

**A REVIEW OF THE ICT SUBJECT IMPLEMENTATION IN SCHOOLS:
A PERSPECTIVE OF LUSAKA PROVINCE**

By

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A thesis dissertation submitted in partial fulfilment of the requirements for the degree of
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DECLARATION

I, Natasha Nyanja, do hereby declare that this dissertation represents my own work, except where otherwise acknowledged, and that it has not been previously submitted for a degree at the University of Zambia or any other university.

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APPROVAL

The University of Zambia approves this dissertation of **Natasha Nyanja** as fulfilling part of the requirements for the award of a Degree of Master of Engineering in Information and Communication Technology.

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ABSTRACT

The study explored effects of the implementation of the ICT subject(s) in primary education in selected schools under Lusaka Province. The study used a descriptive survey design and a target population of 10 public schools. The purpose of this study was to review implementation of the new curriculum framework regarding the newly introduced ICT subject(s). Findings in the study indicated that various schools have implemented ICT in Education subject(s) differently, and low availability of ICT infrastructure in schools within peri-urban areas whereas; schools in urban areas have been receiving donations of computers from corporate firms and non-governmental organizations. Findings in the study further indicated that some of the challenges schools are facing in successful implementation of the ICTs in education subject(s) are lack of qualified teachers, inadequate resources and lack of electricity in some peri-urban areas. The study suggests that even though there has been steady progress in the implementation of ICTs in schools, a lot still needs to be in place if the country is to achieve a 100% ICT subject(s) implementation adoption rate. The study recommends that the government must organize and facilitate training of current teachers through workshops/conferences and make an official plea to corporate firms & NGOs for donations of computers. This study will enlighten key stakeholders on the progress made so far and aid in formulation of appropriate strategies to address full effective implementation of ICTs in the education system.

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LIST OF ABBREVIATIONS

ADB	African Development Bank
AFP	African Future projects
AIDS	Acquired Immune Deficiency Syndrome
COL	Commonwealth of learning
CPD	Continuing Professional Development
DEBS	District Education Board Secretary
ECCDE	Early Childhood Care, Development and Education
ECE	Early Childhood Education
GRZ	Government of Republic of Zambia
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technology
IICD	International Institute for Communication and Development
JICA	Japanese International Cooperation Agency
MOE	Ministry of Education
MOCT	Ministry of Communications and Transport
MOGE	Ministry of General Education
NEPAD	New partnership for Africa's development
NDP	National development plan
NGO	Non-Governmental Organization
PTA	Parent Teacher Associations
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development
ZECF	Zambia Education Curriculum Framework
ZICTA	Zambia Information and Communications Technology Authority

CHAPTER ONE

INTRODUCTION

This chapter explains the background, statement of the research problem and purpose of the study. It also states the objectives, research questions, significance of the study, its limitations and delimitations. It concludes with operational definitions of key terms used in the study.

1.1 Background

The world over has experienced advancements in technology which have brought about free access to information and helped shape some of the world's greatest economies [1]. Information and communication technologies (ICTs) have become commonplace entities in all aspects of life and across the past twenty years, the use of ICT has fundamentally changed the practices and procedures of nearly all forms of endeavor within business and governance [2]. ICTs have become within a very short time, one of the basic building blocks of modern society [3]. Many countries now regard understanding ICT and mastering the basic skills and concepts of ICT as part of the core of education, alongside reading, writing and numeracy [4].

Implementation of ICTs in schools has been compulsory in developed countries since early 1980; however, this has not been the case in developing countries where implementation is considerably more recent, small scale and experimental [5]. Development and application of ICT in African institutions of learning is critically important if the continent is to reduce the knowledge, technological and economical gaps between itself and the rest of the world [6]. It is thus important to implement a curriculum in the education sector that promotes the teaching and learning of ICTs.

The government through the Ministry of Education and with support from various stakeholders developed a National ICT policy for education [7]. The policy provided an overview of goals, objectives and government commitment in key program areas of ICT infrastructure to education institutions, content development, curriculum integration and teacher training. The vision was for ICTs to contribute towards reaching innovative and lifelong education in Zambia by 2030. The incorporation of ICT in the Zambia education curriculum aimed at promoting a major step in equipping computer knowledge [8]. This is one of the main reasons computer studies was introduced in the revised curriculum so that learners could be equipped with the essential skills necessary for them to have basic knowledge of ICTs. Studies on ICT are relevant for all students because they incorporate a broad range of transferrable skills and techniques, such as logical thinking, creative design, synthesis and evaluation [9]. The importance of ICT studies cannot be over-emphasized because they provide students with knowledge and skills to understand current and future technologies and generally teach useful skills in areas of communication, time management, organization and teamwork. The penetration levels of ICTs in Zambia's education institutions has still remained low and the integration of ICTs in learning and teaching practice has been limited, although the introduction of computer studies as a study subject has begun to change this. The adoption of the national ICT policy, as well as the development of a draft ICT policy for education has provided an enabling policy environment to promote far greater access and use of ICTs across all sectors of Zambia's education system [10]. Much has been reported about the impact of technology, especially computers, in education; and research conducted throughout the world to evaluate the positive effects of technology on learning, and investigate the kind of enhanced learning environment that technology provides in the classroom [11].

