to the established use of the innovation.
V. Integration	The user is making deliberate efforts to coordinate with others in using the innovation.
IVB. Refinement	The user is making changes to increase outcomes.
IVA. Routine	The user is making few or no changes and has an established pattern of use.
III. Mechanical	The user is making changes to better organize use of the innovation.
II. Preparation	The user has definite plans to begin using the innovation.
0I. Orientation	The user is taking the initiative to learn more about the innovation.
0. Non-Use	The user has no interest, is taking no action.

From *Taking Charge of Change* by Shirley M. Hord, William L. Rutherford, Leslie Huling-Austin, and Gene E. Hall, 1987. Published by the Association for Supervision and Curriculum Development (703) 549-9110 Reprinted with permission.

I used this model to understand participants' responses to two survey questions:

1) Have you received computer training?

2) Do you regularly use computers?

The following tables outline elements of participants' responses (see Table 9 and 10):

Table 9

Have you received computer training?

Designation	Number of participants	Percentage	Total percentage
Participants who did not receive training	5	27.77	27.77
Participants who received training	13	72.23	100.00
Total	18	100.00	

Table 10

Do you regularly use computers?

Designation	Number of participants	Percentage	Total percentage
Participant using the computer regularly privately	9	50.00	50.00
Participant does not regularly using the computer	4	25.00	75.00
Participant using computer regularly as part of work	4	25.00	100.00
Total	18	100.00	

Based on these survey results, 25% of participants regularly used computers as part of their work and about 72% felt they received computer training. The 25% of participants who regularly used computers for their work represent a low percentage, which falls in Level 3 of the concerns-based adoption model: users realize the value of trying to perform some tasks related to innovation. However, 75% of participants used this technology for private use or did not use it at all despite the fact that about 72% of participants reported having received some sort of computer training. According to the concerns-based adoption model, this group of participants belongs to Level 2: a wise

choice on a first use of the innovation can incite them to undergo training. The results of this research suggest that the use of ELTs in secondary education at these three schools in Burkina Faso is at Level 3. Teachers, administrative staff, and students are fully aware of the benefits and necessity of technology tool use in secondary school and have been creative innovators on using them despite there being no active national policy.

The Raby Model

Raby (2005) developed a theoretical model that helps explain the process of ELTs integration through describing and analyzing the paths teachers peruse when they progress in small steps of nonuse to effective use of ELTs. Raby's model defines four stages of the evolution for teachers in the pedagogical use of ELTs. The awareness phase (Stage 1) consists of a single sub-stage that is in direct contact. The phases of personal use (Stage 2) and professional use (Stage 3) take place in two sub-stages: "motivation and exploration-appropriation." The phase of educational use (Stage 4) has five sub-stages: "motivation, familiarization, exploration, infusion and appropriation" (Raby, 2005, p. 86).

Using the Raby (2005) model as a lens to interpret my survey data, 75% of participants used technology tools for personal use or do not use it at all. These findings indicate that the pedagogical use of ELTs in secondary education is in Stage 2, based on a single sub-stage that is the indirect contact: phase of personal use. Therefore, based on this study's data, the use of ELTs in secondary education in Burkina Faso is not yet at the stage of contributing to teaching and learning in secondary schools. A teacher participant clearly stated this position: "I do not regularly use the computer. I just use books for the preparation of my classes because there is a lack of technology tools and a lack of quality information."

In conclusion, the use of ELTs within secondary education in Burkina Faso is in its beginning stage and it will take more than political will to spread its use.

ELTS IN MODERN BURKINABE CULTURE

ELTs continue to flourish in countries all over the world, allowing an increasing number of people to be connected, share resources, and teach and learn together. The need to reduce the digital divide and achieve universal access to ELTs is a key international development goal (International Telecommunication Union, n.d.). Recognizing the value of ELTs in socioeconomic development, the MESS endorsed the requirements identified by UNESCO (2009). As part of education reform, ELTs are one of the pillars to improve the quality of education because they reach the most remote communities, which are often the most economically disadvantaged and vulnerable to disruption. This study sought to question how respondents in Burkina Faso perceive ELTs, and hopes to provide useful contextual information for improving access to and use of ELTs from 3 secondary schools within the country.

According to participants in this study, ELTs primarily develop and streamline access to information. In Burkina Faso, they are primarily used to facilitate learning and communication not just in the country itself, but to connect inhabitants to the emerging global village. In general, participants understood the usefulness of ELTs and made connections between ELTs and education. Within education, participants primarily used ELTs to create, store, manage, and transmit information while also contributing to the accelerated acquisition of learning skills. However, this type of ELTs use was infrequent as it depended on access to electricity, computers, and the Internet.

Since the early 2000s, computer-training modules have been integrated into teacher training schools in Burkina Faso and into professional-development programs for teachers, trainers, and administrators in institutions like the National School of Administration and Magistracy, Ecole Normale Superieure in Koudougou, and the Institute of Sciences. Despite this training effort, many individuals have had to seek training at their own expense, and almost 30% of the participants in this study had no training in computer at all. Indeed, many teachers and administrators struggled to find time to learn how to use a word processor or a spreadsheet, especially in locations where access to computers is limited.

This study also strived to determine the computer-skill level of participants. Despite challenging learning environments, all participants reported that their competence in computer skills were very basic. They use software such as Microsoft Office for word processing and Internet Explorer to connect to the Internet where they access emails and research information. "I have an average level of knowledge of technology tools. If you had training 5 years ago but cannot practice your knowledge, you forget," one Cassou participant said.

