INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTs) IN THE TEACHING AND LEARNING OF GEOGRAPHY IN SELECTED SCHOOLS OF PETAUKE DISTRICT OF EASTERN PROVINCE

By

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A dissertation submitted in fulfillment of the requirements for the Masters of Education in Geography Education

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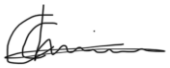
Signed (Candidate):  **Date**……

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APPROVAL

This dissertation of Chirwa Cosmas is approved as fulfillment of the requirement for the award of degree of Masters of Education in Geography Education by the University of Zambia.

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ABSTRACT

This research was an attempt to establish how effective the integration of ICTs in the teaching and learning of Geography was being done in selected schools of Petauke district. The aim of this study was to establish how best ICTs could be integrated in the teaching and learning of geography by teachers and learners in selected schools of Petauke district to ensure relevance of the Geography subject to the current and ongoing technological developments that are shaping the country's social and economic growth. The objectives of the study were to identify ICT facilities that were available in the selected schools, to explore the extent to which ICT devices/platforms were being integrated in the teaching and learning of geography, and to establish the preparedness of teachers and learners in the integration of ICTs in the teaching and learning of geography in selected schools of Petauke district.

The study was purely qualitative with a descriptive design and consisted of 28 participants. To achieve the study objectives, interviews and classroom observations were used to identify the available ICTs in schools and how effective their use was by both learners and teachers in the teaching and learning of Geography in the selected schools of Petauke district. Data collected was then analyzed thematically.

The study revealed that there was no convincing pedagogy developed yet by teachers to enable effective ICT integration in a constructivist approach and teachers were still stuck in the pedagogy of yester years. The study showed that perceptions about the value of ICTs for teaching did not tally with the realities of trying to integrate ICTs in the classroom. This was evident with learners just as much as with the teachers. There were a few barriers noted leading to the failure of effective integration of ICTs in Geography, which included limited ICT knowledge from the learners and the teachers, the cost of running and maintaining ICTs, power disruption, and non-availability of ICT resources.

It is therefore, recommended that there is need to set up Continuous Professional Development (CPD's) programs as well as workshops for Geography teachers to educate and train them on pedagogical skills that will equip them with strategies to effectively integrate ICTs in lessons. Furthermore, schools through Parent-Teacher Association (PTA) meetings, should sensitise guardians of the learners on the benefits and demerits of ICTs so that learning should be an on-going process that does not just start and end in the classroom.

DEDICATION

This work is dedicated to my mother Mrs Monica Chirwa, my elder brother Chitalu Chirwa and my elder sisters Tiyime Chirwa whose positive support, encouragement and sheer will towards my studies remain inspirational.

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I am greatly indebted to my supervisor, Dr. Mubita Kaiko for the constructive guidance, wonderful comments, and encouragement throughout the entire period of this proposal writing. Without his support and guidance, it would have been impossible to finish this research.

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ABBREVIATION AND ACRONYMS

BAED:	Bachelor of Art with Education
CAT:	Computer-Assisted Teaching
CPD:	Continuous Professional Development
CPT:	Computer-programmed Teaching
DEBS:	District Education Board Secretary
DEE:	Department of Electrical and Electronics
DSTV:	Digital Satellite Television
EFA:	Education for All
GPS:	Global Position System
ICTs:	Information and Communication Technologies
NGOs:	Non-Government Organizations
PAC:	Pedagogical Content Knowledge
PTA:	Parent-Teacher Association
SDGs:	Sustainable Development Goal
TPCK:	Technological, Pedagogical Content Knowledge
UNESCO:	United Nations Educational Scientific and Cultural Organization
UNZA:	University of Zambia
Wi-Fi:	Wireless Fidelity

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Since the inception of technological advancements in the world at large, people have sought to incorporate technology in their day-to-day lives and this has been successful so far. So successful to the extent that nearly every household has technological appliance.

In as far as education is concerned, the use of Information and Communication Technology (ICTs) in African schools is slowly taking ground and they are being used by both teachers and learners. This is because ICTs could efficiently manipulate and transmit information in ways that enhance the teaching and learning experience. These ICTs include hardware such as computers, various accessories, projectors, printers and photocopiers, radios and televisions, communication devices such as mobile telephones, video and audio recorders and various software among other things (Marker, 2007).

Most learning is improved or enhanced using learning support materials that are carefully constructed and carefully used. Some complex issues in education or learning process require the mixing of advanced tools of teaching unlike over reliance on the traditional ones such as chalk boards, charts, and paper among others which marred most learning processes especially in the 20^{th} century (Rosenberg, O'Donoghue and Ovlitt, 2008). They further argued that for developing of learning, supporting materials that were flexible and adaptable to diverse and changing contexts, recognizing aspects such as language, purpose and topical complexity was necessary. Mbanjwa (2002) further argued that the educators' ability to appropriately select and mix both traditional and modern learning support tools was key. One of the modern tools which could be mixed with the common methods in teaching and learning is the use of ICTs.

The integration of ICTs in education happens at two distinct levels thus the content integration and the pedagogical integration. According to Roblyer and Doering (2001), the introduction of ICTs in schools for occasional use by teachers and learners is called physical integration, while the pedagogical integration of ICTs in schools refers to routine use of ICTs in the teaching and learning processes. This study therefore focused on the integration of ICTs in the teaching and learning of geography in selected schools of Petauke district.

1.2 Background

The virtual world is growing vastly as ICTs supplement traditional means of doing things. The world has evolved to the extent that nearly every economic, environmental, and social activity is somewhat dependent on ICTs, hence the need for a workforce that is ICT literate and able to stay up to date with modern changes.

According to Pye (1963:3):

> *It was the pressure of communications which brought about the downfall of traditional societies. And in the future, it will be the creation of new channels of communication and the ready acceptance of new content of communications which will be decisive in determining the prospects of nation-building*.

The wide spread of ICTs in this era has not spared the educational sector. ICTs have been often referred to as the future for humanity because in the long run, the analog way of life (use of hard copy books and non-digital platforms) is slowly coming to end as the digital way seems more viable and less costly as well as environmentally friendly to a great extent due to minimal dependency on paper (Clark and Mayer, 2003).

While ICTs have penetrated schools in the western countries in great numbers, most African countries have lagged far behind. For several years now, the African education system has been coping with a multitude of problems, such as funding and countries have had to make some hard choices, which generally do not attach much importance to Computer usage. These schools were still struggling with basics of computer processing. With time however, teachers soon got interested in Computer-programmed Teaching (CPT), an innovation developed in North America and Europe. This allowed the teachers in some African countries to offer instruction in certain subjects with the help of technology (Yong et al, 2016).

With further development, Computer-Assisted Teaching (CAT) came into existence next. This type of instruction was delivered partially or totally through the use of computers. This was done through various tutorials, or educational software, specifically designed to help learners acquire knowledge and develop skills in a given subject area. It could be used at all levels of education from primary to post-secondary courses and thus, proved particularly popular in the schools it was introduced in developed African schools (Clark and Mayer, 2003). By the early 1980s, Computer Assisted Learning (CAL) was then introduced and in the mid-1990s, ICTs were being used in a

variety of disciplines. CAL covered a range of computer-based software packages and applications aimed at providing interactive instruction usually in a specific subject area.

The Zambian government has acknowledged the need for ICTs and via the attainment of Sustainable Development Goals (SDGs number 4) that demand for quality education, there has been an introduction of ICTs in schools as tools to enhance the teaching and learning experience (Ministry of Transport and Communication, 2006). The sustainable development goal number four, which is the educational goal, focuses on ensuring inclusive, equitable and quality education and promoting lifelong opportunities for all. To attain this goal, ICTs play a vital role in the education sector (Yadav, 2013).

ICTs in Zambia have been integrated in nearly every sector of the nation's development sphere thus social and economic. This has brought about the need for a workforce that is ICT literate so as to achieve vision 2030 of making Zambia a prosperous middle-income nation by the year 2030 via social and economic development. The policy recognized the need for integrating ICTs in education and thus, the government formulated the National Information and Communication Technology Policy whose aim was to integrate ICTs in the education system and develop the nation's Research and Development (RandD) capacity to support, facilitate and contribute to the development of key sectors of the economy including the development of appropriate local ICT products and services (Ministry of Transport and Communication, 2006).

1.3 Statement of the Problem

ICT can play a significant role in equalizing opportunities for marginalized groups and communities. But the paradox is that for those groups that are unable to cross the technology divide, ICT is yet another means to further marginalize them. Education has a major role to play in resolving this problem (Pelgrum, 2001). Thus, unless ICT becomes part of both the delivery and content of Zambian education, the disadvantage will deepen and development will suffer. But the failure to use ICT is itself a result of the digital and knowledge divides that exist, and their causes are deeply embedded in the complex historical and socio-cultural context of the country. Fortunately, with the Vision 2030 goals, the Zambian government has begun to implement strategies that will address these paradoxes (National Council for Science and Technology, 2010). Zambia's ICT policy advocates for effective integration of ICTs within the entire education sector

to support administration, teaching, learning and research (Ministry of Education, 2007). By adopting ICT, we can offer high quality education.

Therefore, this study puts emphasis on how ICTs can be best integrated in the teaching and learning of Geography bearing in mind that Geography is a practical and bridging subject, to ensure that the concepts learnt are relevant to current and ongoing technological developments.

1.4 Aim

The aim of this study was to establish how best ICTs could be integrated in the teaching and learning of geography by teachers and learners in selected schools of Petauke district.

1.5 Objectives

This study was guided by the following objectives:

1. To identify ICT facilities that were available in the selected schools of Petauke district of eastern province.
2. To explore the extent to which ICT devices/platforms were being integrated in the teaching and learning of geography in selected schools of Petauke district.
3. To establish the preparedness of teachers and learners in the integration of ICTs in the teaching and learning of geography in selected schools of Petauke district.
4. To suggest the best means of integrating ICTs in teaching and learning of geography in selected schools of Petauke district.

1.6 Research Questions

1. What kind of ICT facilities were available in the selected schools of Petauke district?
2. How are ICT devices/platforms being integrated in the teaching and learning of geography in selected schools of Petauke district?
3. How prepared were teachers and learners in the integration of ICTs in the teaching and learning of geography in selected schools of Petauke district?
4. How best can integration of ICTs be done in teaching and learning of geography in selected schools of Petauke district.

1.7 Significance of the Study

The findings of this study may help establish strategies to enhance effective integration of ICTs in the teaching and learning of Geography. Furthermore, this study could greatly aid stakeholders such as curriculum planners to adopt newer innovations in the teaching and learning of Geography. It may also help the Ministry of General Education to realize the need to produce enough ICT materials that could help transform the learning environment into one that is more relevant to current technological developments. The findings may also help the teachers adjust their teaching methods so as to improve the teaching and learning of geography by the use of ICTs. The findings of this research may further help policy makers in implementing suitable and relevant means of ensuring that ICTs are incorporated in the teaching and learning process nearly at every level of education to ensure that learners are equipped with updated and relevant information. Additionally, this study may add to the much-needed scholarly literature on Geography teaching and learning in Zambian Schools.

1.8 Limitations

With the current and ongoing Covid-19 pandemic, most participants were not found at their designated stations (schools). Therefore, to overcome this, online applications/software (Whatsapp, and Gmail) and phone calls were utilized to conduct interviews so as to ensure the targeted participants were reached and the research objectives fulfilled.

Although this research had been carefully prepared so as to reach its aims, there are unavoidable limitations. Being qualitative in nature, the study involved a relatively small sample size of twenty-eight (28) participants. For this reason, the findings cannot be generalized to the broader community based on this study alone. This calls for a future nation-wide study.

1.9 Delimitation

This study was confined to the selected secondary and primary schools in Petauke District of Eastern Province. Therefore, the study was not extended to all schools in Petauke and to all the ten provinces of Zambia.

1.1.1 Theoretical Framework

The theories of learning will inform the researcher in which ways ICTs can be integrated in the teaching of Geography. Richard (2015) describes learning theories as frameworks describing how

information is absorbed, processed and retained during learning. The way information or knowledge is acquired and stored in the brain has given rise to various theories that emphasize one aspect of the process of cognition over the other processes. Learning theories act as a lens through which one sees an educator interacting with students in the process of learning. These lenses enable researchers to interpret how a teacher practices as a professional in the process of learning. The constructivist approach to teaching geography formed the theoretical framework of this research. This approach places the student engagement with the material being learnt in the center of the learning process. As such, the efficacy of the teacher's pedagogy is measured or evaluated according to the extent to which learners are engaged in the learning process and are therefore able to understand the subject matter (Richard, 2015). In the case of Geography, learners need to be actively involved in the learning process as opposed to the traditional lecture method where learners are just passive expecting the teacher to spoon feed them with knowledge.

Constructivism is grounded in Lev Vygotsky's (1987) theory of social constructivism in which he argues that the role of the teacher is to help the learner acquire knowledge and skills which it would be difficult for the learner to acquire without the help of teacher. Constructivism requires a teacher who acts as a facilitator whose main function is to help students become active participants in their learning and make meaningful connections between prior knowledge, new knowledge, and the process involved in learning (Rice and Wilson, 1999). In Geography it is assumed that digital technology support constructivist learning through student engagement and collaboration. Part of the learning process requires "objectification" of knowledge. Objectifying knowledge involves making abstract concepts concrete so that it is easier for the learner to understand what is being taught. For example, digital illustrations used in the Geography classroom appear closer to reality and the teacher uses this to help learners learn better.

Manovitch (2001) while cautioning against passive consumption of technology without active learning, argues that digital technology "objectifies" concepts and that it is the teacher's skill that ensures the objectification of reality through the multimedia hence the importance of the teachers' skills in using ICTs. Although some learners still may find it difficult to comprehend the concepts even with digital examples, the teacher's teaching skills should also cater for such gaps that may occur in the learning process when using ICTs. For this collaboration to happen the teacher plays a central role and is key to guiding learners through constructive learning.

Various tools are now available that aid constructivist learning, for example simulation games, videos, web surfing, internet, social networks, online tasks, etc. Yadav (2013) went on to say that when using multimedia "learners can be provided sufficient motivation to learn with sustained attention and interest and active involvement in task of learning'. The way the teacher integrates technology plays an important role in whether learners will benefit or not. Though the use of multimedia, learning becomes a form of play and Geography becomes real, interesting, enjoyable and meaningful and both the teacher and the learner are involved in the creation of knowledge.

1.1.2 Conceptual Framework

To conclude this chapter, this chapter looks at the Technological Pedagogical and Content Knowledge Model (TPACK). The way the teacher engages learners in the classroom will exhibit some main elements of the TPACK model. This model is reviewed because of its important contribution in the integration of ICT in the teaching of Geography. Based on the works of Koehler and Mishra (2006) and also borrowing from Shulman (1987). The TPACK is a pedagogical framework to understand the different but related kinds of knowledge needed by the teacher for the effective and efficient pedagogical practice in a technological enhanced learning environment. It argues that the introduction and effective use of ICT in the geography classroom, requires teacher's understanding and negotiating the relationships between these three major components, namely, pedagogy, technology, and content.

To integrate ICT in the geography classroom effectively, there must be technological knowledge, content knowledge and pedagogical knowledge. According to Mishra and Koehler (2006, p.1029) the TPACK model is the foundation of good teaching with technology and requires an understanding of the representation of concepts using technologies, pedagogical techniques that utilize technologies in constructive way to teach content, knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems students face.

The models in figure 1 and 2 summarize the key concepts of the TPACK model.