1.2 Statement of the Problem

The use of ICTs in Zambia is on the increase in all sectors including agriculture, banking and finance, marketing etc. and it is for this reason that the government of Zambia through the Ministry of General Education initiated a curriculum review process to include relevant subjects such ICT studies in the Zambian Education curriculum [9]. A review of the implementation of the new curriculum framework is required regarding the newly introduced ICT subject(s). It has been alleged that most primary schools do not have the required infrastructure and manpower to teach the ICT subject(s) [12]. The focus of the study was therefore on both the effect the introduction of the ICT subject has had on schools and factors that promote or hinder effective implementation of ICTs in schools.

1.3 Purpose of the Study

The main purpose of the study was to review implementation of the new national education curriculum in relation to the introduced compulsory ICT subject(s) for grades 2-9 and investigate on the challenges schools are facing in effectively teaching the ICT subject.

1.4 Objectives

The study was guided by the following specific objectives:

1. To investigate how different schools have implemented the ICT in Education subject(s).
2. To assess the effect ICT has made in schools where its implementation has succeeded.
3. To determine the factors that hinder effective implementation of ICTs in schools and subsequent remedies.

1.5 Research Questions

1. How have different schools implemented the ICT in Education subject(s)?
2. What is the effect ICT has made in schools where its implementation has been successful?
3. What factors hinder effective implementation of ICTs in schools and what interventions can improve ICT implementation?

1.6 Significance of the Study

Greater knowledge on the realities of teaching and learning with ICTs will enhance the potential for national development and international socio-economic development in today's globalized world [8]. ICTs are not only a tool for teachers and learners in educational institutions, but also a compulsory skill for participation in a more global, international knowledge society. The integration of ICTs in learning and teaching practice has been limited, although the introduction of computer studies as a school study subject has begun to change this. The study will enlighten key stakeholders and aid in formulation of appropriate strategies to address effective implementation of ICTs in the education system in Zambia and may also add to the existing literature and provide valuable information for further research.

1.7 Scope of the Study

The study took place in ten selected schools from two districts under Lusaka province. The study could not be extended to all primary schools in Lusaka and all provinces due to limited funding. Therefore, the findings of the study may not easily be generalized to other provinces.

1.8 Theoretical and Conceptual Frameworks

The study was guided by the curriculum implementation theory stating that the implementation of any educational program brings into mind the question of facilities, teachers' capability, management support and compatibility with organizational arrangement and clarity of the implementer of what is to be done [13]. This theory was relevant to guide the study because the factors compounded supporting curriculum implementation are relevant to the implementation of the new education curriculum in relation to the new ICT subject(s). The theory advocates four major elements that influence curriculum implementation: clarity of the innovation to implementers, capability of the implementers, and availability of resources and provision of management support. The elements in the theory are explained as follows: clarity of innovation to the implementer requires teachers who are the implementers should be aware of changes in the curriculum. Resources meant for the new curriculum or existing curriculum must be available and relevant to the curriculum. Capability of the implementer implies that those implementing the curriculum must be trained to be in a position to handle the new curriculum. As far as management support is concerned, principals and management personnel should be involved and put in place by availing finances to make the new curriculum a success.

The conceptual framework adopted in this research was based on the assumption that certain composite factors affect the implementation of the ICT subject(s) in the education curriculum in Zambia. Figure 1 illustrates the relationship of factors that are likely to determine the level of success of implementation of the ICT subject(s) in primary schools.

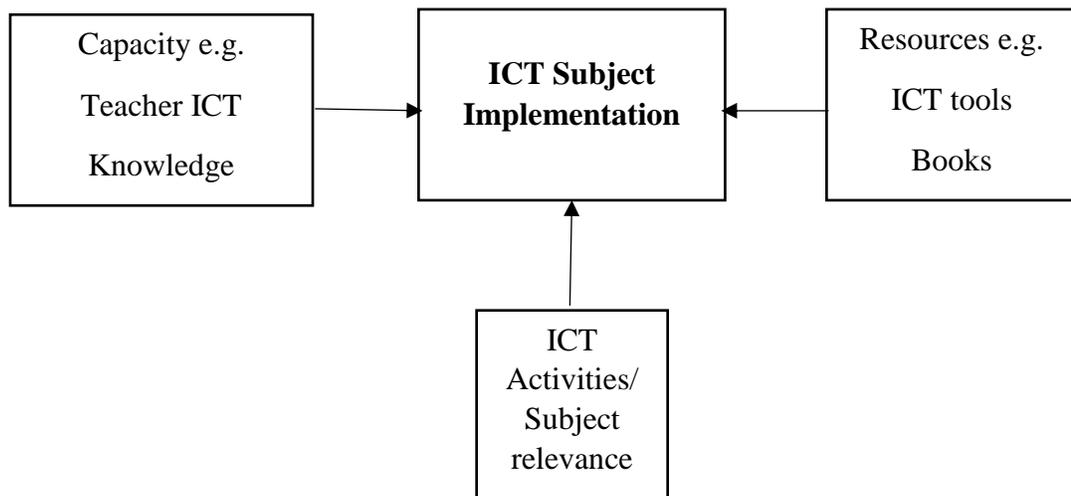


Figure 1: Factors that affect implementation of ICT subject(s) Curriculum

1.9 Operational Definitions

This section discusses some of the key terms that are used in the study. Some of the terms used have other more commonly used generic meanings. In this study, they are defined as follows to develop a common understanding between the reader and the researcher on these terms.