Some participants received introductory computer training in teachers' training school whereas others had computer training at their own expense in cyberspace or multimedia centers located in city halls. The opening of computer lab in secondary schools, particularly in urban areas with access to the Internet, continues to grow through various, though often uncoordinated, initiatives.

One participant, for example, shared, "I had introductory training in Sig-nonguinat, (a district in Ouagadougou), at a multimedia center at the City Hall in 2009 at

my own expense." Often training and mastering computer skills do not correlate because many participants acquired computer skills without having formal training.

I asked participants in this study to comment on the presence of a computer lab at their schools. The answers varied greatly, depending on location. Participants from rural areas such as the high school of Cassou indicated that their school has no computer lab and, according to them, having a lab was not a short-term priority. It is important to recognize that the absence of computer lab in the secondary schools in Cassou, as in most rural areas in Burkina Faso, is primarily due to the lack of electricity and the illiteracy of the population. Furthermore, this study's findings indicate that education providers in these areas often must resort to unusual techniques to charge their ELT devices, powering their cell phones and laptop computers by using energy stored in their motorcycles to charge their devices.

One participant mentioned the lack of reliable energy in the rural area of Cassou, stating, "There is no computer lab at the school. The school would like to get one, but there are problems with lack of finances and electricity." As noted previously, the irregular supply of electricity or its absence—common to most rural areas—is a major obstacle to the use of ELTs outside big cities in Burkina Faso. However, even in urban areas, including the capital Ouagadougou, power outages are common. In the regional capital cities such as the Riale Provincial High School of Tenkodogo, participants were unanimous in sharing that their school has a computer lab but it was not functional. They also noted that the technology tools were old and could not be used. Unlike in rural areas, provincial capitals are electrified, but outdated computer equipment was an obstacle to the use of ELTs in secondary education.

In contrast to these two areas, the Marien N'Gouabi High School, located in Ouagadougou, the capital of Burkina Faso, has electricity and a fully equipped computer lab with Internet connection. However, despite the presence of a computer lab, accessibility remains a problem due to the limited number of computers available to potential users. At this site, there were 15 computers for 2,975 students and 105 teachers in addition to five computers for 45 administrative staff: one each for the principal, steward, censor, superintendent, and secretary. In general, all participants in urban centers had a good understanding of technology and have schools with computer lab, in contrast to rural communities that lack electricity and therefore do not have computer lab.

In summary, the pedagogical use of ELTs in Burkina Faso faces a profound lack of equipment that restricts optimal adoption and use of these tools. Institutions that have computer labs are scarce and offer little or no access to most students. The only alternative method of computer access for these individuals is found in community centers for a fee or in the homes of the few wealthy families who can afford to purchase the technology.

To further expand on this observation, I asked participants if they regularly used computer labs or Internet Cafes to access the Internet. The replies to this question showed that most participants in rural communities and provincial capitals do not use computers in their schools because they lacked computers altogether, the computers lacked functionality, had outdated technology, or lacked electricity. In addition, 11% of participants stated they do not use computer labs or the Internet inside or outside of school because they did not receive training and do not know how to use them. Also, one participant do not use computer labs because he had a personal laptop computer at home;

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a second participant also do not use computer labs, preferring to use a cell phone to connect to the Internet and conduct research.

Overall, the lack of electricity and nonfunctional computer lab are a major reason for not using ELTs at all the locations in this study. Although ELTs could help improve the standard of education in Burkina Faso, electricity, which is critical to the development of ELTs, is available to less than 20% of individuals in the country. Demand for electricity in the country is experiencing an annual growth of about 8% (Agence Francaise de Developpment, 2013). For everyday computing tasks, only administrative staff used desktop computers whereas teachers primarily used laptop computers, if available. This meant that nearly all individuals who have access to the Internet in Burkina Faso were located in electrified urban and semi-urban areas.

Nevertheless, access to ELTs in Burkina Faso is still quite low compare to the rest of the world. Nearly 40% of the world's population uses the Internet. However, despite improvements, a large gap remains in the Internet connection between developed countries and developing countries. Only 28% of households in developing countries are equipped with Internet connectivity whereas 78% of households in developed countries are connected (International Telecommunication Union, 2013).

I asked participants about the relationship between students and the Internet. On this issue, all participants recognized that the Internet is a tool that can promote student learning in research. However, participants also believed that educators must guide students in their use of technology tools and help them acquire the skills necessary to parse the information found online while keeping them from becoming totally dependent on these types of technological tools. Participants believed that students should select

appropriate websites and avoid going to websites that are not recommended. Also, according to some participants, ELTs had the potential to direct more of a student's time toward the Internet rather than learning their lessons and doing their homework. Some participants believed the Internet helps students cheat because individual could search and transmit information via mobile phones during tests and examinations. In general, to help the expansion of ELTs, teachers need to guide students in understanding the benefits the Internet offers to their education and how it can help enable success in their studies. Students need to master technology tools to make good use of them. Additionally, the role of the teacher is to educate and guide students in the use of ELTs so they can resist the many temptations that could have a negative impact on their studies.

One aspect of this study was an attempt to understand the circumstances that would be necessary to encourage school administrators and teachers to explore the integration of technology tools in their schools. Participants were unanimous in recognizing that much work remains in Burkina Faso, such as making electricity available in all localities. Participants also noted the need for better-equipped computer lab in secondary educational institutions so they can serve as a shared communication platform for all stakeholders in education.