Figure 1: TPACK Model

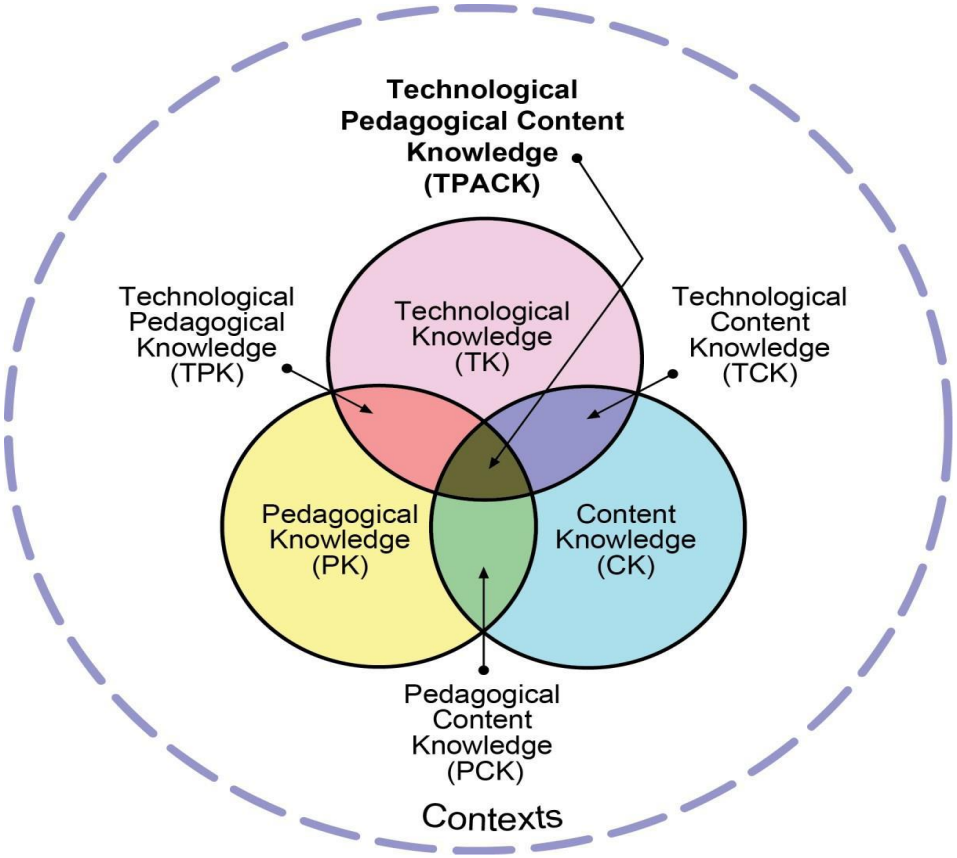

Figure 1. source: (Shulman, 2004)

Figure 2. TPACK model simplified

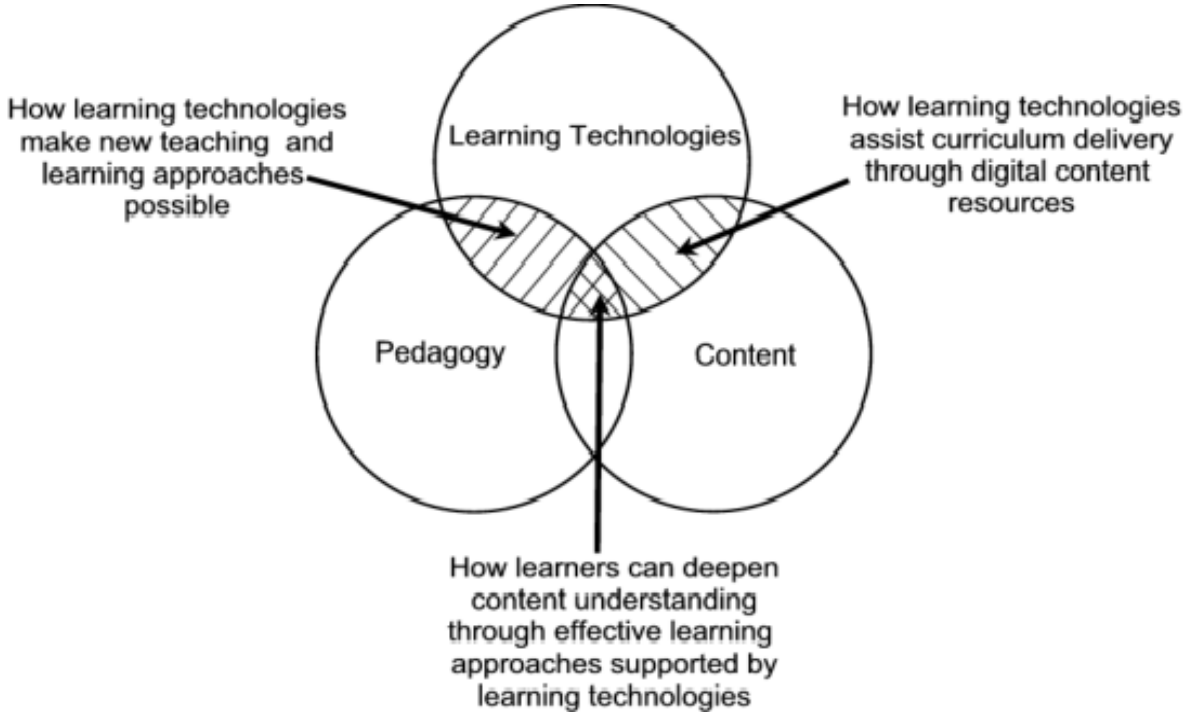

Figure 2. source: (Shulman, 2004)

The works of Shulman (1987) greatly influenced the TPACK model when he first introduced the concept of pedagogical content knowledge (PCK). Shulman (2004) has emphasized the pivotal role played by the teacher content knowledge and teacher pedagogical knowledge in effective teaching. Shulman (2004, p.201) defined content knowledge as "the amount of and organization of knowledge per se in the mind of the teacher". The geography teacher with more content knowledge is able to go beyond geography knowledge and facts and understands the structure of the subject matter. Over and above content knowledge, the teacher should also have the pedagogical knowledge, i.e., the ability to teach what they know. He therefore defined pedagogical content knowledge as "an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different backgrounds bring with them to the learning" (Shulman, 2004, p.203).

Building from Shulman (1987) Pedagogical Content Knowledge (PCK), Mishra and Koehler then developed their TPACK model that went on further to include technological content knowledge

(TCK) to enhance the teacher's capabilities in the integration of technology in the classroom. This is actual the backbone of the ability of the teacher to teach and which is the cornerstone for the effective implementation of ICT in teaching of Geography.

Ndlovu (2015) sees the ability of the teacher to teach being central to the effective implementation of ICTs in the classroom. She argues that ICTs are no remedy to poor pedagogical practices of the teacher and that ICTs will work better if they are integrated into good teaching practices. Ndlovu actually observed a geography teacher teaching using ICT to substantiate her argument. Hence in attaining the set objectives of this study, the TPACK model helped set the basis on which teaching and learning observations were conducted.

1.1.3 Organization Structure

This dissertation is made up of six chapters. Chapter one focused on the background, statement of the problem, Main aim of the study, objectives, significance of the study and the definitions of terms. Chapter Two contained Literature Review. In this chapter, relevant literature on the application of ICTs in relationship with the Improvement in Teaching and Learning of Geography was reviewed. Chapter Three looked at the Methodology which was employed in the study in detail. It began with the description of the research design that was employed, target population, sample size, sampling procedures and research instruments. It also described the data collection procedures and how this data was analyzed to answer the research questions. It further describes the ethical considerations that were made during data collection. Chapter Four Presented the Findings of the study. Chapter Five discussed the Findings in relation to the literature reviewed. Chapter Six gave recommendations and suggested areas of further research based on the findings of the study. Then References, Questionnaires and Appendices were at end of the dissertation

1.1.4 Summary

With the world going digital, the need for a computer literate population proves to be a step in the right direction of sustainable development. Therefore, this study aimed at establishing how best teachers and learners could integrate ICTs in the teaching and learning of Geography in selected schools of Petauke district.

The findings of this study might help stakeholders such as curriculum planners to adopt newer innovations in the teaching and learning of Geography. It may also help the Ministry of General

Education to realize the need to produce enough ICT materials that could help transform the learning environment into one that is more relevant to current technological developments.

The study was guided by the theory of ICT integration as explained by UNESCO. The conceptual framework was established around the TPACK model as proposed by Koehler and Mishra (2006).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides a review of relevant literature on the integration of ICT in the teaching and learning process. The main question that this literature review addresses how do geography teachers integrate ICT in their pedagogy that help improve the quality of learning. The very nature of Geography teaching requires a lot of audio-visual learning aids and this chapter interests itself more into seeing how Geography teachers try to integrate ICTs in place instead of traditional audio-visual learning aids of the '70s and '80s in the teaching of Geography.

2.2 What is ICT in Education?

According to Marker (2007), ICT is seen as an umbrella term that includes any communication device or application, encompassing radio, TV, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video conferencing and distance learning. Marker's (2007) definition highlights the three aspects of ICT, namely: information, technology, and communication technology. These three parts of ICT are intertwined and touch all aspects of technology that can be used in the geography classroom. ICT therefore includes both the technological hardware and the skills needed to operate without demeaning the environment in which it is used. Emphasizing one at the expense of others is untenable because like a three-legged chair, one cannot stand independent of others. This has been one of the challenges particularly in developing countries where the provision of computers is seen as an end in itself and not as a means to an end as if the computers are going to operate themselves.

Marker (2002) gives examples of essential parts that make up ICT. Hardware includes equipment such as computers, laptops, DCs, DVDs, scanner, digital cameras and interactive whiteboards, while software includes operating systems, stored or loaded into the equipment to perform certain tasks. By media is meant the materials that contain data such as DVD, CD, hard disks, USB, flash drives, and SD memory cards. Lastly, the services are a combination of hardware, software and people that enable users to do more through the use of internet and other web-based activities.

Marker (2002) goes on even to include mobile phones, calculators and tablets as part of ICT. He goes further to highlight that these gadgets have a massive power and storage capacity to store data

compared to their size through the use of digital technology. Marker (2002) concludes by giving a comprehensive and full lot of what comprises ICT resources in education. This list includes: computers, Calculator, CAD (computer assisted design, DVD, CD, TV, Radios, Data projectors, Database, Printing, Digital video camera, Digital camera, Laptops, Cell phones, DVD players, Play stations, VLE (Virtual Learning Environment), Video games, Graphic organizer, Digital encyclopedia, Message texting, E-commerce, E-commerce, Email, Internet, Intranet, GPS (Global Position System), PDA (Personal Data Assistant) and World Wide Web (WWW).

Despite different definitions one could ascribe to these concepts, they together and collectively define ICTs in education. Although the list above seems exhaustive, modern technology has introduced some more technological devices and methodologies never experienced or seen before. Some of them are newer versions of the same gadgets listed above, for instance smart phones, phablets, tablets, iPods and iPads. Furthermore, the analogue TVs, analogue radio and VCR are seemingly making way for new and advanced technological devices and new digital modern ways of doing things. It should also be noted that the speed of the digitalizing that the 21st century has seen has rendered many gadgets obsolete. In fact, the popularity and advancements of tablets and smart phones have rendered computers archaic especially with teenagers who spend most of their time on cell phones than on computers. Most smart phones can do and even do better some of the main core functions of the computer hence a shift into what comprise and what does not comprise computers (Marker, 2002).

Therefore, there is need for technological knowledge by the teachers as well as the learners so as to ensure that the ICT devises are utilized to their full capabilities. This aspect of the teacher's and learners' knowledge was not fully brought to light in most of Marker (2002) literature thus this study will attempt to do so.

2.3 Global Studies on ICTs in Education

There are few studies that have been done on the application of ICTs in relationship with the teaching and learning of Geography specifically in Zambia and none in the secondary schools in Petauke District. However, there are many studies that have been conducted in the area of ICTs and education in general around the world. The past few decades have shown an increasing recognition globally of the role of ICTs in development efforts (Marker et al, 2007). Some have referred to this trend as the information revolution. Others have referred to what is called a

knowledge economy, an economy in which knowledge and ideas promptly provided, lead to development of products, economic growth, and hence progress (Castells, 2001).

In addition, this rapid development of these new technologies coupled with the worldwide challenge to educate all children has led to a global reform and development of teacher education (Moon, 2004). The global reform and development of teacher education has motivated educational institutions to redesign and restructure their teaching methods such as to enable learners equip themselves for the future. This global reforming education is apparent in North America, South America, Antarctica, Asia, Australia, Europe as well as Africa.

A study conducted by Light (2009) on the role of ICT in enhancing education in developing countries had some findings worthy noting. The study was conducted in three countries namely, India, Turkey and Chile. The case studies were on the introduction of the Intel® Teach Essentials Course, a professional development program focused on integrating information and communication technologies (ICT) into project-based learning in six schools in Chile, India, and Turkey. The findings of the study indicated that the shift in using ICT and pedagogy must not involve the teachers only, but must involve the whole education system alongside sustainable investment in infrastructure, human resource, circular frameworks and assessment. The point of departure with this study has been the research site.

As much as the study by Light (2009) was carried out in three countries, another scholar Akbaba-Altun (2006) conducted a study on complexity of integrating computer technologies into education in Turkey. The study was conducted in the primary schools of rural Turkey. He used qualitative methods of data collection. His findings were that ICT was a complex subject because teachers needed to be trained at all levels in the education system. He also pointed out challenges like lack of reliable power to enable learners be exposed to the internet throughout the week and term. These finding cannot be generalized to the Zambian context because the study was conducted on the primary school going children. This study was conducted in basic and secondary schools hence the findings might be more reliable than the findings for Akbaba-Altun with regards to secondary school education.

In Chile, Claro et al, (2013) conducted a study dabbed, Introducing 1 to 1 in the classroom: A large-scale experience in Chile. The study was meant to understand how the Mobile Computer Labs were integrated into the 3rd and 4th grade teaching practices. The study also employed a

survey and classroom observations conducted in the two grades, the findings revealed that the classroom observations did not reveal any innovative teaching strategies, related to the use of this new technology. The study showed that amongst the main reasons for this traditional and sporadic use of the ICTs are a lack of targeted teacher training and preparation time, and insufficient technical and pedagogical support during the phases of implementation and integration to the pedagogical practices.

The difference with this study is that this study employed a descriptive design and its population was secondary and primary school learners in Petauke District of eastern province. One interesting and not uncommon observation from global studies is that knowledge of ICTs makes the learners better able to participate with and relate to classmates and society in general, meaning that they were not being left behind. However, and conversely, the potential for ICTs to provide access to inappropriate information or images, and contact with undesirable others is a strong and common negative belief relating to ICTs use. The next generation of students often referred to as the 'Net Generation', are expecting the integration of Web technologies into their learning and teaching programs (Marker, 2002).

According to Bingimlas (2009), in schools today, learners all over the world are carrying mobile electronic devices and if they do not have one, they want one. They use them to communicate with friends and parents; texting and online chatting is a way of life for this generation, and through this medium, they are communicating with purpose like never before. Through the internet and mass media, they are creating a paradigm shift and a challenge for teachers worldwide. For teachers, the challenge of facing the 21st century learner is not a laughing matter, learners are more disengaged and non-receptive to the traditional classroom settings; learning is no longer about pen and paper as they demand to be plugged into ICTs and to work in an engaging, collaborative manner. Learners want access to information and technology devices such as phones, iPods, notebooks, palmtops, laptops, and internet.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) policy on ICT holds that ICTs can help strengthen democratic and transparent education planning and management. Communications technology can expand access to learning, improve equality and ensure inclusion. Where resources are scarce, judicious use of open-source material through technologies can provide the means to bypass the bottleneck of textbook production, distribution

and updating (UNESCO, 1995). The global studies on ICTs in education are important to this study in that they describe a similar trend in teaching and learning patterns that exists in Zambia today; teaching and learning patterns where ICTs are increasingly the order of the day in the classroom. These global studies on ICTs in education also offer a platform on which this study will build.