1.9.1 ICTs

Information and communications technology (ICT) refers to all technology used for the manipulation and communication of information. ICTs include an assorted set of technological gadgets and resources used to communicate, and to create, manage, store and disseminate information, examples of which include computers, the internet, printers, projectors, broadcasting technologies and telephones [14].

1.9.2 Curriculum

The term ‘curriculum’ denotes the contents and processes of learning in schools as well as outcomes of learning [15]. In the Zambian education curriculum, learning about ICT refers to ICT as a subject of learning, such as computer literacy, technology studies or computer studies [9].

1.9.3 ICT Infrastructure

ICT infrastructure refers to computer hardware, software, network connectivity and components such as scanners, printers and projectors [16].

1.9.4 Implementation

This is the process of putting a decision or plan into effect or execution.

1.10 Format of the Study

Chapter 1 introduces the study and provides a background of the study, statement of the problem, purpose of the study, research objectives, research questions, significance of the study, study scope, theoretical and conceptual frameworks, operational definition of terms used in the dissertation and organization of the study.

Chapter 2 is a literature review that seeks to provide background information to the objectives and research questions raised in chapter one on the implementation of the new education curriculum regarding the new ICT subject.

Chapter 3 discusses the research methodology and design used in the study. The chapter also covers issues of data collection, data analysis, data samples and the study population.

Chapter 4 presents the findings of the study based on the responses received from the research instruments administered.

Chapter 5 is a discussion of and interpretation of the findings. The findings in this chapter are compared to findings in the literature review.

Chapter 6 provides conclusions and recommendations to the study. It also highlights remedies for addressing the challenges in the implementation of the ICT in education subject.

1.11 Chapter Summary

The chapter presented the background to the research, statement of the problem, the purpose of the study as well as specific objectives of the study. The significance of the study, study scope and operational definitions of terms have also been given.

CHAPTER TWO

LITERATURE REVIEW

This chapter reviews literature on studies related to the use of ICTs in Education and the introduction of the ICT subject in the new education curriculum. The chapter discusses literature under the following headings: Global studies on ICTs in education, Literature on ICTs in Africa, and Literature on ICTs in Zambia.

2.1 Global studies on ICTs in education

There are few studies that have been done on the implementation of ICTs in education, however, there are many studies that have been conducted in the area of ICTs and education in general. The past few decades have shown an increasing recognition globally of the role of ICTs in development efforts [17]. 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 [18].

In addition, the 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 [19]. 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 reform in education is apparent in North America, South America, Antarctica, Asia, Australia, Europe as well as Africa [4].

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 [20].

The next generation of students often referred to as the ‘Net Generation’, are expecting the integration of Web 2.0 technologies into their learning and teaching programs [21].

The 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 [22].

The global studies on ICTs in education are important to this study because 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.

The role of ICTs is rapidly ever changing, especially with the internet in education. Being aware of the role of ICTs in human life, especially in educational activities, education authorities should be wise enough in implementing the strategies to integrate ICTs in schools [23]. However, research clearly demonstrates the potential of ICTs to increase motivation and autonomy in learning and in improving retention; the use of multimedia to mediate directly to students, at their own pace, realities and experiences which would otherwise be text based stimulates their interest and motivation to learn [24]. Past studies are significant to this study because they show the emerging important role of ICTs in education. The studies show that when used, ICTs are increasingly having a positive effect

in education, such as increased motivation among learners and teachers, autonomy in learning and improved retention levels among learners.

Other studies equally assert that the rapid development of ICTs and related technology during the last few decades has had a significant impact on education in terms of improved motivation, innovation and higher retention levels. Even though access to ICTs is a challenge for most institutions and schools globally, the desire to have ICTs and use them is quite high [25].

The role of the ICTs in developed and developing societies has become the subject of academic focus and research, regional and international seminars and conferences with a view that the new technologies would provide urgent solutions to present and future problems [26].

2.2 Literature on ICTs in Africa

Africa lags behind both in economic development and the use of ICTs yet there is evidence that a handful of successful ICT implementations are beginning to emerge in some African countries. Compared to global trends, African education lags behind in many aspects such as education delivery, curriculum design, teaching methodologies, teaching and learning tools and resource libraries [27]. 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. This, together with increasing debt burdens, governance problems, an unsupportive global economic context, and the impact of HIV and AIDS, means that the basic human right of access to education has been denied to many [28].

However, most African countries have developed a road map for the incorporation of ICTs in their education system and some have detailed implementation plans with priorities, timetables and measurable indicators in place already. Most African countries have planned to enhance ICT accessibility in their NDPs and AFPs [29]. Various studies by the World Bank, UNESCO, NEPAD, UN, ADB, COL and other organizations indicate that ICTs are fostering conducive teaching and learning environments for many countries in Africa [30].