Because of the limited access to ELTs, Burkina Faso's educators need additional tools to support ELT-based learning, provide that the conditions for its proper integration and use are meet (i.e., electricity). Once these conditions are meet, educators can begin to expect a promising future for ELTs integration and use in secondary education within Burkina Faso. The future of ELTs in Burkina Faso secondary schools can only be

considered after identifying and correcting the barriers to their widespread use throughout teaching and learning in Burkina Faso's education system.

GLOBAL PERSPECTIVES ON ELTs IN EDUCATION IN BURKINA FASO

Having a skilled population is a basic concern for all countries of the world, and particularly in developing countries that often have additional challenges not present in "First World" nations. Stakeholders have recognized the potential of ELTs in education on a global scale since 1985 and the authorities in charge of education and training in many nations have tried to harness this potential to improve the quality of training at all levels (Dakoure, 2011). To this end, the first major international meeting to address the issue of ELTs, the Summit on the New World Information and Communication Order (Dakoure, 2011), focused primarily on the search for solutions on how ELTs can contribute to social change on a global level.

Across all educational sectors in Burkina Faso, the appropriation of ELTs has the potential to become one of the most effective ways to teach the skills and knowledge necessary to promote socioeconomic development of the nation's society. Today, in Burkina Faso, ELTs are slowly deployed in all sectors of society and at all levels of education from primary to secondary and university. Therefore, secondary schools in Burkina Faso must exploit the potential of ELTs to improve the quality of education, including encouraging leadership at educational institutions to be informed of the latest methods and technical innovations emerging in the education sector worldwide.

In this context, I asked participants, "As a key player in education, do you have a vision for the use of technology in your daily work?" The answers were clear: more than 72% of a total of 18 participants including 8 supervisors and administrators and 10

teachers of secondary schools believed that technology tools have become an indispensable element in secondary education in Burkina Faso, and that efforts must be made for it to be used in education in the short, medium, and long term. Participants often mentioned that education is viewed as the key element that enables companies and individuals to benefit from technology. As one participant stated, "We should no longer be talking about a vision for the future. Technology tools are essential. If we want to progress either in the short, medium, or long term, we must invest in technology, move to digital tools to facilitate our daily tasks." In other words, the task of the school is to give students the ability to learn and to use ELTs in smart ways; that is to say, to use the Internet to research data related to their studies to boost their academic performances.

However, it is important to note that the use of ELTs is not mandatory in secondary education in Burkina Faso. More than 22% of participants in this study stated that this is because of the inadequate training of stakeholders in secondary education. Participants advocated for additional training of stakeholders in secondary education to get them more familiar with various technological tools. As key players in secondary education in Burkina Faso, study participants believed it is very important to have teachers integrate ELTs in their classrooms and as well as using them in their personal development. Participants, when answering the question, "What can be done to promote the effective and efficient use of technologies tools in secondary education in Burkina Faso?" responded that training stakeholders in secondary education on the use of ELTs must come before any initiative related to the promotion of these tools in the actual classroom. For example, one participant shared during the interview:

> I remember when we were at training school, we had 25 hours of training
> in computer science, which is very insufficient. It is necessary for teachers

to master computer skills and be supported once in the field. Students must also have a well-equipped computer lab and take computer classes. So, if the teacher is not well trained and he does not know how to use the computer tool, how will he train students?"

According to 88% of participants, for effective and efficient use of ELTs in secondary education in Burkina Faso, secondary education programs should integrate a computer training module. This module must be student-focused but also available to all other stakeholders in secondary education (i.e., trainers, administrators, and teachers). Most participants believed the government must work to make technology tools accessible to all stakeholders in education.

This idea supports several studies that illustrate the educational benefits of using ELTs. Gibson and Oberg (2004) showed that ELTs are tools to support teaching by providing access to information, content or lesson plans, and through exchanges and cooperation with other teachers. The studies of Anderson (2006) in Sweden confirmed that teachers use ELTs mainly to access scientific information or resources to enhance the content of their courses. Anderson showed that ELTs are tools for knowledge development and learning for teachers, students, and other education stakeholders.

Among participants, 90% thought the government of Burkina Faso should equip all secondary schools with technology tools. Many teachers who had computer training used their acquired skills for word processing to type their courses and assignments and to store them in a digital format. In addition, using a computer allowed them to take advantage of the ease of editing, modification, and distribution of materials developed in that electronic format. In schools that offered computers to staff, some teachers used the computer as teaching support, making their classes more attractive and motivating for students. In some cases, computers even allowed interactivity between teachers and

students, if both had access to these technology tools. Of participants, 90% believed the government should work to strengthen the continuing training of all stakeholders in secondary education in Burkina Faso. Additionally, 88% believed the government should make technology tools available and accessible to all stakeholders in secondary education.

Finally, I asked participants for their opinions on the use of ELTs in the following question: "What are the challenges to overcome if you became a decision maker on the use of technological tools in your school?" More than 70% of participants emphasized the need to have adequate computer training for all stakeholders in the secondary school system and that efforts should be made to implement computer labs in all secondary schools and then work to make these tools available and accessible to all applicable stakeholders. One participant outlined this notion:

> Technology tools have become truly indispensable tools in all areas. If I become a decision maker, I would place technology tools at the center of education, allowing all users, teachers, students, and administrative staff to be able to access these tools through training. I would also install at least one computer lab in each school.