Drent and Meelissen (2008) reviewed that we need tools and ever since the dawn of human history, people have been inventing and using tools, stone axes and hammers, potter's wheels and furnaces, levers, and pulleys to process food and materials and to harness the energy needed for their physical survival and well-being. As a wise man noted centuries ago, neither a bare hand nor an intellect alone can get jobs done. Similarly, people have used tools for information processing and communication exchange. The invention of language made our far-off ancestors capable of processing and controlling their own thoughts, feelings, and behavior. Words can be considered as the tools of our mental activities, and the first and foremost of the latter is the activity of learning.

Historically, information processing and communication have been major school activities. These occurred mainly between the teacher and a pupil with the very modest external support of pencil, paper, and chalkboard. Now, the extensive use of computers, with versatile sensors, peripherals and extensions, allow teachers a whole new degree of sophistication and flexibility (Hattie, 2009). Hattie (2009) reviews that during the last two decades, the application and implementation of ICT in education has become an important topic in research on educational reform. Research findings over the past two decades provide some evidence as to the positive effects of the use of information and communications technology (ICT) on pupils‘ learning Sanyal (2001) states that there are four ways ICT can support basic education: (i) supporting education in schools, (ii) providing non-formal education for out-of-school children and adults, (iii) supporting pre-service distance education of teachers and their in-service professional development, and (iv) enhancing the management of schools.

Watson (2001) reviewed that modern civilization is characterized by the growing pace of change. The economy now undergoes a radical transformation, including the structure of the labor market and requirements for job qualifications, within a single generation. That is because of the enormous difficulty in understanding, appreciating and even surviving change, we talk about the impact of these changes as future shock. On the other hand, these fundamental shifts do not appear suddenly,

as bolts from the blue: they are always a part of a longer historical evolution, in which technological development plays a part.

The introduction of ICT resources to schools as according to UNESCO (2005), is one of the most significant developments around the world during the last 20 or so years and the expectation that Information and Communication Technology (ICT) has the most benefits for learners when they are working more autonomously. Michiels and Van Crowder (2001: p8) points out that the range of technologies is increasing all the time and there is a convergence between the new technologies and conventional media. This rapid and ongoing convergence means that devices such as digital cameras, digital video cameras and players, personal digital assistants, slide projectors and mobile telephones are also compatible with more traditional media such as radio (digital, satellite), television (cable, digital, satellite) and all these mentioned above are all under the umbrella of ICTs.

UNESCO (2002) recognized ICTs as a major factor in shaping the new global economy and producing rapid changes in society. It also recognized that ICTs have the potential to transform the nature of education where and how learning takes place and the roles of pupils and teachers in the learning process and furthermore, UNESCO (2005) reviewed that modern society needs educated citizens who can make decisions and implement them in a rapidly changing world. Individuals, organizational structures such as corporations and governments, and educational institutions, should be prepared for life-long learning. Information processing and communication are becoming major activities in daily life, and effective citizens and leaders of the 21st century will be required to understand and fluently use the latest sophisticated tools to manage an enormous amount of data, information, and messages. Therefore, lifelong learning will be the normal state for a modern individual (Chibomba et al, 2009).

The growth of information and communication technologies (ICT) has dramatically reshaped teaching and learning processes in higher education. ICT for education is more critical today than ever before since its growing power and capabilities are triggering a change in the learning environments available for education (De Corte et al, 2003). The use of ICT offers powerful learning environments and can transform the learning and teaching process so that students can deal with knowledge in an active, self-directed and constructive way. According to Voogt (2003) ICT is considered as an important means to promote new methods of instruction (teaching and

learning). It should be used to develop students' skills for cooperation, communication, problem solving and lifelong learning, although computers and technology are prevalent throughout our society, developing countries are far from reaping their benefits because of certain barriers. ICT allows many people to generate and disseminate information, thus playing an active role in the process of interaction between professionals, learners, policy makers, peers and so forth as De Corte et al (2003) pointed out that four main elements can be taken into consideration about ICT in education; ICT as an object that refers to learning about ICT, an assisting tool, a medium for teaching and learning and finally a tool for organization and management in schools.

Since the introduction of ICT in education in many other developed countries like Zambia as pointed out by Chibomba et al (2009), one of the most discussed policy questions has been its impact on educational outcomes. This explains why almost all existing data on ICT use in education are derived from sample-based international comparative assessments that rely on students, teachers and schools for descriptions and analysis of educational inputs, processes and outcomes. However, the application of ICTs into education has been assumed as the potential of the new technological tools to revolutionize an outmoded educational system (Albrini, 2006). In the last 20 years, initiatives, projects and implementations related to use of Information and Communication Technologies (ICT) into education motivate teachers to gain necessary knowledge and skills in using ICT in their instruction.

Pelgrum (2001:2) noted that ICT is not only the backbone of the Information Age, but also an important catalyst and tool for inducing educational reforms that change our students into productive knowledge workers. Over the past three decades, governments and education systems around the world have regarded the use of information and communications technologies (ICTs) as an important issue for improving the effectiveness of teaching and learning (Plump et al 2009). As more and more technologies, such as net books, interactive whiteboards, smart phones and digital video recorders, have become more available and affordable, coupled with the rapid expansion of computer networking capability in educational system, there have been continued research efforts in investigating how teachers can use ICT to facilitate student learning (Lebanon, Robinson, and McDonough, 2009; Newhouse, Trinidad, and Clarkson, 2002). Many models for measuring ICT integration in teaching and learning have been proposed through the years. These

models can be grouped into the four categories: learning micro models, ICT-oriented micro models, system models, and population models (Newhouse et al, 2002).

2.4 Literature on ICTs in Africa

With regards to the global trends, African education lags behind in many aspects such as education delivery, curriculum design, teaching methodologies, teaching and learning tools and resource libraries. ICT penetration in schools in Africa remains extremely limited. Access to ICTs remains highly uneven within countries and across the African continent an extension of the developmental disparities that have characterized the region for decades Al-Oteawi (2002). Natural and human-made disasters and conflicts have placed extreme pressure on African educational systems, many of which are built on weak physical and institutional bases.

In addition, many countries in Africa have been victims of austere structural adjustment programs, which, among other consequences, have led to cuts in educational expenditure. A report from the UNESCO (2014) Institute for Statistics (UIS) dabbled teaching ICT for Development in Africa, found that, despite the development of Information and communications technology (ICT) in education policies, the integration of technology in classrooms across sub-Saharan Africa remains insufficient to meet the needs of the 21st century labor market. The study was a survey made in different African countries. Further findings revealed that ICT in education was widely accepted as both enabling learning and preparing students for employment in a technology-rich workplace. As for the sub-Saharan Africa, barriers including; a lack of effective policies, basic infrastructure (that is; electricity, Internet, computers and mobile devices), financing and teacher training. The use of ICT in education is still at an embryonic stage in most countries. Since the conclusions were made by comparing a number of African countries, it was significant to establish how the use of ICT can improve the academic performance of learners in the secondary schools of Petauke District.

A similar study which looked at the application of Information and Communication Technologies (ICT) and its Relationship with Improvement in teaching and learning was done by Ahmadi et al (2011). A questionnaire was used to collect data from participants. Some of the findings were that the most pervasive barrier in African schools was 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. The study further found that in

Guinea and Madagascar more than 500 pupils or more on average share a single computer. In other words, time on task using technology is negligible for most children. Where the infrastructure exists, secondary schools are more likely to be equipped than primary schools. This is understandable given that in many countries, policies to support ICT integration favor investment in higher levels of education. There is need to determine how the use of ICT can help transform the learning environment into a learner centered on in the secondary schools of Petauke District. Studies have seen the potential which ICT has in the ensuring that learners use ICT effectively in their learning environment.

A study by Selwyn (2011) Schools and schooling in the digital age: a critical analysis. The findings indicated that the use of ICT was increasing access and improving relevance and quality of education in developing countries especially in Africa. ICTs are making dynamic changes in society especially the influences are felt more and more in the education system because teachers became instructor while learner learnt on their own. Despite the study being carried in secondary schools, these schools were not in Zambia hence there is need for this study to be done. Some authors maintain that technology has the power to change the ways students learn and teachers teach.

A study conducted by Kozma (1999) in Angola which centered on Designing and developing effective educational software. The findings suggested that technology can revolutionize the learning process. In other words, ICT extend teacher's and student's capabilities, and their well determined use can transform roles and rules in the classroom. The study was a quantitative one with a sample of university students and lecturers. Many people recognize ICTs as catalysts for change; change in working conditions, handling and exchanging information, teaching methods, learning approaches, scientific research, and in accessing information. Lecturers could use ICT to facilitate learning, critical thinking and peer discussions thereby making the learners independent. The reviewed study was done amongst the college students and lecturers while this study will be conducted in the secondary schools of Petauke District. The findings were different looking at the level of ICT application in the preparation of children for self-reliant.

A study by Wagner (2001) on ICT teaching in African schools stated that ICTs are being considered a major tool for improving accessibility to and efficiency of education in developing

countries. ICTs are also being viewed as a flat world enabler by providing access to the latest educational content developed all over the world.

Despite many promising efforts, there is still a significant digital divide between educational institutions located in developing and developed countries. This includes policy and infrastructure gaps, lack of training facilities and trained maintenance personnel, limited community participation, gender related issues, and ICT access issues. With such lapses in other countries, it was significant to find out the types of ICT which were in the secondary schools of Petauke District and how they were used to promote learner centered atmosphere in class.

In a similar study conducted by Schroll (2007) on factors influences a teacher's choice to adopt technology and constructivist principles in the classroom learning environment, the study employed a quantitative design and drew conclusion from the data collected using a questionnaire in primary schools. One recommendation made was that stakeholders of educational policy in African governments should redesign and reconstruct their educational systems based on the new educational paradigms so that both teachers and students benefit from the application of ICTs in schools in order to develop the necessary knowledge and skills sought in this digital age. Hence, most countries in Africa are focusing on approaches to the application of ICT in relation with the teaching and learning to improve the quality of education by emphasizing competencies such as critical thinking, decision-making, and handling of dynamic situations, working as a member of a team and communicating effectively. How the secondary schools are transforming the learning environment into a learner centered one is what the study wishes to establish in the secondary schools of Petauke District.

Reports by UNESCO (2005) regarding ICT teaching in schools stated that the application of ICTs in teaching and learning in schools make natural tools in education in developing countries especially in Africa because of the simple and fundamental fact that learning is largely based on dealing with information which is used in listening, reading, writing, reassuring, talking, synthesizing, evaluating and analyzing, solving mathematical problems, and memorizing verses and state capitals, are all examples of off-computer information processing. Even more importantly, ICT can be used for other types of information processing, formerly marginal in the traditional school, but now becoming more and more essential, like project planning, or the search for new information outside school textbooks, as well as in the processes of so-called creative

writing (drawing, constructing). Zambia was not among the countries in which the report was based hence there is need to conduct this study in selected secondary schools of Petauke District.

A report by UNESCO (2005) on Education in Africa discussed a number of issues regarding integrating ICT in the teaching and teacher training. The integration of ICT has been studied by the UNESCO (2005) during which it developed the criteria for assessing the effectiveness of integration of ICT into the teaching and learning process. According to UNESCO (2005), if ICT is to be effectively integrated, the teacher must set high targets for their learners with clear descriptions of the objectives and how ICTs will help them achieve those goals. In addition, a good number of technological and assessment tools are to be well developed.

There ought to be an effective learning environment that exceeds beyond the classroom to home-based study as well as effective training in practical integration of technology into the classroom activities and not only basic computer functions. Other requirements include a supporting structure for ICT, quality content and materials, enabling policies and strategies (including legal and ethical guidelines for the use of ICT), practice informed by evaluation and research, vision and leadership student-centered approaches to learning, and relevant assessment tools (UNESCO, 2005).

Despite the many challenges faced by African governments, in many other school activities in Africa (such as sport, for example), different kinds of interaction between students and teachers can gain from using ICT. The human dimensions of ICTs manifest themselves in providing powerful means to open dialogue, fruitful interaction, and synergy between a teacher and a student or, rather, between Master and Apprentice, as well as among apprentices themselves whether in close contact or by long distance. The report was not certain regarding the country in which it directed its findings. Therefore, this study will determine how the use of ICTs can help improve the academic performance of school going children in Petauke District of Zambia.

In Uganda, Ali et al (2013) investigated, the role of ICT to make teaching-learning effective in higher institutions of learning in Uganda. The study employed classroom observations, focus group discussions and interviews to teachers and pupils in the secondary schools. The findings cited innovations that ICT has brought in teaching learning process to include: E-learning, e-communication, quick access to information, online student registration, online advertisement, reduced burden of keeping hardcopy, networking with resourceful persons, etc. However, the presence of all these factors increased the chance of excellent integration of ICT in teaching-

learning process. It was not clear how the application of ICT in the secondary schools of Petauke District improved the academic performance of pupils.

A study conducted by Tearle (2003) looked at, ICT Implementation: what makes the difference. The study used a qualitative approach on college students in the South Africa. The results suggested five important reasons for teachers to use technology in education: (1) motivation, (2) distinctive instructional abilities, (3) higher productivity of teachers, (4) essential skills for the Information Age, and (5) support for new teaching techniques. In order to use technology in the classroom effectively, teachers' attitude toward technology should be positive and they should be trained in using the modern technologies in the field of education. Whether the application of ICTs can help prepare learners to be self-reliant after school in the Zambian communities was what the study worked to establish.

Based on the premise of a study conducted by Becker (2001), the application process should strengthen learning of students, there is a need to present an integrated point of view in the application of these processes and to develop some concrete examples for teachers. A mixed methods approach was used to collect and analyze data from a sample which included college students and lecturers. The conclusions drawn from the study were that the effective use of ICT in lessons depends on the awareness of teachers of the potential of ICT in teaching and learning processes. Further conclusions were that there was need for appropriate selection of materials for their students, effective contemplation of their lessons and carrying out class management rules while overcoming the difficulties encountered during lessons in which technology supported learning environment. These requirements are assessed within the framework of questions and a detailed model is suggested. Instead of conducting a study on college students in Uganda who were able to purchase a computer, this study will dwell on the secondary school students in the secondary schools of Petauke District in eastern province.

2.5 ICT in Geography teaching and learning

In this 21st century, the use of modern information and communication technologies (ICTs) has greatly enhanced the excitement of geographical learning. This includes the use of communication networks, computers, software, digital data storage and audiovisual systems. Students can benefit greatly from appropriate use of ICTs, particularly geospatial technologies which support spatial thinking and also make the acquisition of knowledge more efficient and engaging (Catling, 2015).

It cannot be denied that 'teaching is an art' where the success of a teacher lies in his/her ability to make a subject lucid and intelligible to pupils. Geography has also some general as well as specific objectives of teaching, which is driven by prevailing social, political and economic factors. Bloom's taxonomy classified instructional objectives into cognitive domain, affective domain and psychomotor domain. The cognitive domain objectives include knowledge, understandings, applications, analysis, synthesis and evaluation where as the effective domain objectives include the appreciation, values, attitudes, interests, feelings etc. and the psychomotor domain objectives include skills. Realisations of these objectives are under specific aims of teaching geography.

The geography teacher is expected to bring practical examples, provide audio-visual materials, and very important, close the gap between the learner knowledge of the world and the examples expected in class. Some concepts in Geography are so abstract and beyond the cognition of many learners and this calls for a sensitive teacher who will make these difficult concepts simpler by bringing teaching and learning aids that simulate reality. According to Van de Schee (2003) it is important that audio-visual learning aids are part and parcel of the geography lesson and that it is the duty of the teacher to use his/her pedagogical skills to provide these learning aids.