However, 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 [31]. Though the level of technology penetration in Africa is low compared to developed countries, most African countries have identified the education sector as a priority area for the deployment and exploitation of ICTs to broaden access to education, improve quality of educational delivery, promote efficiency in the administration of the educational system and reduce costs of education delivery [32]. For instance, computers entered into Nigeria's education system in the late 70's and early 80's, but no concrete policy was evolved for its entry into the nation's education system until the evolution of the National Policy on Computer Education in 1988 [33]. The 1988 document contains information on the application of computers at various levels of the country's education, and with issues related to basic objectives, hardware and software requirements. The document also comments on teacher training, specifically, for the secondary school level. The implementation of the policy was kick started with a training program conducted for 197 teachers from across the country. In addition, computer systems were introduced into

the federal unity schools and armed forces secondary schools. Studies have established positive attitude among educators in Nigeria towards computer education [34]. Similarly, most teachers in Nigerian schools have positive attitude towards computer education [35]. In an effort to keep up with these new ICT developments, the Kenyan Government, through its key ministries of Education, Science and Technology, and Information and Communication Technology, developed several policy and strategy documents to guide the integration of ICT in education [36][37].

Another study on promoting teaching and learning through ICTs in Ghanaian basic schools reviewed that there are relatively low computers at Primary Schools (4%) compared to the Junior High Schools (10%). In the Primary Schools, 69% of female teachers and 50% of male teachers use ICT tools to teach. The ability of teachers to use computer to teach and research is weak due to lack of access to internet, electricity/power problem, inadequate number of computers and technical know-how. The study recommends a strong and sustainable Public-Private-Partnership between the government, private sector and civil society organizations to map out plans and strategies in order to minimize the problems associated with the integration of ICT in the education system [38].

The few African studies on the integration and role of ICTs in education above provide a general background to this study and the challenges faced are most likely to manifest in our study because developments in African countries are homogenous. Thus, this study goes further by analyzing the implementation of ICTs in Zambian Schools.

2.3 Literature on ICTs in Zambia

The history of ICTs in Zambia dates 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 and education [7]. In 2001, GRZ, with assistance from the JICA through UNDP, embarked on the formulation of a National Information and Communications Technology (ICT) policy [39]. 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 (R&D)' [39]. It is evident that the Zambia national ICT policy also recognizes the potential role of ICTs in education as stated in the thirteen pillars and objectives of the policy document. With support from IICD, COL, and USAID, the former MOE together with MOCT developed a National Information and Communication Policy; with a vision to enable all schools in Zambia have access to ICTs by 2030. This was in order to provide and promote lifelong education and training to all. The ICT policy was formulated in line with the Fifth National Development Plan [40]. In 2007, GRZ launched the ICT national policy under the theme, 'ICT-For accelerated wealth and job creation'. The policy document emphasizes the significance of ICTs. Its objectives do not advocate stressing the importance of electronic devices or information technologies, but the role

they play to open access to knowledge, information and communications for the Zambian society.

The National Information and Communication Technology Policy acknowledges that the Zambian Education system faces a number of challenges regarding the integration of ICTs in schools such as:

1. Financial and technological constraints,
2. Inadequate awareness on the benefits of integrating ICTs in the education sector,
3. Lack of coordinated approach in the adoption and implementation of initiatives targeted at the deployment of ICTs within the educational system, and
4. Shortage of teachers with ICT skills to meet the requirements of the schools, thus limiting ICT penetration within the education system.

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 unserved and underserved areas of the country at a cost of K24 Million [41]. 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. Objectives number one and two state the need to increase access, efficiency, and equity to quality ECCDE and Secondary 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 [42].

The then Minister of Education, Dr. John. T.N. Phiri 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 secondhand and refurbished [43]. 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.

2.4 Brief History on the ICT in Education Subject(s) Curriculum

The philosophical rationale for educational provision is to nurture the holistic development of all individuals and to promote the social and economic welfare of society. In all its educational endeavors, the aim of MOE is making it possible for citizens to lead useful lives, taking into account knowledge and skills appropriate to their age, their social and economic roles, the complexity of the modern world and the environment in which they live. Since knowledge, skills and technological development change so rapidly, education must also be continually renewed. For this reason, the GRZ through the MOGE developed the ZECF to provide a clear articulation of the direction the Zambian education ought to take in this modern world [44].

The curriculum review process brought about introduction of new subjects including studies on ICT offered through various subjects from grades 2-9. According to the new curriculum, key competences of learners in primary school include acquiring ICT skills. Computer studies continued grade 8-9 in order to equip learners with essential skills for them to have basic knowledge of ICTs. The framework in its entirety outlined the new curriculum, subject allocations for learners and teachers alike and resources needed to achieve successful implementation of the new curriculum. The new curriculum implemented over a period of four years begun in 2014 to 2017 as outlined in Table 1.