Ten percent of participants believed that lack of computer training is the main barrier to integrating ELTs in schools, believing the government needed to make technology tools and resources available and accessible to all stakeholders in the education sector.

This study shows that educational stakeholders are not yet prepared for ELTs integration in their daily practices due to limited availability and access problems. Although the government continues to makes efforts to improve training and increase ELTs availability and access in the education sector, the impact of such policies is still limited. However, even with these limitations, Burkina Faso continually attempts to

ensure the widespread adoption of emerging technology tools, most clearly reflected in the National Center for Information Processing, founded in 1970.

As outlined previously, the first national IT-orientation plan from 1990 to 1995 would have allowed the development of microcomputers, with a proposed growth in IT investments in the order of 16% over the 5-year period. According to Bande, an official of the DELGI, the body responsible for driving the IT policy of the government was created in 1990 as part of the first IT master plan (Faso-deve, 2008). During the second master plan that followed, the government began to introduce computers into the administration, equipping services with technology tools. During the second master plan, from 1995 to 2000, DELGI created management software to help some services. It was during this period that they made the Internet public (Faso-deve, 2008). Apart from these actions, an additional focus of the DELGI was the training of civil servants in IT.

In modern Burkina Faso, the Information and Communication Technology and Cyber Spaces group aims to fight against the inequalities of access to technology tools by working to grant the poorest individuals access to these technologies through community cyberspaces call (télé-centres communautaires). Some of these associations focus on ELTs specifically, even if they are not organized into a formal network. The Dutch International Institute for Communication and Development has encouraged development of these associations with The Netherlands acting as the main foreign support for these networks (UNESCO, 2006).

However, some non-governmental organizations/associations outside this Burkinabe ELTs network have collaborated with foreign partners such as telecentre.org, which is financed by Oxfam Quebec and other donors. Many associations foster the

development of ELTs in Burkina Faso (Hanna, Adama, & Theresa, 2008) with many of them having their own ELTs subdivisions, responsible for addressing questions related to ELTs.

ELTs are becoming more common throughout Burkina Faso and are generating much interest from stakeholders and students. As the use of ELTs expands stakeholders (teachers, administrators, and students) have started to think about strategies to ensure ownership and wide distribution in the education sector and the general public. As a final exercise of this study I gave participants the opportunity to make any appeals to donors, government, and bank authorities. "I call on state authorities to formulate a good national policy for the promotion of technology tools. Donors and banks, can be invited to equip us with technology tools," a teacher in Cassou said. "Donors should help fund public school computer labs. The government should introduce a computer training module starting from 6th grade and train all the staff," a participant in Tenkodogo suggested. "Donors, government, and banking authorities could help train educators in computers and make computers available by subsidized prices," an administrator in Ouagadougou noted.

No matter where interview subjects were from, their optimism about the future of ELTs in secondary education in Burkina Faso was a constant. Even in locations like Cassou, where there was lack of basic infrastructure like grid-based electricity, participants understood that classroom technologies needed to be embraced if Burkina Faso was to join the global community as equals. However, while participants sometimes took this global view, mostly they focused on what ELTs could do for their students in the classroom. They spoke of educational opportunities that were only available via ELTs

and wanted those opportunities for their communities. It was at this local level most

interviews began and ended; educators wanting to give their students the best possible

education day in and day out.

CHAPTER 6

IMPLICATIONS AND CONCLUSIONS

This study attempted to understand the various considerations that determine the successful integration of ELTs into secondary schools in Burkina Faso, with focus on the benefits and challenges of the integration process. I designed this case study to answer the following research questions:

1. What are the perspectives of educators and administrators regarding the use of ELTs in Burkina Faso?

2. In the local educational contexts of cities and rural areas, how do educators and administrators experience the use of ELTs in education?

3. What are the main issues (benefits and challenges) regarding the use of ELTs for educational purposes in Burkina Faso?

I conducted this study using semi-structured interviews with teachers and administrators in three public secondary schools in Burkina Faso. Interviews focused on ELT integration challenges and benefits as part of participants' work and personal use. In addition to the semi-structured interviews, I conducted a survey, distributing questionnaires to individual teachers and administrative personnel. The intent of the survey was to discern the skills of teachers and administrative personnel in the use of ELTs and their integration into Burkina Faso's education system, and to determine the popularity of ELTs and whether their presence in the education is sufficient to have a positive effect on teachers, students, and society as a whole.

In this chapter, I first discuss the significance of this research. Next, I identify the potential significance of my research as well as its limitations. Finally, I conclude with recommendations for future research as well for Burkina Faso's government, its private sector, nongovernmental organizations, technical partners, and financial institutions.

SIGNIFICANCE OF RESEARCH

The purpose of this study was to understand the various factors that determine the successful integration of ELTs, commonly called ICTs in Burkina Faso, in teaching and learning sectors within secondary schools, focusing on public institutions. This study facilitated a better understanding of the benefits and challenges that face ELT integration in contexts where such activities are not always welcome, successful, or possible. Currently, Burkina Faso faces accessibility issues that render ELTs in its classrooms nearly nonexistent and barely present within the administrative sector of secondary schools. The irregularity of electricity supplies in cities, the lack of Internet availability, and a mostly rural population are major barriers to the integration of ELTs in secondary schools in Burkina Faso. In this unfavorable context, those who do have access to ELTs use it primarily for access to information, for entertainment, and to communicate with friends through social networks. It is important to better understand these activities and how they can impact education in the country.