Choosing a method of teaching depends upon available resources, psychological re-quirement of pupils, environment and above all feasibility of implementing it. Some methods such as Socratic Method or question-answer method, descriptive method, observation method, regional method, lecture method etc. are more frequently used where as some others like project method, Dalton plan method, laboratory method, excursion method etc are neglected. The latter types of approaches are gaining much importance nowadays. This has been realised in National Curriculum Framework of 2005 stressing upon learner centred environment, which means paying careful attention to the knowledge, skills, attitudes, and beliefs that learners bring with them to the classroom (MOE, 2007). Use of ICTs provides overwhelming benefits to learners if used appropriately in the classroom. Many ICTs, particularly geospatial technologies, can be used in geography to support spatial thinking, but they also make the acquisition of knowledge more efficient and engaging.

A generation ago, teachers expected that what they taught would last their students a lifetime. Today, because of rapid economic and social change, schools have to prepare students for jobs

that have not yet been created, technologies that have not yet been invented and problems that we don't yet know will arise. These technologies have not just become tools of learning, but networking and knowledge sharing, as well as innovation and entrepreneurship (Schleicher 2019).

According to Catling (2015), the range of geography-related ICTs expands on those general ICTs that are typically used in classrooms, such as:

- word processing software
- Internet searching, navigating and publishing tools
- mind mapping tools
- databases
- email
- simple audio and video software
- digital cameras and audio recorders.

ICTs specific to geography include data visualization tools and geospatial technologies. Data visualization tools can include graphing applications such as Microsoft Excel or Gapminder, infographics, and even 3D rendering tools such as Google Earth and SketchU.

Geospatial technologies relate to data that is associated with key ideas unique to Geography that help students to make sense of the world, thus location, distribution, distance, movement, region, scale, spatial association, spatial interaction and change over time (Reinfried et al, 2007). These technologies include a range of ICTs including, Global Positioning System (GPS), Geographic Information System (GIS) and remote sensing (aerial and satellite images) (Ofsted, 2002).

GPS is a natural fit for geographers, the technology has developed where most of us carry one in our pocket through our phone or have one in the car for navigation. The range of software tools can start with online geospatial viewers such as Gmaps, GIS or Google Maps. More advanced geospatial tools include Explorer Online or industry-standard software packages like the freely available Quantum GIS (QGIS) or ArcGIS, (Ofsted, 2002).

There is also a multitude of games that take advantage of spatial thinking and spatial mechanics. Many providers have educational geography games accessible online for students. Those wishing to do more with gaming could start with the popular Minecraft. Geospatial technologies are one of the key ICTs you will use in the classroom. They are fantastic tools for imparting geographic knowledge and encouraging geographic thinking. National Geographic Education has created two videos to expand on the idea of geographic thinking. To ensure that you are using the most appropriate technology for the task when implementing geospatial technologies in your school. It should be noted that, if used creatively, some of the simpler geospatial technologies can offer opportunities to engage in limited higher-order thinking tasks and activities. (Reeves and Jonassen, 1996)

From a career perspective, geospatial technologies are also relevant as most professional geographers use them in some way in their practice. There is a rapidly increasing need for geospatial technologies and subsequently, geospatial professionals across the world. These professionals work in environmental management, mining, statistics, demographics, utilities, agriculture, defense and the public service. They use a broad range of technologies including remote sensing, geospatial mapping applications and Global Positioning Systems (GPS). (Schleicher 2019)

The use of ICT helps a lot in many different settings of learning geography. There are many benefits from the use of ICT in geographical education. The benefits of the use of ICT contribute to the attainment of objectives of geographical knowledge and also aim to attain the goals of education for sustainable education. Education for sustainable development in a sense that ICT helps to update information, to have access in the latest results of sciences, and to re-correct any contradictions and wrong information that circulate. (Ofsted, 2002). Another important topic of the impact of ICT in geographical education for sustainable development is that ICT create the opportunity to have new point of view for many issues and to have better understand and conceptualization.

The use of these ICT tools is very much in sync with the constructivism theory that sees ICTs as means of attaining the set lesson objectives in Geography. Constructivism rests on the premise that in the process of learning, the learner leans heavily on his/her interaction and dynamic response to

the world. According to Davis, Sumara and Kapler (2000) constructivist forms of learning are understood as "a process of maintaining an adequate fit with one's ever-changing circumstances as opposed to assembling an internal model of an external world". The ability to shift thinking in response to the environment puts the learner in the center of the learning process and learning is no longer seen as taking or absorbing things but as a process of adaptation with one's changing circumstances. This shift in the teaching of Geography will see a teacher using technology to empower learners to be involved in knowledge creation rather than being absorbers of the knowledge given by the teacher. The integration of ICT in geography lessons should be imbedded in the teacher's planning and execution of the lesson taking into account the learner's cultural and contextual factors.

Davis et al (2000) highlighted that cognition is "a collective, embedded in, enabled by, and constrained by the social phenomenon of language caught up in layers of history and tradition". This view is also promoted by Vygotsky (1934) who dedicated a whole book to the central role of speech and language as provided by an individual's social background and environment. Vygotsky (1934) wrote that "thinking and speech are key to understanding the nature of human consciousness". This emphasizes the special role played by social history and tradition in constructivism. Cognition extends to where learners are involved in small groups in the creation of knowledge and understanding. In constructivist methods of teaching, learners work in groups engaging with learning materials through the assistance of the teacher to build understanding and draw shared conclusions.

ICT tools become handy in the constructivist approach to teaching by providing learners with materials that stimulate their thinking faculties. Critical thinking is at the center of constructivist approach to the teaching of Geography (Cooper, 1983). The use of ICTs will promote this discovery method of teaching depending on how the teacher engages the learners with the technology available. Simulation games have also been used to force the learners to think out the answer than just waiting to be spoon-fed by the teacher. It should be noted that ICTs on their own do not produce miracles and the role of the teacher cannot be overemphasized if learners are to reap maximum benefits from ICTs. Glorifying ICTs as an end in themselves leaving behind the special role of the teacher can be suicidal.

Cooper (1993) argues that a relationship exists between instructional theory and its dependent technologies and is suggested that implementation of designed instruction is grounded in theory. Geography is a subject that will benefit from the constructivist approach to learning which calls for active and meaningful learner participation, ICT, therefore may help to achieve this approach.

In this literature review it should be stressed that the mere presence of ICTs will not guarantee what constructivist approaches to learning are. Cooper (1993) also mentions that even in behaviorism and cognitivism, technology has been used extensively especially in Skinner's programmed instruction (PI). However, Ernst (1991) criticizes the use of computers in a behaviorist manner of behavior modelling because the learner is turned into a 'passive bystander' (Cooper, 1993). Ernst's point is critical in this study because it is not only the availability of technology in the classroom but how Geography teachers integrate it in their teaching of the subject. Lamos (cited in Cooper, 1993, p.14) has highlighted the use of computer assisted instruction (CAI) as promoting individual learning and long-term memory but he still emphasizes the role of the teacher in making sure that the learners benefit. This cognitive approach saw an improved use of technology to promote thinking rather than to model learners. As a result, many computer programs were developed that encouraged the stimulation of the brain, for example computer-managed instruction (CMI) that has been used widely in the teaching of Geography in New Zealand.

The cognitivist approach to using computers in teaching was also criticized because it did not provide deep and authentic learning. Borne (1990) cited in Cooper (1993) accused this approach as being rather too 'technocentric' and a superficial way of learning. Lack of satisfaction about behavioral and cognitivist lens of using ICT, gave rise to constructivism which gave more emphasis on how the learners engaged with ICT to create knowledge. The role of the teacher still remained critical because the teacher decides and provides which ICTs are to be made available for the learners. Constructivism places a lot of emphasis on the social environment and the cultural context in which the learner is found. The shift from cognitivism to constructivism saw a significant expansion of the dimensions of the learning environment setting "where the limits are expressed in terms of the desire and goals of the learner and not the designs of the instructor" (Cooper, 1993). This is important to this study because the contextual factors will determine the way the teacher integrates ICTs in the teaching of Geography in the classroom. It should also be

understood that constructivism as a theory can be better understood in conjunction with other theories such as behaviorism and cognitivism.

Laurillard (2012) suggests that each theorist focus more on a particular aspect of learning, but the idea of a "synergy in our understanding of learning can succeed if we treat the contrasting theories as complimentary rather than oppositional, where each offer a different kind of insight into what is to learn". In the classroom, this synergy of various contrasting theories has a great impact on how teachers integrate ICTs in the classroom. While constructivism is the main conceptual framework in this study, I'm also aware that other theories of learning can also help understand how teachers integrate ICTs in the teaching of Geography in the classroom.

The teacher's role using ICT is to what Vygotsky (1978) called scaffolding the learners to higher levels of cognitive processes which a learner will struggle to reach on his/her own. The concept of the Zone of Proximal Development (ZPD) puts the teacher in a special position in the learning process. The ZPD is defined as "the distance between a child's actual development level as determined by independent problem solving and the higher level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978). Wiegand (2003) puts the teacher in a special position in the learning process and makes the role played by the teacher to be indispensable in learning. In fact, Applefield et at (2000) actually caution on the dangers of what they dubbed the myths of constructivism. These include the myths that there is no focus or clear goals on what is to be learnt. Another myth that teachers need to guard against include that learners are left alone to do as they want without the teacher's interference and that there is an absence of structure and that teachers' explanation is less important. The teacher provides, simplifies, explores, decides and clarifies which technologies can be and should be used in the geography classroom and this forms part of the teacher's central job of preparation and planning for the lesson. This removes the notion that ICT on its own can make a difference in the teaching and learning process but it is how the teacher integrates ICT in the teaching of geography that makes the difference.

In fact, Laurillard (2012) argues that knowledge construction happens when the teacher uses ICTs to enhance teacher-learner interaction. She actually quotes John Derry who wrote that "effective teachers must know how to get students actively engaged in learning activities that appropriate for the desired outcomes" (Laurillard, 2012).

2.6 Literature in ICTs in Zambia

The history of ICTs in Zambia goes back to 1913 when the first manual phone was installed in Livingstone the then capital of Northern Rhodesia. Until the country's reversion to liberalism in 1991, the provision of ICTs was solely the monopoly of the state. However, since 1991 Zambia, like other Sub-Saharan African countries, has been integrating ICTs in various sectors of its economy.

Zambia has put in place an ICT policy (Ministry of Transport And Communication, 2006) that aims to improve the livelihoods of Zambians by ensuring the availability of accessible, efficient, reliable and affordable ICT services in most of the government institutions. The national information and communication technology policy document addresses several sections, among them includes; Information technology, Broadcasting, telecommunications and Postal services. However, it is the section on information technology that sets out the objectives and strategies pertaining to ICT and education. The relevant objective in this section according to Ministry of Transport And Communication (2006) states that government will encourage the use of ICT in schools, colleges, universities and other educational institutions in the country so as to improve the quality of teaching and learning.

Zambia, like other Sub-Saharan African countries, has been integrating ICTs in various sectors of its economy and education (MOTC 2006). In 2001, government (GRZ), with assistance from the Japanese International Cooperation Agency (JICA), embarked on the formulation of a National Information and Communications Technology (ICT) policy (Habeenzu, 2010). The policy formulation process completed in 2005 and the prolonged process served to raise general public awareness of the role of ICTs in fostering socio-economic development. The policy is oriented around thirteen pillars, of which the third relates to the education sector and reads, 'Education- To integrate ICTs in the education systems and nation's research and development (RandD)' (Habeenzu 2010).

In addition, and more recently, GRZ through the ZICTA embarked on a project to enhance ICTs in the economy, including the education sector. ZICTA was mandated under the ICT Act to establish the Universal Access Fund to finance projects that promoted and provided ICTs infrastructure and services to all unserviced and under-served areas of the country at a cost of K24 Million (Sichone 2011). The project sought to promote the use of ICTs through enabling access to

online educational resources to both teachers and learners through establishment of computer laboratories in all districts in its first phase. Clearly, GRZ is committed to the growth of ICTs in the country in general and in the education sector in particular. Zambia's Sixth National Development Plan echoes education objectives that are directed at increasing access to ICTs and quality education. The way to achieve this is through many strategies such as strengthening CPDs, introducing ICTs as a teaching and learning tool, and expanding alternative modes of education including ICTs (MOE 2007). The Minister of Education attended the Southern African ICT for Education Summit in early 2012 in Zimbabwe where he delivered a keynote speech about ICTs in Zambia. He stated that Zambia had recognized the role of ICTs as a potent tool in reducing poverty, extending health services, expanding educational opportunities and generally improving the quality of life. However, he explained that the penetration levels of ICTs in Zambia's education institutions remained low. He further stated that most of the computers in schools were second-hand and refurbished (Phiri, 2012). Clearly, the integration of ICTs in various sectors of the Zambian economy has been recognized to be of great importance. The keynote speech by the Minister of Education above shows how important ICTs are in the Zambian Education system

While the Ministry of General Education's decision to introduce ICT as a compulsory subject in secondary schools may be a step in the right direction, its implementation may prove beyond the capabilities of those involved. This is because many schools including those in urban areas have little or no access to computers that can form a strong base on which Information and Communication Technology (ICT) will be taught in a classroom. According to Williams (2011), constraints such as inadequate technical infrastructure, limited human skills to use available networks and services, the relatively high cost of communications equipment, and poor policy and regulatory environments have hampered the development of ICT in Zambia. Nevertheless, the newly introduced ICT subject in Zambian schools provides strong evidence that policymakers in the country's education sector have recognized the importance and value of technology for learning and teaching in secondary schools.

Additionally, it is indisputable that the ICTs are increasingly important in achieving development goals and promoting citizen participation not only in Zambia but also across borders. Apparently, experts suggest that the advent of the new growth theories means that technology change has been indigenized and linked up more closely to education, health and other such inputs that enhance

human development. This could have instigated Zambia's policymakers to introduce ICT as a compulsory subject in secondary schools (Williams, 2011). While ICT continues to advance in western and Asian countries, African countries still experience a lag in its implementation, and that continues to widen the digital and knowledge divides. In a recent study by Kiptalam et.al (2010) and Mewcha and Ayele (2015), observed that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries. Whereas results indicate that ICT has penetrated many sectors including banking, transportation, communications, and medical services, the Zambian educational system seems to lag behind. Further, recent report by the National Council for Science and Technology (2010) indicated that computer use in Zambian classrooms is still in its early phases, and concluded that the perceptions and experiences of teachers and administrators do play an important role in the use of computers in Zambian schools. Specifically, governments especially in developing countries have tried to improve their national programs to integrate ICT into education. According to Benzie (1995), national programs have not been so successful to implement ICT into educational systems because they were formulated in non-educational realms and they were not supported with educational research. According to Williams (2011) effective and successful application of ICTs in schools there is need to first of all consider Teacher Training and Professional Development. It is a well-known fact that professional teacher development is a key to successful application and the integration of ICT in teaching and learning process. Teachers remain the gatekeepers for pupils' access to educational opportunities afforded by technology: They cannot and should not be ignored. Moreover, providing technical skills training to teachers in the use of technology is not enough. Teachers also need professional development in the pedagogical application of those skills to improve teaching and learning process.

Watson and Watson (2011) pointed out that the starting point of a digital classroom is a teacher. Teachers must be trained to effectively use the technology for planning student instruction. The role of the teacher has subtly shifted from being the sole 'provider' of knowledge to being a facilitator as the student explores for himself, the expansive world of knowledge. From being a 'sage on the stage', to being a 'guide by the side'. In today's world, lifelong learning has become a critical determinant of success. Hence, more than mastering various competencies, the key skill required is learning how to learn. The Learning Management System (LMS) harnesses the

potential of technology to improve learning outcomes and to prepare students for the accelerated changes in the world in which they live.