Table 1: New Curriculum Implementation Roadmap

YEAR	GRADE				
2014	ECE	1	5	8	10
2015	Adult Literacy	2	6	9	11
2016	-	3	7	-	12
2017	-	4	-	-	-

2.5 Related Studies

There have been arguments that the introduction of the ICT in education subject(s) curriculum in Zambia is a source of worry especially for pupils in rural areas who do not have access to computers [12]. These sentiments are partially supported by various studies conducted in different provinces and districts in the country. A study conducted in Livingstone concentrated on the impact of making the ICT in education subject compulsory at junior secondary level [45]. The thrust of the study was to find out availability of trained ICT teachers, computers and the outcome of making the subject

compulsory. Findings revealed that there are insufficient ICT teachers and ICT equipment in addition to lack of electricity in some rural areas. The study further reviewed pupils' performance in the final examinations for the period since the introduction of the subject and results showed improved performance over the years.

Another study conducted under Chipata district concentrated on the introduction and integration of ICTs at the primary school level. It was revealed by the study there was low usage of ICTs by both teachers and pupils during the teaching and learning processes due to limited availability of ICT materials and infrastructure [46].

Yet another study conducted under Ndola district concentrated on the implementation of the computer studies curriculum in public schools of Ndola and based on findings, rating the same a success of failure [47]. The study focused on investigating the extent to which the computer studies curriculum had been effectively implemented in public primary schools under Ndola district. Findings in the study revealed that schools had inadequate resources and infrastructure in addition to having untrained teachers in ICT.

The importance of reviewing related studies is to highlight what previous researchers have done and also bring out knowledge gaps if any. After reviewing above related studies, the knowledge gap discovered is that the said studies were conducted during the implementation phase of the ICT in education subject(s) curriculum and this study is being conducted post-implementation phase of the curriculum hence some of the initial challenges recognized may have been sorted out.

2.6 Background on Theories of Methods Used

The following is a brief background on the theories used for the study.

A qualitative research is used as a means of collecting verbatim statements from respondents in view of the fact that open-ended surveys allow respondents to offer responses within their unique context, and the value of the information provided can be exceptionally high [48]. Researchers who use qualitative methods seek deeper truth and they aim to study things in their natural setting, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them [49]. They use “a holistic perspective which preserves the complexities of human behavior” [50]. The researcher attempted to observe, describe and interpret settings as they were, maintaining something called, “empathic neutrality” as quoted below:

The neutral investigator enters the research arena with no axe to grind, no theory to prove, and no predetermined results to support. Rather, the investigator's commitment is to understand the world as it is, to be true to complexities and multiple perspectives as they emerge, and to be balanced in reporting both confirming and disconfirming evidence [51].

A population is a group of individual objects or items from which samples are taken for measurement [48]. The sample size of the study refers to the items to be selected from the universe to constitute a sample. The size of sample should neither be excessively large, nor too small however, it should be optimum; meaning that it should fulfill the requirements of efficiency, representativeness, reliability and flexibility [52].

Non-probability sampling procedure is a method of sampling that aims to be theoretically representative of the study population by maximizing the scope or range of variation of the study [48]. A theme captures something important about the data in relation to the

research question, and represents some level of patterned response or meaning within the data set [53].

2.7 Chapter Summary

As observed from the related literature from various scholars and past researchers collected from secondary sources i.e. textbooks, internet and journals, it shows to a large extent that effective ICTs in education implementation in developing countries is still minimal in public primary schools. Regarding resources and infrastructure used in the implementation of the ICT subject(s), most studies indicated to a larger extent that costs of these are high and thus affect implementation of the ICT subject(s). Some of the resources and infrastructure in a number of public primary schools were inadequate or completely unavailable. Further, lack of skilled manpower affects the effective implementation of the ICT subject(s) curriculum as outlined by various scholars. However, no study had been conducted to review implementation of the new education curriculum regarding the new ICT in education subject(s) post the four-year implementation period, a gap that this study intended to fill. This study therefore investigated the implementation of the new education curriculum regarding the new ICT in education subject(s) and challenges schools are facing in effectively teaching the ICT subject(s).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This chapter explains the research design and methodology used in this study to achieve the purpose and objectives stated in sections 1.2 and 1.3 of chapter 1. In doing so, the chapter discusses the following: the population, sample and sampling techniques, data collection methods and instruments, data collection procedures, ethical considerations, and data analysis.

3.1 Research Design

This study was qualitative in nature and took the form of a case study of ten selected public primary schools in Lusaka Province. A qualitative research is a form of research that involves description; it seeks to describe and analyze the culture and behavior of humans and their groups from the point of view of those being studied. This approach was appropriate for this study, which sought to solicit information and establish the perceptions of teachers and learners on the ICT in Education subject implementation in primary education.

3.2 Population

The population consisted of school administrators, teachers and pupils. The study targeted on pupils, teachers and head teachers. Therefore, the research study was conducted in ten primary schools of Lusaka and Kafue Districts under Lusaka Province; Nakatete, Kasaka, Soloboni, Shantumbu, Shikoswe, Mumuni, Regiment, Lotus, Muyoma and Chilenje 'B'. The two districts under Lusaka Province were selected for the study because they represent information suitable for urban, peri-urban and rural setups.

3.3 Sample Size

The study comprised of ten (10) schools from various zones under Lusaka province for equal representation. In total the sample size was 70 respondents comprising of ten (10) head teachers (one from each school), 20 teachers of ICT (two from each school) and 40 pupils (4 from each school). The study samples were categorized in three groups: teachers, administrators and pupils as outlined in Table 2.