For ELTs to have a real impact on sustainable development and to improve student achievement, they need to be more than a mere object of learning; they must be truly integrated into teaching and learning (Karsenti & Ngamo, 2007). To achieve this end, teachers have an important role to play. When they have access to technology, they must use the full potential of the available tools to further their professional development.

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In turn, the teacher who is aware of the cognitive potential of these tools will encourage students to use them constructively and wisely.

In summary, ELT training and professional development for teachers and school administrative personnel is necessary for a successful ELT integration in Burkina Faso's education system. However, ELT integration in the education system cannot be effective without considering all elements such as accessibility issues and a lack of necessary user skills in a region where the infrastructure is not in place. Thus, for successful integration of ELTs in the education system in Burkina Faso, stakeholders must first resolve accessibility issues, particularly in rural and remote areas; interconnect the regional administrative department in Burkina Faso; and develop a regional communication interconnection with international transit centers to help resolve connectivity issues.

LIMITATIONS

This study's goal and objectives were to give voice to the participants. Thus, this study may pose tensions related to building relationships with participants and the schools, using interview and survey data, and publishing results. Therefore, I took precautions prior to interviewing participants. These precautions included obtaining the Institutional Review Board's approval of the study (see Appendix C), and a legal request to the administrative authorities of secondary schools in Burkina Faso for formal permission to do the study. All participants went through consent processes and signed a consent form before beginning the interviews. In addition, no names were used in the results and connections between schools and its participants are limited in order to protect the identities of participants.

This study took a descriptive approach and has its limitations. The major difficulties encountered during this study are inherent in any research. In this case, difficulties arose associated with the geographical distance between my main location (United States) and the research site (Burkina Faso). Also, distances to data collection sites were significant: 320 km (198.80 miles) round trip between Ouagadougou and the rural town of Cassou, located in the southern part of the country; and 400 km (248.50 miles) round trip between Ouagadougou and the town of Tenkodogo located in the eastern part of the country. Ouagadougou is the capital of the country. These long distances required financial expense and road safety, particularly during travels for data collection. In addition, the team was confronted with difficulties related to the absence of electricity in the rural town of Cassou. Thus, during interviews, photos and videos could not be taken because cameras could not be recharged due to the lack of electricity.

A qualitative research approach based on interviews, self-assessment questionnaires, documentation, and observation was not sufficient to determine the skill level of participants with ELTs or how they could meet all the benefits and challenges highlighted in this study. I tried to find middle-ground between the semi-structured interview and self-assessed questionnaires, and consider this study a first step toward understanding the barriers to integrating ELTs within the country. I encountered other constraints during the investigation. We collected data at the end of the school year and 10th- and 13th-grade students were taking final examinations. This timeframe posed some difficulties related to the availability of participants. Some participants were taking their professional aptitude of secondary education certificate. This made the interviews

days and time management more difficult because data collection days and times had to align with the availability of participants.

In conclusion, most participants explained that economic difficulties, lack of time due to their busy schedules, and the lack of electricity made it difficult, if not impossible, for them to integrate ELTs in the education system. The socioeconomic realities are the major obstacle in gaining access to ELTs for all teachers, students, and administrators in the secondary education system within Burkina Faso. Social realities implicitly affect access and use of ELTs, showing a type of inequality that is visible and relates to the location and school attended by students, teachers, and administrative personnel.

FUTURE RESEARCH

My dissertation research is one step forward in analyzing the impact of ELTs in one of the least developed countries in the world. Its results help to identify existing accessibility issues in Burkina Faso, which indicate numerous socioeconomic and technological constraints. Bado (2012) reminds us that the challenge for the strategic integration of ELTs is to ensure that they can contribute to local community development and create effective and efficient conditions for sustainable development in places like Burkina Faso.

Thus, in order to build on the findings of my dissertation that focused on public schools, I suggest future research studies that measure the current degree of integration of ELTs within all education contexts in this country:

- What are the current impacts of ELTs in secondary *private* education institutions in Burkina Faso?

- What are the current impacts of ELTs in *semi-conventional* secondary education institutions in Burkina Faso?

- What are the current impacts of ELTs in *primary* school education institutions in Burkina Faso?

- What are the state and impact of ELTs in *non-formal basic-education* centers in Burkina Faso?

By focusing in these additional questions, a more detailed picture of the use of ELTs in Burkina Faso can be created. Furthermore, more information on the current state of ELTs would allow for more targeted recommendations to be developed for future actions within the education system.

RECOMMENDATIONS

This study illustrates how ELTs are used, and not used, within public secondary schools in Burkina Faso primarily based on interviews and questionnaire responses by 18 participants. This study took place in three secondary schools in Burkina Faso with participants comprising teachers and administrative personnel. Based on the analysis of information collected and analyzed, the following recommendations are addressed to Burkina Faso's government, its private sector, nongovernmental organizations, technical partners, and financial institutions:

- Establish infrastructures to create "centers of excellence" for ELT training;

- Develop learning programs with ELT modules for educational institutions, particularly in secondary education;

- Train technicians and specialists in ELT for secondary school institutions;

- Implement computer labs in all secondary schools in Burkina Faso;

- Promote access to electricity in all regions and localities of Burkina Faso;

- Promote the coverage of Burkina Faso with high speed and stable Internet connections;

- Encourage technical and financial partners to support sectorial policies for ELT development and integration in secondary education; and

- Fund tools and hardware for all people involved in secondary education such as teachers, administrative personnel, parents, and students.