According to UNESCO (2002) Teacher education institutions may either assume a leadership role in the transformation of education or be left behind in the swirl of rapid technological change. For education to reap the full benefits of ICTs in learning, it is essential that pre-service and in-service teachers have basic ICT skills and competencies. Teacher education institutions and programs must provide the leadership for pre-service and in-service teachers and model the new pedagogies and tools for learning. They must also provide leadership in determining how the new technologies can best be used in the context of the culture, needs, and economic conditions within their country. To accomplish these goals Williams (2011) reviewed that teacher education institutions must work closely and effectively with teachers and administrators, national or state educational agencies, teacher unions, business and community organizations, politicians and other important stakeholders in the educational system. Teacher education institutions also need to develop strategies and plans to enhance the teaching-learning process within teacher education programs and to assure that all future teachers are well prepared to use the new tools for learning.

To prepare successful students for the 21st century, there is a general consensus among researchers that the learning standard should shift from teacher-centered instructive approach to pupil-centered learning approach where learning is possible anytime, anywhere, anyway and anyhow as earlier alluded. The vision of learning that will prepare students to face the challenges of the 21st century will be one that is active, participatory, deep, and personalized. Teachers will be facilitators, motivators, and analysts of learning who have the knowledge and skills to design the necessary conditions in the learning environment to bring about the desired learning for our students. One of the major changes in education can be described as a general shift from teaching to learning. This does not mean that the teacher is becoming any less important. Rather, the teacher's role is increasingly to assist students to become good learners. At the same time, teachers must help create stronger relationships between the subjects of study and concrete reality, putting them in a more relevant context for students. In many cases, this implies an integration of disciplines and cooperation among teachers of different subject areas (Benzie, 1995).

As is the case for other sectors of the wider economy and society, education will need to come to terms with the new technologies. This could require substantial public and private sector

investments in software research and development, purchase of hardware, and refurbishment of schools. It will be difficult for national policy-makers to resist finding the necessary resources, whatever their sensibilities for expenditure on education, although without international cooperation and assistance the poorest countries could fall still further behind. Parents and the public at large, in the industrial countries at least, are unlikely to accept for too long the notion that education should be less well equipped with the new technologies than other areas of social and economic activity (UNESCO, 1998, pp. 19-20). The dilemma that arises in providing educational technology stems from a lack of financial resources and a limited distributive capacity. In addition, many African countries have not been able to employ teachers, and provide resources to keep up with this demand. This brings about compromised quality of education. Further, many African governments face the predicament of educational expansion that corresponds with economic development. Despite the setbacks, access to education is a strong focus of most governments (Tearle, 2003).

Ehrmann (1994) identified four distinct faces of quality education, which can be supported by ICT: learning by doing, real time conversation, delayed time conversation and directed instruction, thereby taking this into consideration the use of ICT could improve performance, teaching, and administration, have a positive impact on education as a whole, and develop relevant skills in the disadvantaged communities - helping in liberation and transformation. The Dakar Framework for Action (World Education Forum, Dakar, Senegal, 2000) also stressed the use of ICT for achieving Education for All (EFA) goals and recommended, ICT must be harnessed to support EFA goals at an affordable cost as earlier alluded. These technologies have great potential for knowledge dissemination, effective learning and the development of more efficient education services.

In conclusion, ICTs can play a special role in the teaching approach that is learner-centered and constructivist depending on how the teacher have used them to engage learners. The role of the teacher is to act as a midwife in the production and creation of knowledge by integrating the relevant and appropriate technologies in teaching. The teachers' activities will determine to a large extent how successful ICTs are in promoting the learning of Geography in the classroom. This puts the teacher's pedagogy in the center of effective and efficient use of ICTs to promote learning.

2.7 Summary

The reviewed literature shows how helpful ICTs can be if well utilized alongside with training teacher's preparedness regarding usage of ICTs. Furthermore, in the African education setup, its noted that being mostly comprising of development countries, most African counties are lagging behind in terms of availability of the needed ICTs for education.

With regards to Zambia, the reviewed literature shows that adequate teacher training is needed if the desired positive outcomes brought by the use of ICTs are to be realized. Hence, policies have been put in place to help realize the potential ICTs can bring about.

Extensive literature related to the factors affecting the application of ICTs in relation with teaching and learning of Geography in secondary schools in Petauke district has been reviewed. However, there is still knowledge gap on the factors affecting application of ICTs in relation with teaching and learning of Geography in secondary schools in Petauke district.

In addition, literature does not show the extent to which the integration of ICTs in relation with teaching and learning of Geography in secondary schools in Petauke district is being done and the beneficiaries of these services upon integration.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

In this chapter the methodology that was used in this research project is discussed. The research approach and design are given and justified, as well as the target population, sample population, sampling techniques, the instruments used, data collection procedures as well as data analysis. The purpose of this chapter was to explain the manner in which the researcher investigated the ICT integration in the teaching of geography in selected schools of Petauke district.

3.2 Research Approach

This study used a qualitative research approach. Qualitative research aims to describe and analyze the culture and behavior of humans and their groups from the point of view of those being studied (Kombo and Tromp, 2006).

According to Bell (2005), the purpose of a qualitative approach is for the researcher to understand and gain insight into the participants' perspectives. Ary et. al. (2010) concurs suggesting that qualitative research focuses on understanding social phenomena from the perspective of the human participants in natural settings. Qualitative research enables human thinking and reasoning for doing something to be matched and understood. Various human qualities that may be difficult to quantify can be studied better using the qualitative research method. That is why it is important for this study to find out ways in which Geography educators integrate technology in the classroom, a qualitative research design was appropriate for this study.

3.3 Research Design

Research design is defined as a plan used to study a problem or question. In the same line, Orodho and Kombo (2002) define a research design as the scheme, outline or plan that is used to generate answers to research problems. Meanwhile, Msabila and Nalaila (2013:27) point out that a research design is a plan on how a study will be conducted or a detailed outline on how an investigation will take place. This research utilized a descriptive research design. Being a qualitative study, this research sought to identify characteristics, trends and categories as observed in the field, therefore, a descriptive design proved most appropriate for the study as it sought to attain the set objectives of the study by describing the characteristics and trends under study (Creswell, 2015).

3.4 Target Population

Target population refers to the total number of items or units in any field of inquiry or the total number of items about which information is desired (Sidhu, 2009). Target population is also defined as the population from which the findings will be realized (Msabila and Nalaila, 2013). In this study, the target population was all basic and secondary school teachers and learners in the selected schools of Petauke district of eastern province. Petauke district has in total 157 schools from which the sample was selected (MOE, 2007). This population was selected on the basis that this was where the phenomena under study had been observed by the researcher.

3.5 Sample Size

According to Sidhu (2009), a sample is a small proportion of the population selected for observation and analysis. For the purpose of this study, four schools in Petauke district of eastern province were selected. Two primary schools coded, A1 and A2, as well as two secondary schools coded as B1 School and B2. These schools were selected on basis that they were government schools which were connected to the national electricity grid and had been examination centers for over 10 years. This selection criterion ensured that the selected school were regarded as government-gazetted established schools. By selecting gazetted schools, the study ensured that findings were representative of most government schools. These criteria ensured that the set objectives were obtained due to the fact that the schools, being examination centers, needed to have computer laboratories which kept ICT devices.

Primary schools were included on the basis that they had grade 8s and 9s who took Social studies in which Geography is a sub-subject. Two (2) teachers from each school participated giving a total of eight (8) teachers. In addition to this, five (5) learners from each school participated giving a total of 20 learners. The total number of participants therefore came to twenty-eight 28.

Table one summarizes the selected sample size of this study which included four selected schools, two secondary schools, B1 and B2, and two primary schools, A1 and A2.

Table 1: Sample Size

School	Teachers	Learners	Total
B1	2	5	7
A1	2	5	7
A2	2	5	7
B2	2	5	7
Total	**8**	**20**	**28**

Source: field data, 2020.

3.6 Sampling Techniques

With reference to Kombo and Tromp (2006), sampling technique is that part of the research plan that indicates how objects are to be selected for the study. Sampling technique or procedure is the process of selecting units from the target population of the researcher's interest. A non-probability sampling method was used, specifically homogeneous purposive sampling. Scholars like Singleton et al (1988) note that purposive sampling is a type of sampling which is based entirely on the judgment of the researcher. In this technique, a sample is composed of elements which contain the most characteristic, representative of typical attributes of the population.

White (2003) observes that purposive sampling is based on the researchers' knowledge of the population and a judgment is made about which subjects should be selected to provide the best information to address the purpose of the research. Msabila and Nalaila (2013) add that purposive sampling involves nothing but purposely handpicking individuals from the population based on the authority or the researcher's knowledge and judgment. With regards to the study, homogeneous purposive sampling was used to select teachers and learners who taught and learnt Geography, respectively. Homogeneous purposive sampling is a purposive sampling technique that aims to achieve a homogeneous sample; that is, a sample whose units share the same or very similar characteristics or traits (Kombo and Tromb, 2006). Therefore, two teachers of Geography per school participated and five learners who took Geography as a subject per selected school were selected as participants in the study.

3.7 Research Instruments

According to Kombo and Tromp (2006), research instruments are the tools that the researcher uses in collecting the necessary data. On the basis of being a qualitative descriptive study design study,

this research mostly used inductive data collection methods which were unstructured interview guide and an observation guide.

3.7.1 Unstructured Interview Guide

This research employed inductive techniques, which were based on a less directed and prescriptive interview techniques. Thus, the interviews were unstructured and conversational and were organized around themes rather than direct questioning. These interview schedules acted as a guide as some questions may have not been asked while others may have been included to elucidate issues. The interview schedule grew as issues emerged in other interviews. The researcher used unstructured interview schedule to collect qualitative data from both teachers and learners in the selected schools. Subjective responses in the unstructured interview provided more information through certain gestures and expressions regarding the integration of ICTs in geography in the selected schools of Petauke district.

3.7.2 Observation Guide

An observation guide was used to collect data aimed at satisfying the set research questions and objectives. Thus, this research used the non-participatory approach on the unstructured observation. According to Kombo and Tromp (2006) this observation technique enables the researcher to take up the role of an onlooker and focuses on describing the studied phenomena. The researcher used an observation guide to acquire further information on the available ICT devices and their usage amongst the learners and teachers of Geography in selected schools of Petauke district.

3.8 Data Collection Procedures

Before commencement of the data collection, a pilot study was conducted whose purpose was to test the unstructured interview guide and the observation guide in one school which were not part of the sample but were equipped with ICT facilities which were used for teaching and learning. This was done so as to find out ambiguous or poorly worded items on the instruments which were to be amended afterwards. The pilot study generally served as an assurance of the reliability of the instruments and their outcome.

Before conducting both the actual and the pilot study, permission was sought from the selected school head teachers. Thereafter, the data collection was conducted with the sampled participants on different days.

Individual based interviews were conducted to collect data. In order to determine validity of the interview findings, the data collected was verified via participant validation. According to Bergold and Thomas (2012) this technique involves testing initial results with participants to see if they still ring true. To attain this, this research had all interviews recorded on an audio recording device then later transcribed and presented to participants for validation before analysis was done.

Classroom and infrastructure observations was one of the two methods that was used to collect data on the integration of ICTs in teaching and learning of Geography in the selected schools of Petauke. Cohen et al (2007) suggest that the distinctive feature of observation is that it offers an investigator the opportunity to gather live data from naturally occurring social situations. In this study, non-participatory approach towards observation was used thus the researcher did not get involved or influence the observed so as to ensure accuracy of information. The researcher therefore, whilst being as unnoticeable as possible, observed teachers and learners as they utilized ICTs in the teaching and learning process. ICT facilities were also observed so as to take note of the available ICT resources.

Using classroom and infrastructure observations as well as interviews showed a correlation of what was said and what was seen on the actual ground thus providing some form of triangulation to validate the collated data

3.9 Data Analysis

Data analysis refers to the practical application of formal procedures to the analysis of social science data. It is concerned with sensitizing social researchers to the use, interpretation, and evaluation of relevant data (Kombo and Tromp, 2006). Due to being qualitative in nature, data collected in this study was analyzed using thematic analysis. Interviews were recorded and common themes were categorized and put together under each research question so as to enable qualitative content analysis which, according to Bergold and Thomas (2012), is the process that permits the researcher to extract the objective meanings and themes which is either clearly

observable or hidden in the given information. The inductive qualitative content analysis was used in the study for that purpose.

The thematic analysis was guided by Braun and Clarke's (2006) six phase framework. Therefore, six phases were taken in formulating a complete analysis of the data collected and these are as follows;

i. Familiarization
ii. Coding
iii. Generating themes
iv. Reviewing themes
v. Defining and naming themes
vi. Writing up

Table two summarizes how this study analyzed data thematically by explaining the activity which was done at each phase.

Table 2: Six Phase framework for thematic analysis

Phase	Activity
Familiarization	Transcribed data, read and reread, and noted down initial codes.
Coding	Codded interesting features of the data in a systematic fashion across the data-set and collected data relevant to each other.
Generating themes	Assembled codes into potential themes and gathered all data relevant to each potential theme.
Reviewing themes	Themes were checked if they worked in relation to the coded extracts and the entire data-set so as to generate a thematic 'map'.
Defining and naming themes	Ongoing analysis refined the specifics of each theme and generation of clear names for each theme was established.
Writing up	Appropriate extracts were selected, discussion of the analysis was done in relation to research question and literature and later on a report was produce.

Source (Braun and Clarke, 2006)

Charts generated from the information obtained in interviews and observations were produced using Microsoft Excel.

3.1.0 Trust worthiness of the study

To ensure credibility of the findings of this study, a pilot study was undertaken to ensure that the instruments used address the sought objectives. Furthermore, the instruments used provided a form of triangulation as information obtained through observations was confirmed by the information attained through interviews. Interview findings were validated through participant validation.

3.1.1 Ethical Consideration

A study of this nature required that the safety, rights, needs, values, and interests of participants were protected and respected hence, the researcher sought permission from all stakeholders. These included; introductory letter from the University of Zambia and District Education Board Secretary (DEBS) for Petauke district. Participants were also informed that they had the right to withdraw from participation if they so wished therefor, persuasion and cohesion of any form was avoided so as to rule out biased views. Participants, therefore, participated on their own free acceptance and willingness.

3.1.2 Chapter Summary

This chapter explained the manner in which investigation of ICT integration in the teaching and learning of Geography in selected schools of Petauke district was done. The study adopted a qualitative approach with a descriptive survey as research design. The target population was all primary and secondary schools in Petauke district and the sample population was comprised of four schools, two primary schools and two secondary schools.

The study used non-probability sampling, specifically, homogenous purposive sampling. The research instruments used included an unstructured interview guide and an observation guide. Prior to data collection, a pilot study was conducted to verify the research instruments. Thereafter, data was collected via observation and one on one interviews of participants. Upon collection, data was analyzed thematically by identifying common themes and putting them together under each research question.

This chapter is concluded by explaining ethical considerations taken during the study. Permissions were sought from all the involved institutions and participant's rights, safety, needs, values, and interests were also protected. Persuasion and cohesion of any form was avoided to ensure that no biased views were given.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.0 Introduction

This chapter presents qualitative research findings on integration of ICTs in the teaching and learning of geography in four selected schools of Petauke district. The research findings were collected using unstructured interview guides with teachers and learners, and classroom observations of both teachers and learners were also used. The chapter starts with a brief description of the study participants followed by the presentation of themes; major themes, sub-themes and categories that emerged from the primary data. Some major themes that emerged from the study include, available ICT devices and facilities, integrated ICTs in teaching and learning, Teacher's, and Learner's preparedness in the use of ICTs, challenges and benefits of ICTs, administrations role in management of ICT devices and facilities, and means of imparting ICT skills in teachers and learners. Themes were illustrated through verbatim quotations. As part of triangulation, the findings from both interviews and classroom observation were presented side by side to corroborate the findings from either interviews or observations.