Table 2: Categories of respondents in the sample

CATEGORY	TOTAL NUMBER
Administrators	10 (1X10 Schools)
Teachers	20 (2X10 Schools)
Pupils	40 (4X10 Schools)
TOTAL	70 Participants

3.4 Sampling Techniques

The study employed non-probability sampling procedures. Purposive sampling purposely targets a group of people believed to be reliable to the study. Purposively selected informants are preferred for the reason that they are likely to be more conversant with the phenomenon the researcher is investigating, than random sampling where informants selected may not be conversant about the phenomenon [51]. Two (2) pupils represented learners from grade 2-7 and they totaled 20 while those from grade 8-9 were represented by two (2) learners and totaled 20.

3.5 Data Collection methods and instruments

In this study, the researcher used interviews and non-participant observations; these methods provided adequate information to address the research questions. The methods of data collection for this study were semi structured face to face interviews, focus group discussion and observations.

The data collection instruments used were face-to-face interview guides, focus group discussions and simple observation checklists. Face-to-face interviews proved to be very helpful in the clarification of data collected since the researcher conversed with the participants in person. Additionally, face-to-face interviews are ideal and provide accurate information as they allow the researcher to probe for deeper information and opinions. In addition to face-to-face interviews, focus group discussions were used. In focus group discussions, the researcher had specific topics to discuss and a recording list of the discussions.

Observation checklists provide a relevant criterion for observing a phenomenon against anticipated results or changes in the phenomenon. In this case, an observation checklist was used to observe the school environment and some lessons, checking for uses of ICTs in classroom teaching and learning and available ICT tools. The researcher also used a tape recorder and digital camera as research tools to record all interviews and discussions, and to take relevant photographs.

3.6 Data Collection Procedure

Data was mainly collected from primary sources in form of interviews and observations in the ten schools. Secondary data were also collected in form of document analysis. Before embarking on the study, the instruments were piloted at Lusaka Girls School. In

addition, the researcher designed consent forms for the participants. The consent forms were relevant to seek for permission from relevant authorities such as the MOGE and DEBS for Lusaka and Kafue respectively. Before the interviews, the purpose of the study was explained to the respondents and confidentiality of the information to be given was assured to them. The researcher started with face-to-face interviews with the head teachers and teachers and went on to conduct focus group interviews with learners. Lastly, observations were conducted out in the various schools.

3.7 Data Analysis

Data analysis refers to examining what has been collected in a survey or experiment and making deductions and inferences. This involves selecting, categorizing, comparing, synthesizing and interpreting the information collected [38]. Upon the completion of interviews, all audiotaped data were transcribed into Microsoft Word format and analyzed qualitatively involving re-reading the interview transcripts to identify themes emerging from the respondent's answers. Thematic analysis using Microsoft Word (Find Tool) to reveal recurring themes from the data was applied.

3.8 Ethical Considerations

The researcher sought permission to carry out research from the Lusaka and Kafue DEBS and had an introductory letter from the University of Zambia. The researcher explained to the participants what the study was all about before commencing interviews or observations. She informed the participants approximately how long the interview would take and participants were assured that there were no physical risks to them if they took part in the study. If potential participants did not want to take part in the study, they were free to decline. At the same time if they did not want to answer any question they were

free to declare so. They were further informed that they were not getting any form of personal benefits by participating in the study. The participants were also informed that the information that was collected was to be used for academic purposes and was confidential.

3.9 Chapter Summary

This chapter has described the methodology used to collect data for this study. The researcher began by presenting the research design, giving a description of the sample and the research instruments. This was followed by an explanation of the data collection procedures and methods, data analysis and ethical considerations.

CHAPTER FOUR

RESEARCH FINDINGS

This chapter presents the findings of the study beginning with presenting background information on the participants, followed by the presentation of the responses of head teachers, teachers and pupils on emerging themes: available ICT resources, teacher capacity, types of infrastructure, successful ICT curriculum implementation, ICTs Usage by teachers, factors hindering effective ICT implementation and remedies of improving the implementation of the ICT in education subject. The themes emerged to correspond to the research questions below:

1. How have different schools implemented the ICT in Education subject(s)?
2. What is the effect ICT has made in schools where its implementation has been successful?
3. What factors hinder effective implementation of ICTs in schools and what interventions can be considered to improve ICT implementation?

4.1 Background Information on participants

This section presents background information on the respondents who were involved in the study. Additionally, there is some background information on the environment of the schools that served as research sites. This information is important and helpful in fully understanding the emerging issues and findings presented below.

Ten school head teachers participated in the study and of these, seven were male while three were female. All the ten school head teachers had access to ICTs both at home and at the office or school, implying they were conversant with the subject of ICTs and its role

in administration and classroom teaching. Twenty teachers of the ICT subject(s) participated in the study that is 15 males and five (5) females, all with over five years teaching experience teaching various subjects. Information on the gender of the respondents was summarized according to Table 3 on the following page.