It is important that technical partners and financial institutions support government policies that put in place a regulatory institutional framework to encourage the effective integration and use of ELTs in education in Burkina Faso. Nongovernmental organizations can ensure that basic needs are central to technological progress and work to assess the real information needs of the population, such as the provision of relevant local data. The private sector can provide funding for technical infrastructure with innovative ideas to share and aid in the dissemination of information.

This dissertation research was both the final step in my journey to achieve a PhD and the first step in better understanding a place that means much to me personally. I am a product of Burkina Faso's educational system. I was once the same as the students I observed when conducting interviews. I was taught by the same types of teachers. I studied in the same rooms and felt the warmth of the same sun as the people who are there now. I have a personal connection to where the education system in Burkina Faso has been because I was there. I now have a personal investment in where, hopefully, that same system is headed in the future. This dissertation is just the start of my journey towards helping Burkina Faso fully join the global community as equals in education and

technology. Having met the people on the ground during this process I know that the

passion, skills, and drive are there, and that this goal is within reach.

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pdf

Appendix A

Participants Interview Guide

I-PARTICIPANT INFORMATION

Last Name: ……………………………………………………………

First Name: …………………………………………………………

Sex: M   F

Occupation: Teacher Administrator

Education level: University or equivalent No higher education

II-IDENTIFICATION OF THE PLACE OF THE INTERVIEW

1-Distance from Ouagadougou: …………..

2-Number of students: ……………………………………………………………………...

3-Status of the locality:

➢   City   :   ⬭   ➢   Provincial Capital :   ⬭

➢   Rural :   ⬭   ➢   Regional capital :   ⬭

III- THEMES OF THE INVESTIGATION

A.   IMPACT OF EMERGING LEARNING TECHNOLOGIES IN SECONDARY

EDUCATION IN BURKINA FASO

    1. Emerging Learning technologies, what does it mean to you?

       ………………………………………………………………………………

    2. Do you think that technological tools contribute to improving the quality and

       enhancing the level of secondary education in Burkina Faso?

       ❖ If Yes, How and Why? ………………………………………………….

       ❖ If not, give reasons ……………………………………………………

    3. Do you use the school's computer lab or internet cafes in an educational

       context?

    ➢ Within the school:

       o Yes, Why? ……………………………………………………………

       o Not, Why? ……………………………………………………………

    ➢ Outside the school:

       o Yes, Why? ……………………………………………………………

       o Not, Why? ……………………………………………………………

    4. Students and the Internet, what do you say?

       ………………………………………………………………………………

       ………………………………………………………………………………

    5. Do you use a desktop or laptop computer for your daily tasks?

B.   USE OF EMERGING LEARNING TECHNOLOGIES IN SECONDARY

SCHOOLS IN CITIES, RURALS AND PROVINCES

6. Role of the administration or teacher in promoting technological tools in your educational environment

………………...……………

……………………………………………………………………………………

7. As a key player in education, do you have a vision on the use of technology in your daily work?

✓ In the short term ……………………………………………………………

✓ In the medium term …………………………………………………………...

✓ In the long term...…………………………………………………………………...

8. What policy implemented by the ministry in charge of Secondary Education leads to the promotion and use of technological tools in secondary educational institutions in Burkina Faso?

……………………………………………………………………………………

C. KNOWLEDGE OF THE TECHNOLOGICAL TOOL

9. What is your technological skill level?

Very Good   Good   Average   None

10. Have you received computer training?

Yes   No

11. Do you regularly use computers?

Yes   No   For personal use   For work

12. According to you, do students use computers to improve their academic performance?   Yes   No

13. Does your school has a computer lab?

- If yes, is the amount of equipment enough?

- Do all grade levels have access? Why?

- What is the state of this equipment?

- If not, is your school planning to acquire one?

  o When? …………..………………………………………………………

  o Why? ……...….………………………………………………………

D.   PROSPECTS FOR THE USE OF EMERGING LEARNING TECHNOLOGIES IN SECONDARY EDUCATION IN BURKINA FASO

14. What is your assessment of the use of technological tools in city, rural, provincial capital, and regional capital contexts?

✓ Good?   Explain the limitations and strengths ……………………………….

…………………………………………………………………………………

✓ Average? Explain the limitations and strengths ……………..………………...

…………………………………………………………………………………

✓ Not good? Explain the limitations and strengths ……………..…………….

…………………………………………………………………………………

15. What can be done to promote the effective and efficient use of technologies tools in secondary education in Burkina Faso?

……………………………………………………………………………

16. What are the challenges to overcome if you became a decision-maker on the use of technological tools in your school?

……………………………………………………………………………

……………………………………………………………………………

…………………………………………………………………………………………

17. Do you want to make any appeals to donors, state authorities and banks for

assistance?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

Thank you for your participation.