4.1 Description of Study Participants

The study had 28 participants and all gave both written and verbal consent to participate in the study. The study took place in Petauke district in four schools coded, B1, A1, A2, and B2. Table 3 summarizes the description of participants that took part in the study.

Table 3:Description of study participants

School	Teachers	Learners	Total
B1	2	5	7
A1	2	5	7
A2	2	5	7
B2	2	5	7
Total	**8**	**20**	**28**

Source: field data, (2020): number of participants per school totaling up to 28 participants.

The study included only teachers of Geography as well as learners of Geography as summarized in table 4.

Table 4: Social Demographic Characteristics

Category		Learners	Teachers
Gender	Male	11	5
	Female	9	3
Academic Qualifications	Degree (BAEd)	-	3
	Diploma	-	5
Years of Service	0-5	N/A	4
	6 -10	N/A	2
	>10	N/A	2

Source: field data, (2020): Social demographic characteristics of participants showing number of years in service as well as academic qualification.

Among the participants of the study were eleven male learners and nine female learners along with five male teachers and three female teachers. Three of the teachers were degree holders and five were diploma holders. Two of the teachers who participated in the study had taught for over ten years and two others had been teaching for not more than ten years. The remaining four teachers had all been teaching for not more than five years.

As indicated in the preamble, the study findings have been categorised into major themes, categories and sub-themes as emerged from the interviews with the participants both the teachers and the learners. Table 5 shows the major themes and sub-themes that emerged from the audio interviews with the participants.

Table 5: Major and code for themes

MAJOR THEME	Code
AVAILABLE ICT DEVICES AND FACILITIES	• Few Computers • Old set of computers • Limited access to ICT devices due to shortage
• BENEFITS AND CHALLENGES OF USING ICTS	• Lessens workload • Syllabus content covered swiftly
INTEGRATED ICTS AND SKILL SET OF TEACHERS AND LEARNERS	• Laptops, tablets, and projectors were the most used devices by teachers during lessons • Inadequate skills shown by teachers and learners to manipulate software for geographic purposes • Some teachers are discouraged to used ICT devices due to limited availability of the ICT resources
TEACHER'S AND LEARNER'S PREPAREDNESS IN THE USE OF ICTS	• Overall performance is improved • Accuracy in diagrams given enhances understanding of concepts leading to good performance.
• ADMINISTRATIONS ROLE IN MANAGEMENT OF ICT DEVICES AND FACILITIES IN SCHOOL	• No troubleshooting skilled personnel provided • Insufficient funding towards the Geography section • Need stuff dedicated to servicing and providing technical support to teachers and learners.
MEANS OF IMPARTING ICT SKILLS IN TEACHERS AND LEARNERS	• Workshops • CPD • Introduction of ICT to learners prior to geography lesson

Source: field data, (2020)

4.2 Theme 1: Available ICT devices and facilities

Through observations and interviews, it was established that all schools visited had ICT facilities and devices useful for the teaching and learning process. The most common devices found in all the visited schools were; Computers (laptop and desktops), televisions (with DSTV subscription), radios, printers, and internet facilities. It was observed that most computers available were outdated and were running on old operating systems.

However, one primary school did not have a projector, as it was damaged and has not been repaired since. This was because, according to one of the teacher participants, there were very few activities that required the use of projectors in primary schools. This was because only grade 8's and 9's needed such services. One participant explained this scenario as follows:

> *We need to have more laptops and projectors as a school because there are instances where I would wish to use a projector and another teacher wishes to do the same. Because of this, most of my fellow teachers avoid using the projector even when it's free or fear of having an alteration with fellow workers over the projector (Participant, T02).*

In all schools visited, it was observed that TV's were restricted to the staffrooms only and laptops to departments, thus only personally owned laptops were used by the participant teachers in lesson delivery. Tablets/iPads and smart phones used were also personally owned by the Teachers. Furthermore, in all four schools visited, learners were not allowed to come with their iPads/tablets and smart phones. According to one of the participants this restriction is done so as to avoid learners losing concentration during lessons via usage of social media and the internet. One participant explained this as follows:

> *Learners are not supposed to come with their phones or tablets unless special permission is given. This is because they tend to be distracted in class as they either will want to show off the device to their friend or they will be busy on WhatsApp and Facebook thereby missing out on the lesson (Participant, T01).*

4.2.1 Benefits and challenges of ICTs in teaching and learning of Geography

The Teachers were asked to point out what they regarded as any other advantage associated with the integration of ICTs in the teaching and learning of Geography. Some of their responses were that the use of ICTs had the capacity of developing some practical skills in pupils that are needed in order for one to succeed in life. They attributed this to the fact that the use of ICTs in the teaching

and learning process provides a hands-on experience for learners thereby intensifying the ability to grasp geographical concepts being passed on.

Teachers also explained that the integration of ICTs in the teaching process ensured that learners were made aware of the digital world as it relates to Geography therefor making the subject more relevant to the learner. According to one of the teachers:

> *Learners are exposed to the use of gadgets and software that enhance their research capabilities and skills. This will help them once they get into tertiary education as well as in industry too. Therefore, ICTs play a vital role especial role in Geography especially considering that it is a subject that bridges earth (natural science) and man (social science) (Participant, T06).*

Despite these pronounced benefits the use of ICTs presented, both teachers and learners also expressed the downside that come with the use of ICTs. One of the challenges mentioned by teachers was that concentration on the subject during lessons is compromised due to the learner's curiosity to explore the ICT device further. As a result, the learner lagged behind and this eventually resulted in poor performance. One of the teachers explained as follows:

> *I once gave my tablet to one of the learners to read out some work to their classmates and the minute I left them unsupervised, him and his friends halted the lesson so that they could explore other functions that the device had. Totally out of the lessons content, they began taking pictures (Participant, T06).*

This showed that the device proved to be more of a destruction than a teaching aid as learners were more interested in using the device for pleasure rather than learning geographical concepts.

Another downside that the use of ICT devices and platforms brings to the classroom is that most learners are not from families that can afford to get them any ICT devices. Hence such learners tend to lag behind as they often have to rely on their friends' devices or spend most of their time coping notes and drawing diagrams instead of studying. This discourages some teachers from integrating ICT in their lessons as they felt that some of the learners would feel left out. One of the teachers explained as follows:

> *In most cases I prefer using the traditional way of teaching, thus the use of chalk board, because no child should feel left out in class. If they do feel left out then I would have failed as a teacher, therefore*

> *to ensure that no one is left behind, I introduce at a very slow pace such that each learner is on the same page (Participant, T04).*

Moral degradation is yet another threat brought about with the use of ICTs if misused. Some learners indulged themselves in the consumption of illicit content found on the internet. This could be pornographic content or crime related, and in the long run they will as a result indulge in sexual relations and other morally degrading vices. One of the teachers explained to say:

> *I avoid leaving my learners unsupervised when dealing with geographic research that requires them to Google up some work, by doing so I try to restrict them from visiting sites that have harmful and illicit content (Participant, T04).*

According to the findings of this study, teachers were demotivated to integrate ICTs in the teaching of Geography due to the challenged that are brought about with the use of ICTs. Despite the benefits that using ICT brought about, the challenges appear to be more pronounced due to the inadequate ICT devices and facilities available in the visited schools.

4.3 Theme 2: Integration of ICTs in teaching and learning of Geography

The study established that there are various ICT devices and platforms being utilized in the teaching of Geography. Amongst these laptops, printers, tablets/iPads, projector and smartphones proved to be the most widely used ICT devices that are integrated in the teaching and learning of geography. However, it was observed and noted that there is little known knowledge on how to incorporate most geographical applications and software available on laptops in their teaching and learning process. Most teachers and learners during interaction with these devices only limited their usage to note taking, as one would do with a hardcopy book. Therefore, learners did not attain the skill of manipulating information on these devices to attain the intended skill. One participant explained this as follows:

> *Our teacher likes to comes with his tablet and he uses it when teaching because that's where he saves his notes. Sometimes he shows us diagrams on the tablet whenever the projector is not available. I don't know how to use the tablet so most times when he asks for someone to write point-form notes on the board very few of us offer to participate. But I know how to open a document on my phone and on a computer (Participant, L13).*

During a lesson observation at B1 School, whilst conducting a lesson on Earth Movements via PowerPoint, the teacher only relied on bulleting notes and pictures to convey the concept of earth

movements. The focus on pictures and bulleting notes was at the cost of not using videos and models found in some software installed on the laptop such as Encarta Encyclopaedia. Such software has animations illustrating earth movements. When asked about this during interviews, teacher explained not being aware of such a provision being available on the laptop. One participant explained this as follows:

> *I don't know any software that has Geographic videos that is why I rely mostly on the bulleting. The alternative would be using YouTube but then again that would require data bundles of which the school does not provide (Participant, T03).*

During another lesson observation conducted in at B1 School, when a grade 12 learner was asked to operate the laptop, they showed to have little know how on the basic functions on how to operate a laptop and display a PowerPoint presentation on a projected screen. However, opening the same PowerPoint document on their mobile devices was a walk over as they were more convenient with their mobile device. Teachers in the visited schools occasionally shared printed out copies of PowerPoint documents with learners whenever ink was available in the school printers. This, however, was not common as most cases the printers were reserved only for administration to use for running documents and thus teachers had little to no access to printers. Teachers in most cases were forced to use their own money to have their work printed out and this proved costly due to the overwhelming number of learners in classes. As a result, learners incurred the cost of printing these documents as teachers would only share softcopy documents.

In an interview with the learners, it was noted that their lack of knowledge on how to operate the computer was due to the fact that they are hardly given work that needs the use of the laptop. The learner explained as follows:

> *Even when our teacher wants to send us softcopy notes, we access them through our phones because we can't afford to buy laptops and some of my friends who don't have smartphones print and photocopy the same notes from the market because we are not allowed access to use the school printer. There are also very few computers in the computer lab and they are never connected to the Internet when we go there (Participant, L06).*

When asked about availability of computers in school to learners, one of the teachers explained to echo what the leaner had explained of not having enough devices in the lab. The teacher explained that the school has a very high enrolment rate that surpasses the available resources. The computer

lab at B1 consisted of 24 desktops and one printer whilst the Geography classes handled by the teacher comprised of not less than 70 leaners per class. Therefore, it was difficult to conduct lessons from the computer lab where learners could have hands on access to computers. As a result, the teacher was limited to the use of just his laptop and the projector during classes. One participant explained this as follows:

> *Our computer lab has 24 computers and my class is a class of 70 learners, so it is not possible to conduct a lesson from the lab as a result I really mostly on the projector if I want to show them a video or diagrams (Participant, T03).*

This lack of adequate computers proved to have been a common problem for all the other schools visited under the study. All the teachers also shared the view that there was a tendency of over enrolment that resulted in ICT devices not being enough for the learners to use during lessons.

It was also established that internet services were hardly available as school management told the teachers that they have no money to always have an active internet subscription in school. As a result, some teachers utilised their personal data bundles whenever they wished to access the internet on school laptops or computers. This discourages most teachers in using ICTs because the cost of buying data bundles was high.

4.4 Theme 3: Teacher's and learner's preparedness in the use of ICTs

During the study, performance of the learner was measured by the daily and ongoing progression of the leaner by the teacher. The teachers interviewed agreed to the fact that ICTs assisted in improving performance in both the learners and the teacher's delivery of geography lessons. In the interviews, it was mentioned that ICTs made work much easier and faster. One of the participants explained as follows:

> *I use my laptop during lessons because its faster than having to write down notes on a piece of paper, it is even better when a projector is used so that learners can have access to accurate diagrams (Participant, T04).*

Furthermore, it was observed that in all schools, there was a shortage of resources other than ICT devices, such as text books. This seemed to re-enforce the usage of ICT devices during lesson delivery. This was because the use of devices such as a projector during geography lessons meant completely cutting out time spent on drawing diagrams on the board. These drawn diagrams risk

being inaccurate due to human error, therefore diagrams from text books placed in PowerPoint presentations proved accurate. Learners were also given a printed copy of the diagrams used in every lesson. Therefore, both the teachers and learners would progress at the same pace and this proved progressive. One of the teachers explained to say:

> *I am able to cover more syllabus content much faster now via the use of PowerPoint presentations and sharing files with learners through Email or WhatsApp. As a result, we have enough time to revise for the exams when the syllabus content is covered and this ultimately results in good results by pupils when exams are written (Participant, T07).*

Learners also explained that they find learning Geography more interesting when ICT devices were used unlike the traditional chalkboard lessons, thereby improving their performance in the subject. The use of the projector to display notes made it easy for learners to know which areas to focus on when studying. Furthermore, learners preferred the use of ICT because it proved easy for learners who missed a class to catch up. This was because the PowerPoint slides were always shared through WhatsApp after the lesson through the class representative who later circulates the information to fellow leaners. Those that had no smart device would have the information printed out, sometime by the teacher when they submitted their names and other times, they did it at their own expense from the market.

4.4.1 Administration's role in management of ICT devices and facilities in school

The provision and maintenance of ICT devices and facilities in schools was the responsibility of the school management/ administration body. As such, they were the referral point for teachers whenever there were challenges being faced regarding ICTs. The teachers in the visited schools all expressed displeasure as to how the Geography section was neglected and how the ICT devices are not enough. The teachers explained that even with the few devices present, management failed to maintain the facilities adequately. One of the teachers explained this as follows:

> *Not until recently we had no computer lab and so we depended on our own personally owned devices. Its only recent that I manage to utilize a projector in class because we never had one as a school. The fact that this is a primary school with only two junior high classes, 8 and 9, the management was reluctant in acquiring computers till ICT was introduced as an examinable subject. So, thanks to that, even us Geography teachers have access to computers available (Participant, T01).*

Teachers from the visited secondary schools had a similar argument. They explained that the computer laboratories were somewhat viewed as property belonging to the mathematics department. Therefore, when the Social Science Department, specifically the Geography section, requested for funds to purchase data bundles to conduct research, management was very reluctant in approving the budget which in most cases was declined. Furthermore, management neglected maintenance of the devices until exams were close because that's when ICT pupils would need the facilities most. This showed that the labs were not available to Geography teachers and learners as much as they could have been.

During interviews, a good number of the teachers commended their management over providing security for their ICT devices and facilities. One of the teachers expressed it as follows:

> *there is always a teacher in the computer lab whenever it is unlocked to ensure that nothing is stolen. There is also a security guard in school premises at night who secures the area at night times till morning when we report for work and so we have not recorded any loss of our ICT devices from theft (participant, T06).*

Despite providing security for the devices, management in all schools visited found a challenge in maintenance of the ICT devices. All the schools visited schools never had technical personnel responsible for maintenance of these devices, the school instead depended on ICT teachers who had little knowledge on most hardware and software problems that were being faced. This lack of personnel knowledgeable in the fixing and maintenance of ICT devices or providing support in usage resulted to as one of the reasons some Geography teachers shunned the usage of ICTs in their lessons.

In view of maintaining sustainable use of the available ICT facilities and devices, school managements in three of the visited schools had purchased petrol propelled electric generators. These were purchased to curb the effect brought about by electric load-shedding currently ongoing nationwide. Therefore, the school management is further tasked to ensure that these generators were always ready to be used whenever needed, thus should have fuel at all times, which happened not to have been the case. Due to the high fuel prices, the generators are only available on "need to use" basis that is to say emergencies, thus Geography teachers and learners who wished to use the computers during load shedding hours would have to wait until electricity was restored.