Table 3: Frequency (F) and Percentage (%) distribution of respondents per gender

Gender	ICT Teachers		Head Teachers	
	<i>F</i>	<i>%</i>	<i>F</i>	<i>%</i>
Male	15	75	7	70
Female	5	25	3	30
Total	20	100	10	100

Forty learners of the ICT subject(s) participated in the study that is four (4) learners from each of the ten selected schools in Lusaka and Kafue districts. Of the ten schools that participated in the study, eight were strictly primary schools offering lessons to pupils from grades one to nine while two recently upgraded schools offered lessons to pupils from grades one to twelve. The average number of pupils in these schools was at least thirty-five per grade and class.

4.2 Themes

The themes and headings used in presenting the data below are in line with both the objectives of the study and research questions. The schools in the study sample were coded with letters A-J for easier representation of the ten schools and to maintain anonymity.

The first three themes speak to objective and research question one:

4.2.1 Available ICT Resources

The study sought to look at the availability of teaching materials such as textbooks in primary schools as this was necessary in order to access whether the ICT in education subject(s) has been effectively implemented. The schools studied had varying amounts of ICT textbooks available for both teachers' and pupils' use. Furthermore, the availability and number of ICT textbooks for the ten schools that participated in the study were recorded as shown in Figure 2.

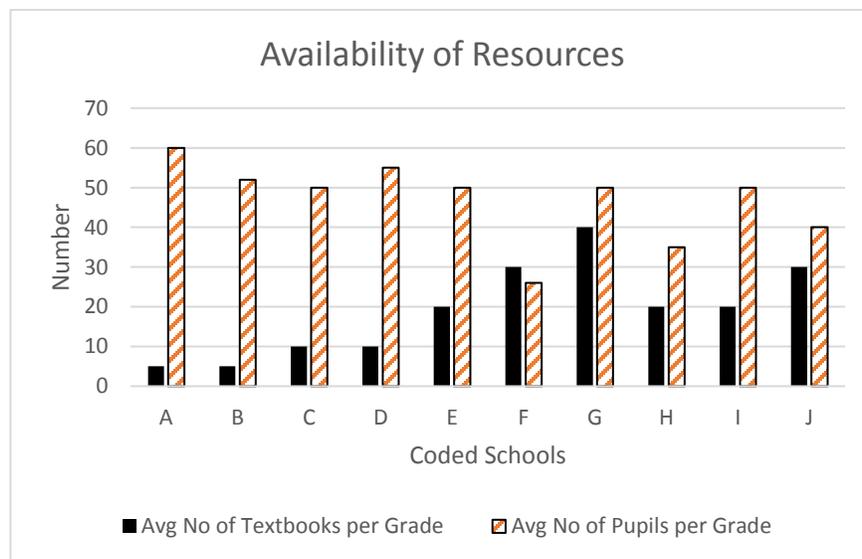


Figure 2: Comparison of availability of ICT textbooks against number of pupils

Form the findings depicted in Figure 2; the average ratio of ICT textbooks to pupils is 2:5 while the worst ratio reported was 1:12 (textbooks/pupils).

4.2.2: Teacher Capacity

This study further sought to establish the professional qualifications of the ICT teachers and head teachers. This information was important to assist in establishing whether teachers were knowledgeable enough to teach the ICT in education subject(s) or if they

had the required ICT technical knowledge. The findings obtained were as recorded in Table 4.

Table 4: Frequency (F) and Percentage (%) distribution per qualification

Professional Qualification	ICT Teachers		Head Teachers	
	<i>F</i>	<i>%</i>	<i>F</i>	<i>%</i>
Degree	7	35	5	50
Diploma	8	40	5	50
Certificate	5	25	0	0
Total	20	100	10	100

The information in Table 4 indicates that 35% of the ICT teachers had a degree in Education, while 40% had diplomas in various teaching subjects and 25% had primary school certificates. Only 50% of the head teachers were degree holders while the other half had diplomas. It was established that 75% of the ICT teachers had no formal computers or ICT training; though most of them reportedly gained computer literacy through use of personal computers and internet cafes. It was further established that there was only five teachers representing 25% had certificates in computer packages. Head teachers were asked if teachers teaching ICT subject(s) were qualified and one head teacher responded,

No teacher trained in ICTs has been deployed to our school yet and the current teacher has been delegated to teach ICTs because he showed interest in the subject.

While another head teacher responded,

We only have one skilled teacher that teachers all classes from grades 2-9, however, this becomes a challenge when the said teacher is unwell or on annual leave.

4.2.3: Types of Infrastructure

The study also sought to establish the types of infrastructure that was available in the schools for effective implementation of the ICT in education subject(s) curriculum. Thus, in addition to independent observations, head teachers and ICT teachers were asked what infrastructure was available and the quantity. The responses from five (5) of the ten schools in the study sample are outlined below. Table 5 shows results obtained from School I under Lusaka District.

Table 5: ICT Infrastructure available at School I

Infrastructure	Quantity	School
Scanner/photocopier	2	School I
Computers/Laptops	25	
Projectors	1	
Printers	2	
Computer Lab	Yes	

Results in Table 5 reviewed that computers were available though they were slightly inadequate compared to the number of pupils per class/grade as the computer/pupil ration currently stands at 2:1 whereas the ideal situation is to have a ratio of 1:1. Furthermore, results show that the school has a computer laboratory in place. Figure 3 shows the available infrastructure setup in the school computer laboratory.