Responses to Interview Questions

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Q1: Emerging Learning technologies, what do they mean to you?																		
ELTs are a set of technical tools used to facilitate work and communicate reliably.		x	x	x	x								x					
Keywords: Work and communication.																		
ELTs are the sum of all tools related to computers.	x													x	x	x	x	
Keywords: Tools related to computers.																		
ELTs are means of communication via the Web.							X	x	x									x
Keywords: Communication via the Web.																		
ELTs are a plus for accurate information and accelerated learning.										x	x	x						
Keywords: Information and learning.																		
ELTs help create, store, manage, and transmit information.						x												

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Keywords: Information processing																		
Q2: Do you think technology tools contribute to improving the quality and enhancing the level of secondary education in Burkina Faso?																		
ELTs contribute to improving the level of education in Burkina Faso; however, access to ELTs is a problem.	x	x	x	x	x	x										x		
Keywords: Improved level																		

Question	C1	C2	C3	C4	C5	C6	M1	M2	M3	M4	M5	M6	T1	T2	T3	T4	T5	T6
ELTs contribute to improving education in secondary schools in Burkina Faso by making information accessible for research for all users (students, teachers, and administrators).								x	x	x	x	x	x	x	x		x	x
Keywords: Improved level by providing a well furnished database																		
Q3: Do you use the school's computer lab or Internet cafes in an educational context?																		
Do not use computer labs in school, but, do use computers outside the school.	x	x	x	x	x			x		x			x	x	x	x	x	x
Keywords: Lack of computer labs in schools																		
Do not use computer labs or Internet Cafes because they have no basic training in this area.						x	x				x							
Keywords: Lack of basic training																		
Use the school computer lab and go to Internet Cafes outside the school to do research.									x		x							
Keywords: Use of computer lab																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Q4: Students and the Internet, what do you say?																		
The Internet encouraged student learning in research; however, educators must guide and support students in their research, so they spend time only on appropriate sites. Also, students spend more time surfing the Internet than learning their lessons. The Internet promotes cheating through the use of mobile devices.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Q5: Do you use a desktop or laptop computer for your daily tasks?																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Use a desktop or laptop computer for everyday tasks.		x					x	x	x	x			x	x	x	x	x	x
Keywords: Access to a desktop or a laptop computer																		
Do not use a desktop or laptop computer for various reasons such as lack of electricity, no skills to use computers, and the high cost of computers.	x		x	x	x	x					x	x						
Keywords: Lack of electricity and lack of computers skills																		
Q6: What role the administration or teacher should play in promoting technological tools in your educational environment?																		
Teachers can guide students in the use of technology tools. The government must try to provide electricity to all areas of Burkina Faso and equip each school with a well-equipped computer lab.		x	x		x											x	x	
Keywords: Guide students; provide electricity, well-equipped computer lab																		
Government promotion of technology tools in secondary schools had no	x			x									x					

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
noticeable effect. Teachers can only encourage students to be interested in technology tools.																		
Keywords: The central government effort is not noticeable																		
Government must work to provide each school with a well-equipped computer lab that will serve students and teachers.							x	x	x	x	x			x			x	x
Keywords: Provide each school with a computer lab.																		

Question	C1	C2	C3	C4	C5	C6	M1	M2	M3	M4	M5	M6	T1	T2	T3	T4	T5	T6
Administrators must maximize efforts to train teachers in technology who will in turn train students.						x						x						
Keywords: Training all players in secondary schools																		
Q7: As a key player in education, do you have a vision for the use of technology in your daily work																		
Technology tools have become indispensable and essential in education today, and we must work to allow their use in education in the short, medium, and long term.	x	x	x	x	x	x		x	x	x	x	x				x		
Keywords: Insert and use technology tools in education																		
Lack of training of key players produced a constriction in secondary schools. Train educators as a force that can bring people together and encourage them to become more familiar with technology tools and make these tools accessible to the public.							x						x		x		x	
Keywords: Lack of training for key players in secondary education																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Q8: What policy implemented by the Ministry of Secondary Education leads to the promotion and use of technology tools in secondary educational institutions in Burkina Faso?																		
No information on any policy promoted by the Ministry of Secondary Education leading to the promotion and use by all of technology tools in secondary schools.	x	x	x	x	x	x		x		x	x	x		x		x	x	
Keywords: No information on any policy on the part of the ministry																		

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Question	C1	C2	C3	C4	C5	C6	M1	M2	M3	M4	M5	M6	T1	T2	T3	T4	T5	T6
In the past, the Ministry planned to develop management software for secondary schools; however, this is not a reality yet.															x			
Keywords: Develop management software																		
Learned about a policy of the Ministry of Secondary Education to promote and use technology tools in secondary schools.																		x
Keywords: Information in the media																		
The Ministry of Secondary Education has a policy of allocating technology tools in all schools to ensure the minimum functioning of these institutions.							x		x									
Keywords: Allocation of technology tools in secondary schools																		
Q9: What is your technological skill level?																		
Average	x	x	x	x	x		x		x	x	x	x	x	x		x	x	
Keywords: average computer skills																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Very basic skills learned from a 30-hour course at a teachers' training school.						x												
Keywords: Very basic skills																		
Fairly good.							x											
Keywords: Fairly good skills																		
Q10: Have you received computer training?																		
30 hours of computer training on average, while at professional teachers' training schools and at their own expense.	x	x		x	x	x	x	x					x	x	x	x		x
Keywords: Had computer training.																		
No computer training.			x				x			x	x	x						
Keywords: No computer training																		
Q11: Do you regularly use computers?																		
Use computers regularly for personal use.		x		x	x					x	x		x	x	x			
Keywords: Personal use																		
Do not use computers regularly.						x	x				x							x
Keywords: non-regular use																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Regularly use computers at work.							x	x								x	x	
Keywords: Daily use																		
Q12: According to you, do students use computers to improve their academic performance?																		
Students do not use technology tools to improve their academic performance.	x	x	x	x	x	x				x	x							
Keywords: Students do not use																		
Students use technology tools to improve their academic performance.							x	x	x			x	x	x	x	x		x
Keywords: Students use																		
Q13: Does your school has a computer lab?																		
School does not have a computer lab, and there is no plan to acquire a computer lab for the school, due to lack of electricity.	x	x	x	x	x	x												
Keywords: No computer lab and lack of electricity																		
School has a computer lab but it is old and out-of-date. Given the lack of functionality of the computer lab, some participants preferred to say that the school had no computer lab.													x	x	x	x		x