For one school visited which had no generator, the school management hires one from the market and this was costly. Similarly, the use of a generator was only on "need to use" basis. This situation had led to most teachers at that school refraining from the use of ICTs. As a result, both Geography teachers and learners at that visited school have little to no experience as to how integrate ICTs in their lessons.

4.5 Theme 4: Means of imparting ICT skills in teachers and learners

When asked what ways they felt would best help understand ICTs so as to ensure smooth and beneficial integration in Geography lessons, teachers reviewed that they needed training programs such as workshops or CPDs. In these programs, those that knew much would share with those that knew less regarding integrating ICTs in Geography. One of the teachers explained this as follows:

> *it would help to have a specialist come to train us on how to use some of these devices in school as well as the software's on them too. I personally only know how to use Microsoft Word and PowerPoint and yet my laptop as well as computers in the school lad are said to have other software applications that would enhance teaching and learning of Geography (Participant, T06).*

However, teachers expressed that there was lack of adequate financial support regarding the Geography section and as such, the schools hardly sent Geography teachers to workshops.

Learners on the other hand had the view that teachers were supposed to give them lessons separately from normal contact hours where they should be taught on how to use ICT devices for geographic purposes. By doing so, learners explained to say it would help them concentrate on lessons during class and not focusing on the ICT device being used because they would have already been familiar with it. One of the learners explained as follows:

> *Our teacher always complains that we do not focus on the lesson when he a brings computer or tablet to class. So, we always tell him that he should first teach us about using a projector, computers or tablets before he brings them to class so that we focus on what his saying during class. If he teaches us this, even those that don't have computers or smartphones of their own at home will learn something and so in class it will be easy to focus (Participant, L09)*

4.6 Summary

This chapter looked at the findings of the study as collected in the field. It was observed that the provision of ICT devices was the responsibility of school management. Therefore, schools not

having adequate funds, resulted in acquiring very few ICT devices and platforms. This shortage of ICTs in schools had negatively affected Geography teachers as well as learners in that they had limited access to these facilities. The lack of adequate funding in schools according to the findings of this study, further lead to the poor maintenance of available ICTs in schools.

Furthermore, the findings showed that when ICTs are used in the teaching and learning of Geography, performance is improved by both the teachers and the learners. To improve the usage of ICTs, the findings showed that teachers needed training programs on the use of various ICTs with regards to integrating them in teaching Geography. The findings also showed that learners depended on the teachers to train them on using ICTs for geographical purposes.

CHAPTER FIVE: DISCUSSIONS OF FINDINGS

5.0 Introduction

This chapter presents the discussion of the qualitative research findings of the study in relation to the literature reviewed in this study. The discussion will relate the objectives of the study to the findings of the research.

5.1 Description of Study Participants/ Social-Demographic Characteristics

The study had 28 participants and all gave both written and verbal consent to participate in the study. The sample size was equally distributed amongst all four schools as illustrated in table three (page 43). This sample comprised of two teachers per school and five learners per school. The sample size was evenly distributed to ensure an equitable representation of findings from all four schools. The study further sought to fairly distribute respondents according to gender so as to tell if usage of ICTs is somehow gender dependent. However, this was not possible as shown in table four (page 44), there were more male respondents amongst both teachers and learners. This did not affect the study as there appeared to have been no indication assuming that the use of ICT was dependent on gender. The results of the study did not collaborate with a study by Hernandez (2017) who demonstrated that females had more positive attitudes towards ICT usage than males.

With regards to academic qualifications of teachers, there was no evident data showing a difference in skill or knowledge on content matter on Geography or integrating of ICTs with Geography. Both degree and diploma holders proved to have been at par with regards to competence and this was established during the interviews and classroom observations conducted in all four schools.

The number of years served by teachers in service proved to have had a slight impact on their willingness to utilize ICT resources. Mostly it was the teachers who had served less than five years who were more willing to use ICT resources. This is because this group of teachers were fresh out of collage or universities and were more exposed to the use of ICT resources as compared to the elderly teachers.

5.2 ICT Facilities available in the selected schools

According to findings, the schools were found to be mainly using computers and projectors and hardly using TV or video clips, and smart phones as ICT facilities in the learning and teaching of geography. It was further discovered that among the ICTs used in the schools, they were poorly

stocked with regards to quantity and modernity of the devices. The findings further disclosed that primary schools where least stocked in ICT resources as compared to secondary schools.

These findings as similar to study by Ahmadi et al (2011) which indicated that where the infrastructure exists, secondary schools are more likely to be equipped than primary schools. This is understandable given that in many countries, policies to support ICT integration favor investment in higher levels of education.

These findings fall in line with the given literature by UNESCO (2014) suggesting that the integration of ICT in classrooms in most African countries does not meet the needs of the 21st century labor market. However, this does not necessarily mean the teaching and learning going on in the selected schools of Petauke district is null and void, it simply means there is a long way to go and from the looks of things these schools are not so far behind.

Furthermore, the findings established that there was a tendency by teachers of not utilizing ICTs due to the overwhelming number of learners in class that made it difficult for the teachers to make illustrations on ICT devices such as computers. This resulted in most teachers avoiding using ICT devices with the view that the devices would not be available, even when the devices are actually available. A good example could be the use of a projector, in three of the visited schools, only one projector was found per school. This very projector was utilized by all departments of the schools including administrations during meetings. Therefore, access to the device was difficult and hence the demotivation teachers had in the use of it. As a result, the benefits of using ICTs, in this case the projector, as earlier explained were not realized. Therefore, some teachers resulted in spending most of their time trying to dispense information the traditional way by writing and drawing on the chalk board. This is in line with what some researchers have agreed and stated that some of the major impediment to ICT use in schools have been attributed to inadequate ICT infrastructure and poor access to ICTs (Mewcha and Ayele, 2015).

With regards to the above, as seen in the literature review according to Van de Schee (2003), it is important that audio-visual learning aids are part and parcel of the geography lesson and that it is the duty of the teacher to use his/her pedagogical skills to provide these learning aids. Therefore, omitting the use of video clips as evident in the findings results in failure to fully fulfill the benefits that the use of ICTs present.

Furthermore, the population of learners in the schools by far outnumbered the available types of ICTs used in these schools. The implication of this finding is that learners are not exposed to a

variety of ICTs hence not fully benefiting from them. In addition to this, the simplicity of the type of ICTs found in the selected schools proved to have been too basic for learners to fully realize their learning capabilities. The desktops available were all old models with old software hence they were slow and as a result, learners only accessed them for basic functions such as displaying information from a thumb drive. Similar to the explanation of Alkahtani (2017), society is advancing at an alarming rate digitally and having any access to ICT devices is a plus to the learners. However, these devices if outdated, as seen in some of the schools visited, will not yield the desired outcome of the geography lessons. GPS devices are always being updated, similarly weather applications and other geographic related applications are being updated nearly on a monthly basis, thus to have a computer that is dated 10 years back is not practical and falls short of what one would describe as quality education due to lack of relevance.

Despite these shortcomings, most teachers found a way of being innovative enough to curb the impact of having outdated ICT resources. The use of personally owned devices was one of these means of addressing this issue of outdated ICT resources. Even where some teachers could not manage to provide modern ICT resources, additional information was given to the learners on current developments regarding the particular geographic phenomena under study. Doing enabled learners to outsource resources thereby sharpening further on their research skills thus fulfilling Vygotsky's learner centeredness as proposed by constructivism theory.

This is in line with a study by Selwyn (2011), it explained on how ICT enhances learning by enabling learners to learn on their own with teachers only playing the role of instructors.

Furthermore, these findings are similar to what Kiptalam et.al (2010) found in their study, it was observed that access to ICT facilities is a major challenge facing most African countries, with a ratio of one computer to 150 students against the ratio of 1:15 students in the developed countries.

5.3 ICT devices and platforms being integrated in the teaching and learning of geography

The findings of the study established that projectors, laptops, desktops and tablets were the most widely used devices in the visited schools. However, it was established that both the teachers and the learners in the visited schools had limited skills with regards to the usage of these devices. This was observed during class observation and further confirmed during interviews where teachers admitted to not knowing other geographically beneficial applications and software available on laptops, computers, tablets and smart phones. Sarangi's (2003) study revealed that teacher's competency levels have a direct impact on learner's performance, hence if teachers are not well

vest in the use of these ICT devices, set geographical objectives are very unlikely to be attained. Given a scenario where ICT resources are available, with the status quo at the time this study was conducted, learners would still find it hard to grasp concepts because their "instructors" lack the needed skills to operate and letter on integrate ICTs in the geography lessons. The findings of this study therefore confirmed and agrees with Sarangi's (2003) findings. Furthermore, this proved that there was little to no scaffolding of concepts by the teacher for the learners and as such the basis of learner centered education was not presented.

In most of the visited schools, it was established that the teacher was in most cases the only one interacting with the technology and then conveying concepts. As a result, learners are left black with regards to how to use the ICT devices. Attaining the best results with the use of ICTs in Geography lessons might require that learners have direct interaction with the ICT resources being used, furthermore, the learning process ought to be led by learners to ensure learner centeredness. This was evident in one of the schools visited where the teacher only gave instructions when learners diverted from the intended objectives.

The findings are line with Sarangi (2003) and Alkahtani (2017) whose study revealed that educators had a limited idea about how the available ICT equipment could be used in teaching-learning situation. Their findings were attributed to the poor training opportunities for teachers to develop the necessary ICT skills.

Furthermore, some teachers shunned the use of ICTs due inadequacy of the resources in schools, this resulted in some of the learners not being presented with the chance to integrate ICTs in there learning hence missing out on the benefits that come with usage ICTs.

These findings are similar to what Mishra and Koehler's (2006) study which suggested that good pedagogical techniques used when teaching using technology, thus ICTs, should often involve constructivism. In this, learners interact with the technology and with the help of the teacher, bridge geographic concepts with the ICTs being used.

5.4 Preparedness of teachers and learners in the integration of ICTs in the teaching and learning of Geography

The findings of this study revealed that the readiness of teachers and learners to utilize ICTs was very much linked to the availability, maintenance and cost of ICT devices and platforms as well as the skill set of both the learners and teachers. In most of the visited schools, it was observed and noted that ICT resources were very few and as such this demotivated most teachers and learners

from using them so as to avoid the scramble for the few available resources. The study revealed that most teachers had little knowledge beyond using ICTs such as Laptops for data presentation only disregarding data manipulations. The focus on this showed that despite their readiness to use ICTs, teachers were not fully utilizing these devices to the best of their potential hence falling short of what the TPACK model suggests in order to efficiently integrate ICTs in the teaching and learning of Geography. The teachers thus lacked the needed understanding to tap into the vast geographic capabilities that these devices may offer. Learners on the other hand proved to only mirror the teacher's knowledge and skill with regards to the use of ICTs in geography lessons. For this reason, learners too did not get the most out of the ICTs as they should.

Tezci (2010) argues that there is a significant correlation between the levels of knowledge about ICT and the use of ICT in education. His study revealed that the higher the level of knowledge on ICT, the higher its level of use in education. Another finding supporting this result is the significant differences observed between teachers in terms of their previous participation in a computer course. The study also showed that teachers who had participated in the computer course showed a positive attitude towards ICT use in the teaching and learning of Geography than those that had not participated in any computer course. Furthermore this is in support with the constructivism theory that sees the teacher "objectifying" concepts and learners using ICTs to get a hands on experience in the learning process hence, learner centred. However, Tezci's (2010) suggested correlation between levels of knowledge on ICTs and their use in teaching proved to be absent in the selected schools as teachers subjected themselves and their learners to basic computer functions whenever ICTs were used. By so doing, the learners did not attain the best out of the ICT resources being used for the concepts learnt to be relevant to their existing surrounding thus, the current state of technological developments being undertaken in Zambia.

Furthermore, there was a tendency by teachers of not utilizing ICTs due to the overwhelming number of learners in class that made it difficult for the teachers to make illustrations on ICT devices such as computers. This was similar to Alshowaye's (2002) study that revealed that ICT provision and facilities in schools were found to be poorly equipped to deliver adequate ICT integrated lessons, not least because some still operated in buildings that were not purpose-built to serve as schools, shortages of computer equipment.

The findings of this study further showed and confirmed that both teachers and learners had limited knowledge on the use of various ICT devices and platforms. This was observed during class

observation and further confirmed during interviews where teachers admitted to not knowing other geographically beneficial applications and software available on laptops, computers, tablets and smart phones.

The study further revealed that the school administration had a challenge maintaining ICT devices and this was mostly due to not having an ICT technician specialist within the school. As a result, maintenance cost is high due to hiring ICT technicians to fix or troubleshoot the ICT devices. According to Bingimlas (2009), ICT resources including hardware and software, effective professionals' development, sufficient time and technical support need to be provided to teachers. No one component in itself is sufficient to provide good teaching. However, the presence of all components increases the possibility of excellent integration of ICT in teaching and learning opportunities.

In addition, the study discovered that some teachers had very little knowledge on integrating ICTs in their Geography lessons. Despite having the basic know-how on usage of ICT devices, most teachers found it very hard indicating how the ICT device would aid the achievement of the geographic concept intended for the lesson. Learners lack of exposure to various ICTs which translated to their lack of skill also proved to have been a challenging factor leading to ICTs not being used. This is so as some teachers felt the ICTs will grab the learner's attention and due to this curiosity of these devices, learners would miss out on the intended lesson concepts. This was observed during classroom observations where learners at some point completely shifted their attention of the geographical content and on to explore the functions that the ICT device had.

These findings are similar to the study in Chile by Claro et al, (2013) the findings revealed that the classroom observations did not reveal any innovative teaching strategies, related to the use of new technology. The study showed that amongst the main reasons for this traditional and sporadic use of the ICTs are a lack of targeted teacher training and preparation time, and insufficient technical and pedagogical support during the phases of implementation and integration to the pedagogical practices. This falls in line with the findings of this study as evident by the findings.

5.5 Suggested means of imparting skills in teachers and learners to make them more proficient in integrating ICTs in teaching and learning of geography.

The findings of this study on one hand found that there was a link between the challenges faced in integrating ICTs in Geography and financial funding of the Geography department. It was revealed

that there was need for conducting workshops and CPDs where teachers would share and learn skills needed for the integration of ICTs in teaching and learning of Geography. However, teachers complained that their department was poorly funded and thus most of them hardly go for workshops. This is in line with Husain's (2010) findings which revealed that teachers thought that using ICT skills in developing and presenting information was essential technical competency that teachers need to acquire. However, ICTs as excellent pedagogical tools does not come without any demands from the teachers. There is need for teachers to put up an extra effort and creativity in achieving this objective. It is imperative then, that teachers need to be well vested in ICTs if they are to integrate them in the teaching and learning of Geography.

Learners on the other hand placed the responsibility of them knowing how to integrate ICTs in Geography on their teachers. They explained to say once the teacher made them familiar with a specific ICT device or platform to be used prior to the lesson, the learners would find it much easier to focus on the lesson and not get too carried away with curiosity over the ICTs being used. Therefore, teachers and learners must both have some pre-exposer to ICT resources to heighten their preparedness and willingness to integrate ICT in Geography lessons (Zhang, 2013).

These findings are similar to the study conducted by Light (2009), the study indicated that the shift in using ICT and pedagogy must not involve the teachers only, but must involve the whole education system alongside sustainable investment in infrastructure, human resource, circular frameworks and assessment. Other researchers have suggested that teachers should receive training on the effective strategies and tools that can allow technology integration into classrooms and improve curricula with technology-boosted materials (Almekhlafi and Almeqdadi, 2010).

These findings further support UNESCO (2005) suggestions for having an effective integration of ICTs in the Teaching process. According to UNESCO (2005), there must be an effective learning environment that exceeds beyond the classroom to home-based study as well as effective training in practical integration of technology into the classroom activities and not only basic computer functions. Other requirements include a supporting structure for ICT, quality content and materials, enabling policies and strategies (including legal and ethical guidelines for the use of ICT), practice informed by evaluation and research, vision and leadership student-centered approaches to learning, and relevant assessment tools.

5.6 Summary

This chapter discussed the findings of the study and related them to literature so as to establish the areas needed to be rectified. Among the findings, it has been established that funding in schools is very poor and as such workshops are hardly done. Furthermore, learners explained that the solution to the problem of them being taken with curiosity on ICTs during lessons, would be for teachers to educate them on the ICTs to be used before introducing them along with the lesson.

It was further established with reference to literature that the challenges commonly faced in the selected schools in Petauke district are common in most developing countries specifically developing African countries.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

The previous chapter discussed the findings of the study. This chapter presents the conclusions drawn from the research. It further makes recommendations and proposes areas for further study based on the findings of the study.

6.1 Conclusion

The main goal of this research was to establish how best ICTs could be integrated in the teaching and learning of geography by teachers and learners in Petauke district so as to ensure relevance of the Geography subject to the current and ongoing technological developments that are shaping the country's social and economic growth. The rationale was to find strategies to enhance effective integration of ICTs in the teaching and learning of Geography in the selected schools of Petauke district by exploring how ICTs are being integrated in Geography lessons so as to realize the benefits of ICTs.

Having attained the research objective one, it was concluded that most schools under this study were poorly stoked with ICT devices and infrastructure. As a result, usage of the little available ICT resources was mostly shunned by teachers.

With regards to the second research objective, from the findings, there proved to be very minimal integration of ICTs in the teaching and learning of Geography. It was established that no reliable pedagogy had been developed yet by teachers to meet the demands of ICT integration in a constructivist approach and teachers were still stuck in the pedagogy of yester years. The study showed that perceptions about the value of ICTs for teaching did not tally with the realities of trying to integrate ICTs in the classroom. This was evident with learners just as much as with the teachers. There were a number of barriers noted leading to the failure of effective integration of ICTs in Geography, some of these included limited ICT knowledge from the learners and the teachers, the cost of running and maintaining ICTs, power disruption, and the availability of ICT resources.

With regards to the third research objective, despite being aware of the benefits that come with using ICTs in class, teachers in the observed schools neglected using ICTs even when they came with them to class. Therefore, in relation to the TPACK model, it was evident that the teachers in

the study lacked the basic requirements needed for ICT integration. Teachers had a limited pedagogical, content and technical knowledge. Them having laptops and smartphones does not necessarily translate to them using these devices effectively in the classroom. Some teachers are still struggling with the basic functions of using a laptop and worse off on integrating ICTs as part of their pedagogy in Geography lessons.

In addressing the fourth objective, it can be concluded that a paradigm shift is needed for both the teachers and learners to appreciate ICTs as learning tools and this is a process that calls for patience from all stakeholders to achieve full ICT integration. Learners proved to be in need of adequate exposer and training regarding the use of ICTs in geography. By doing so, learners will not lag behind as evidently seen during classroom observations where learners were more curious on learning the functions of a computer or tablet and not geographical content.

6.2 Recommendations

With regards to the information found during this study, the following recommendations have been suggested to address the challenges faced in ICT integration in the teaching and learning of geography as well as to ensure that ICTs are used to the best of their potential in improving the teaching and learning of geography;

- It was established that schools were poorly stocked in ICT devices. To address this, it can be recommended that the ministry of general education should involve more partners in the provision of ICT devices in schools so as to ensure adequate ICT resources are available in schools. Partnerships in the provisions of ICTs with willing NGOs and the private sector should be sought to assist in supplementing and substituting obsolete ICT devices in the schools.
- The study revealed that the application of ICTs can help prepare learners to be self- reliant after school. It is therefore, recommended there is need for school administrators to set up Continuous Professional Development (CPD's) programs as well as workshops for Geography teachers to educate and train them on pedagogical skills that will equip them with strategies to effectively integrate ICTs in lessons. Furthermore, schools through Parent-Teacher Association (PTA) meetings, should sensitise guardians of the learners on the benefits and demerits of ICTs so that learning should be an on-going process that does not just start and end in the classroom.

- The study proved that poor maintenance of ICT facilities tends to discourage both learners and teachers from using these facilities. In view of this, there is need for the ministry of general education to ensure that every school has a school-based technician or have easy access to one so that learners and teachers with technical or software problems can be attended to promptly.
- The findings of the study show that some learners come from areas of Petauke with no electricity. In view of this, there is need for the ministry of general education to encourage government to speed up the on-going rural electrification process so that rural households may benefit from the being connected on the national electricity grid. Furthermore, due to the prolonged on-going electricity load-shedding, it can be recommended that there is need for the adoption of solar energy to replace electric generators as a source of electricity as it is less costly to maintain. Schools should seek partnership willing with dealerships in solar commodities rather than relying only on government funding to purchase or provide solar equipment. This will ease the expenditure on buying of fuel needed to run electric generators. This money would be best diverted to the maintenance and acquisition of more ICT devices.
- There is need for schools to partner with internet service providers so as to ensure a steady and constant connection to the net via Wi-Fi or wired connection. This is in line with the findings of the study that revealed that internet services were hardly available in the four selected schools. Furthermore, safety systems should be placed on both the internet and ICT devices for the safety of learners who are vulnerable to illicit consumption on the internet.
- It was established that there was inadequate security to man computer labs as all the visited schools only had one security guard in school to man the whole school overnight. Therefore, it can be recommended that security measures be revised and more guards be employed to avoid possible theft and vandalism of ICT devices should also be put in place.
- This study was localised to only four selected schools of Petauke district therefore the findings cannot be entirely representative to schools in other districts and this calls for further research in other areas of Zambia.

- Furthermore, this study focused only on government schools found in Petauke district leaving out private schools. Therefore, it was not established if private schools encounter similar challenges as government schools, this calls for further research.

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APPENDICES

APPENDIX A

INFORMATION SHEET

Researcher: Chirwa Cosmas, School of Education: The University of Zambia.

I am a Masters Student in Education, (Geography Education) at The University of Zambia. The study I am undertaking is on Integration of Information and Communication Technologies (ICTs) in the teaching and learning of Geography in selected schools of Petauke district of Eastern province. The University requires that informed consent be obtained from participants. I am inviting administrators, teachers and learners to participate in this study. Participants will be interviewed face to face, tested and questioned. Should any participants feel the need to withdraw from the study, they may do so without question at any time before the data is analyzed. Just let me know at the time.

Responses collected will form the basis of this research study and will be put into a written report on an anonymous basis. It will not be possible for you to be identified personally. Only grouped responses will be presented in this report. All material collected will be kept confidential. No other person besides me and my supervisor, Dr, K Mubita, will see the raw data. The thesis will be submitted for marking to the School of Education and deposited in the University of Zambia repository Library. It is intended that one or more articles based on the information obtained will be submitted for publication in scholarly journals. If you have any questions or would like to receive further information about the study, please contact me on +260978636878 or my supervisor, Dr, K Mubita, at the School of Education (Languages and Social Science department), The University of Zambia, P.O Box 32379, Lusaka.

Chirwa Cosmas

Signed: .....

Appendix B

Approval of study

THE UNIVERSITY OF ZAMBIA

DIRECTORATE OF RESEARCH AND GRADUATE STUDIES

RESEARCH DEPARTMENT

APPROVAL OF STUDY

2nd November, 2020.

REF NO.HSSREC-2020-SEP-007

Cosmas Chirwa
LUSAKA

Dear Mr. Chirwa,

RE: "INTERGRATION OF INFORMATION COMMUNICATION TECHNOLOGIES (ICTs) IN THE TEACHING AND LEARNING OF GEOGRAPHY IN SELECTED SCHOOLS OF PETAUKE DISTRICT OF EASTERN PROVINCE OF ZAMBIA"

Reference is made to your protocol dated 1st September, 2020. HSSREC resolved to approve this study and your participation as Principal Investigator for a period of one year.

REVIEW TYPE	ORDINARY REVIEW	APPROVAL NO. HSSREC-2020-AUG-002
Approval and Expiry Date	Approval Date: 2nd November, 2020	Expiry Date: 1st November, 2021
Protocol Version and Date	Version - Nil.	1st November, 2021
Information Sheet, Consent Forms and Dates	• English.	To be provided
Consent form ID and Date	Version - Nil	To be provided
Recruitment Materials	Nil	Nil
Other Study Documents	Questionnaire.	
Number of Participants Approved for Study		

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

Conditions of Approval

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to HSSREC within 5 days.
- All protocol modifications must be approved by HSSRECprior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to HSSRECwithin 5 working days.
- All recruitment materials must be approved by HSSRECprior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. HSSRECwill only approve a study for a period of 12 months.
- It is the responsibility of the PI to renew his/her ethics approval through a renewal application to HSSREC.
- Where the PI desires to extend the study after expiry of the study period, documents for study extension must be received by HSSRECat least 30 days before the expiry date. This is for the purpose of facilitating the review process. Documents received within 30 days after expiry will be labelled "late submissions" and will incur a penaltyfee of K500.00. No study shall be renewed whose documents are submitted for renewal 30 days after expiry of the certificate.
- Every 6 (six) months a progress report form supplied by The University of Zambia Humanities and Social Sciences Research Ethics Committee as an IRB must be filled in and submitted to us. There is a penalty of K500.00 for failure to submit the report.
- When closing a project, the PI is responsible for notifying, in writing or using the Research Ethics and Management Online (REMO),both HSSRECand the National Health Research Authority (NHRA) when ethics certification is no longer required for a project.
- In order to close an approved study, a Closing Report must be submitted in writing or through the REMO system. A Closing Report should be filed when data collection has ended and the study team will no longer be using human participants or animals or secondary data or have any direct or indirect contact with the research participants or animals for the study.

- Filing a closing report (rather than just letting your approval lapse) is important as it assists HSSRECin efficiently tracking and reporting on projects. Note that some funding agencies and sponsors require a notice of closure from the IRB which had approved the study and can only be generated after the Closing Report has been filed.

- A reprint of this letter shall be done at a fee.

- All protocol modifications must be approved by HSSREC by way of an application for an amendment prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address or methodology and methods. Many modifications entail minimal risk adjustments to a protocol and/or consent form and can be made on an Expedited basis (via the IRB Chair). Some examples are: format changes, correcting spelling errors, adding key personnel, minor changes to questionnaires, recruiting and changes, and so forth. Other, more substantive changes, especially those that may alter the risk-benefit ratio, may require Full Board review. In all cases, except where noted above regarding subject safety, any changes to any protocol document or procedure must first be approved by HSSREC before they can be implemented.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of HSSREC, we would like to wish you all the success as you carry out your study.

Yours faithfully,

Dr. J. Mwanza

DR. JASON MWANZA
Dip. Clin. Med. Sc., BA.M.Soc., PhD

CHAIRPERSON
THE UNIVERSITY OF ZAMBIA HUMANITIES AND
SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE - IRB

cc: Director, Directorate of Research and Graduate Studies
Assistant Director (Research), Directorate of Research and Graduate Studies
Assistant Registrar (Research), Directorate of Research and Graduate Studies

APPENDIX C

INFORMED CONSENT TO PARTICIPATE IN RESEARCH- TEACHER

My name is Mr. Chirwa Cosmas, I am from The University of Zambia, Great East Road Campus, from the Department of Languages and Social Sciences. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate. We are asking you to take part in the research study because we are trying to learn about how ICTs are integrated in the teaching and learning of Geography in selected schools of Petauke district of Eastern Province.

1. There are no risks in taking part in this study. Taking part in the study will make you a contributor to the possible improvement of how Geography is taught and learnt.
2. If you do not want to be in this study, you do not have to participate. Remember, being in this study is up to you and no one will be upset if you do not want to participate or even if you change your mind later and want to stop.
3. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me on +260978636878.
4. Signing your name at the bottom means that you agree to be in this study.

Name and signature of participant Date:

....

APPENDIX D

INFORMED CONSENT TO PARTICIPATE IN RESEARCH-PUPIL

My name is Mr. Chirwa Cosmas, I am from The University of Zambia Great East Road Campus from the Department of Languages and Social Sciences. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate. We are asking you to take part in the research study because we are trying to learn about how ICTs are integrated in the teaching and learning of Geography in selected schools of Petauke district of Eastern Province.

1. If you agree to be in this study, we shall ask you questions about ICTs that are used in the teaching and learning of Geography. There are no risks in taking part in this study
2. Taking part in the study will make you a contributor to the possible improvement of how Geography is taught and learnt.
3. Please talk this over with your parents before you decide whether or not to participate.
4. If you do not want to be in this study, you do not have to participate. Remember, being in this study is up to you and no one will be upset if you do not want to participate or even if you change your mind later and want to stop.
5. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call me on +260 978636878.
6. Signing your name at the bottom means that you agree to be in this study.

Name and signature of participant Date

…….. ……

Appendix E

Interview schedule guide

Question for the Teachers

1. What do you understand by the term ICTs?
2. What ICTs are you aware of?
3. What ICTs are you able to access from your school?
4. Which ICTs do you use in your teaching of Geography?
5. How often do you use those (ICTs) in your teaching?
6. Does your school administration support in procurement and maintenance of ICT devices for teaching and learning Geography?
7. What advantages and/or disadvantages do you think you have gained from the use of ICTs in the Teaching and learning process?
8. What challenges do you face in integrating the ICTs available with geographical concepts during lessons?
9. Suggests possible means of addressing the challenges you have mentioned.

Thank you for your participation

Questions for the learners

1. What do you understand by the term ICTs?
2. What ICTs are you aware of?
3. What ICTs are accessible from in school?
4. Are you conversant in usage of all the available ICTs in your school?
5. Which ICTs do you use for your geography lessons?
6. What other ICTs besides those in school do you feel would help enhance understanding of geographical Concepts during lessons?
7. What challenges do you face in the use of ICTs in learning Geography?
8. Suggest possible solutions addressing the challenges you have mentioned.

Appendix F

Observation guide

Intem	**Comment**
Available ICT Devices	Laptop [] desktops [] tablet [] projector [] Television set (LCD/LED) [] Other (specify)
Teachers use of ICTs	
Learners use of ICTs	
Computer lab infrastructure	
Internet service	

Appendix G

Budget

Descriptions of Items	**Cost In ZMW**
Transport	900.00
Talk time	150.00
Refreshments	150.00
Reams of papers	150.00
Ball Pens	20.00
Laptop	4,500.00
Tablet	3,000.00
Internet	500.00
Authorization/Ethical clearance from University of Zambia	500. 00
Contingency	2,000.00
Flash disk	150.00
Printing of proposal	150.00
Binding of proposal	50.00
Printing of the final report	300.00
Binding of hard copy of the final report	450.00
Grand Total	**= 12,470.00**

Appendix H

RESEARCH SCHEDULE		
1**. Background research and literature review**	• Meet with supervisor for initial discussion • Conduct a more extensive review of relevant literature • Refine the research questions • Develop a theoretical framework	20th February 2020
2**. Research design planning**	• Design questionnaires • Identify online and offline channels for recruiting participants • Finalize sampling methods and data analysis methods	13th March 2020
3**. Data collection and preparation**	• Recruit participants • Conduct semi-structured interviews with selected participants • Transcribe and code interviews and clean survey data	24th July 2020
4**. Data analysis**	• Analyze survey data and Conduct thematic analysis of interview transcripts • Draft the results and discussion chapters	28th August 2020
5**. Writing**	• Complete a full thesis draft • Meet with supervisor to discuss feedback and revisions	17th September 2020
6**. Revision**	• Redraft based on feedback • Get supervisor approval for final draft • Proofread • Print, bind and submit	28th October 2020