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Keywords: Old, nonfunctional and no computer lab																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
School has a functional, well-equipped computer lab with an Internet connection.							x	x	x	x	x	x						
Keywords: Functional computer lab																		
Q14: What is your assessment of the use of technological tools in city, rural, provincial-capital, and regional-capital contexts?																		
Use of technology tools is extensive in urban areas and less so in rural because of the lack of electricity and high illiteracy among rural populations.	x	x	x	x	x	x	x	x	x	x	x	x						
Keywords: Good in urban, less in rural, lack of electricity, high illiteracy and rural population																		
Use of technology tools in urban and rural area is not extensive because of the lack of electricity or frequent electrical black-outs where it is present.															x	x	x	x
Keywords: Not good, lack of electricity and frequent cutoff																		
Q15: What can be done to promote the effective and efficient use of technologies																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
tools in secondary education in Burkina Faso?																		
Training modules in technology tools must be part of students' and teachers' training. Technology tools must be made accessible to all educators and students.	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	
Keywords: Training and accessibility																		
Secondary schools must be equipped with technology tools.															x	x		
Keywords: Provide technology tools																		

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
Q16: What are the challenges to overcome if you became a decision-maker on the use of technological tools in your school?																		
Adequate computer training of all educators and students, implementation of computer labs in all secondary schools, and making tools accessible to all.	x	x	x	x	x	x		x			x	x	x		x	x	x	x
Keywords: Training, accessibility, and computer labs																		
Government must work to continually train all educators and students.									x					x				
Keywords: Training																		
Government must work to make available technology tools to all educators and students.							x		x									
Keywords: Accessibility and promotion.																		
Q17: Do you want to make any appeals to donors, state authorities and banks for assistance?																		
All of these participants appealed to the donors, government, and bank authorities to work together to promote technology tools and the	x	x	x					x				x	x	x		x	x	

Question	C 1	C 2	C 3	C 4	C 5	C 6	M 1	M 2	M 3	M 4	M 5	M 6	T 1	T 2	T 3	T 4	T 5	T 6
training of education professionals.																		
Keywords: Promotion and training																		
Donors, government, and bank authorities must work together to promote technology tools and make them accessible and beneficial to all those involved in secondary education.				x	x	x	x	x		x	x				x			x
Keywords: Promote, beneficial, and accessible																		

Note. C refers to participants in Cassou high school; M refers to participants in Ouagadougou high school; T refers to participants in Tenkodogo high school; Q refers to a question.

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Appendix C

Institutional Review Board Approval

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Human Research Protection Program
Office of the Vice President for Research

D528 Mayo Memorial Building
420 Delaware Street S.E.
MMC 820
Minneapolis, MN 55455

Office: 612-626-5654
Fax: 612-626-6061
E-mail: irb@umn.edu or ibc@umn.edu
Website: http://research.umn.edu/subjects/

April 25, 2014

Romaric R Zongo

Education/Human Development Room 210LES

6197A

1954 Buford Ave

St Paul, MN 55108

RE: "INTEGRATION OF EMERGING LEARNING TECHNOLOGIES IN

SECONDARY SCHOOLS: A BURKINA FASO CASE STUDY"

IRB Code Number: 1404P49543

Dear Mr. Zongo

The Institutional Review Board (IRB) received your response to its stipulations. Since this information satisfies the federal criteria for approval at 45CFR46.111 and the requirements set by the IRB, final approval for the project is noted in our files. Upon receipt of this letter, you may begin your research.

IRB approval of this study includes the consent form received April 9, 2014.

The IRB would like to stress that subjects who go through the consent process are considered enrolled participants and are counted toward the total number of subjects, even if they have no further participation in the study. Please keep this in mind when calculating the number of subjects you request. This study is currently approved for18 subjects. If you desire an increase in the number of approved subjects, you will need to make a formal request to the IRB.

For your records and for grant certification purposes, the approval date for the referenced project is April24, 2014and the Assurance of Compliance number is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003). Research projects are subject to continuing review and renewal; approval will expire one year from that date. You will receive a report from two months before the expiration date. If you would like us to send certification of approval to a funding agency, please tell us the name and address of your contact person at the agency.

As Principal Investigator of this project, you are required by federal regulations to inform the IRB of any proposed changes in your research that will affect human subjects.

Changes should not be initiated until written IRB approval is received. Unanticipated

problems or serious unexpected adverse events should be reported to the IRB as they

occur.

The IRB wishes you success with this research. If you have questions, please call the IRB
office at 612-626-5654

Sincerely

Christina Dobrovolny, CIP

Research Compliance Supervisor

CD/bw

CC: Aaron Doering