Figure 3: ICT Infrastructure setup at School I

Table 6 shows results obtained from School A under Kafue District.

Table 6: ICT Infrastructure available at School A

Infrastructure	Quantity	School
Scanner/photocopier	1	School A
Computers/Laptops	9	
Projectors	0	
Printers	2	
Computer Lab	None	

Results in Table 6 reviewed that computers were available though they were inadequate compared to the number of pupils per class/grade. Figure 4 shows the available infrastructure which sits in the head teacher's office.



Figure 4: ICT Infrastructure setup at School A

Table 7 depicts results obtained from School D under Kafue District.

Table 7: ICT Infrastructure available at School D

Infrastructure	Quantity	School
Scanner/photocopier	1	School D
Computers/Laptops	15	
Projectors	0	
Printers	1	
Computer Lab	Yes	

Results in Table 7 reviewed that computers were available though they were inadequate compared to the number of pupils per class/grade. Furthermore, results show that the school has a computer laboratory in place though it was formally a normal classroom. Figure 5 shows the available infrastructure setup in the school computer laboratory.



Figure 5: ICT Infrastructure setup at School D

The results in Table 8 were obtained from School F under Lusaka District.

Table 8: ICT Infrastructure available at School F

Infrastructure	Quantity	School
Scanner/photocopier	1	School F
Computers/Laptops	25	
Projectors	0	
Printers	2	
Computer Lab	Yes	

Results in Table 8 reviewed that computers were available. Furthermore, results show that the school has a computer laboratory in place. Figure 6 shows the available infrastructure setup in the school computer laboratory.



Figure 6: ICT Infrastructure setup at School F

Table 9 shows results obtained from School H under Lusaka District.

Table 9: ICT Infrastructure available at School H

Infrastructure	Quantity	School
Scanner/photocopier	2	School H
Computers/Laptops	30	
Projectors	0	
Printers	1	
Computer Lab	Yes	

Results in Table 9 reviewed that computers were available. Furthermore, results showed that the school has a computer laboratory in place. Figure 7 shows the available infrastructure setup in the school computer laboratory.



Figure 7: ICT Infrastructure setup at School H

For further analysis of availability of infrastructure, head teachers and ICT teachers were asked to assess the rate of availability of facilities and resources. The responses from twenty ICT teachers (20) and ten (10) head teachers are presented in Table 10 on the following page.

Table 10: Frequency (f) and Percentage (%) distribution of ICT infrastructure in all schools

Infrastructure	Available		Not Available	
	<i>f</i>	%	<i>f</i>	%
Scanners/Photocopiers	30	100	0	0
Computers/Laptops	30	100	0	0
Projectors	9	30	21	70
Printers	27	90	3	10
Computer Lab	24	80	6	20

Results in Table 10 reviewed that 100% of respondents indicated that scanners or photocopying machines and computers were available although quantities of these devices were limited and inadequate. Furthermore, findings revealed 90% of respondents indicated that printer supply was adequate while only 10% indicated they had inadequate supply of printers. To support teaching of ICTs using projectors, 30% of the respondents indicated that projectors were available while 70% of respondents did not have adequate supply of projectors. Concerning the computer laboratories, 80% indicated they were setup and in use while 20% of respondents had no computer labs in place.

The following two themes address objective and research question two:

4.2.4: Successful ICT Curriculum Implementation

This study further sought to establish whether schools in the study sample had successfully implemented the new education curriculum regarding the new ICT subject(s). This was aimed at establishing the actual extent to which the ICT in education subject implementation had been done in Lusaka province and if the schools under the study sample had implemented it in the same way or not. In addition to independent observations conducted regarding successful ICT subject(s) implementation, head teachers and teachers were asked if their schools had implemented the ICT in education subject(s) as mandated by the new education curriculum. Findings indicated that the ICT in education subject(s) curriculum was implemented in all the schools under the study sample, though the success rate or percentage differed from school to school.

This study also sought to establish from the Head teachers and ICT teachers if the introduction of the ICT in education subject(s) into the curriculum was a good policy and its effects. The responses from twenty (20) teachers teaching ICT(s) and ten (10) head

teachers all stated that it was a good policy and helpful for pupils though some schools were facing various challenges with implementing it successfully.

Concerning the issue of whether the ICT in education subject(s) curriculum policy was good or not, one teacher said,

ICT is very helpful because it is very practical for pupils learn how to use different tools for communication and beginning from grade 2 is good because that is the foundation of learning.

Another teacher on commenting over the ICT in education subject(s) policy said that,

ICT is very useful, because we are living in a world where pupils need to learn the new technology and is necessary because it prepares pupils for the future especially in this computer age.

4.2.5: ICTs Usage by teachers and pupils

The aim of finding out the levels of ICTs usage by both teachers and pupils was to understand the effect ICT made in schools where it had been successfully implemented. By establishing this, the study would better bring out results on the effects brought about by the introduction of ICTs. From interviews conducted with 20 teachers from the schools under the study sample, it was generally found that ICT materials were not available or inadequate in primary schools which affected effective implementation. Teachers were further asked to identify the type of ICT they used in the teaching process and it was established that the most used technology type was a calculator followed by computers, flash drives and spread sheets. This information is summarized and presented in Figure 8.

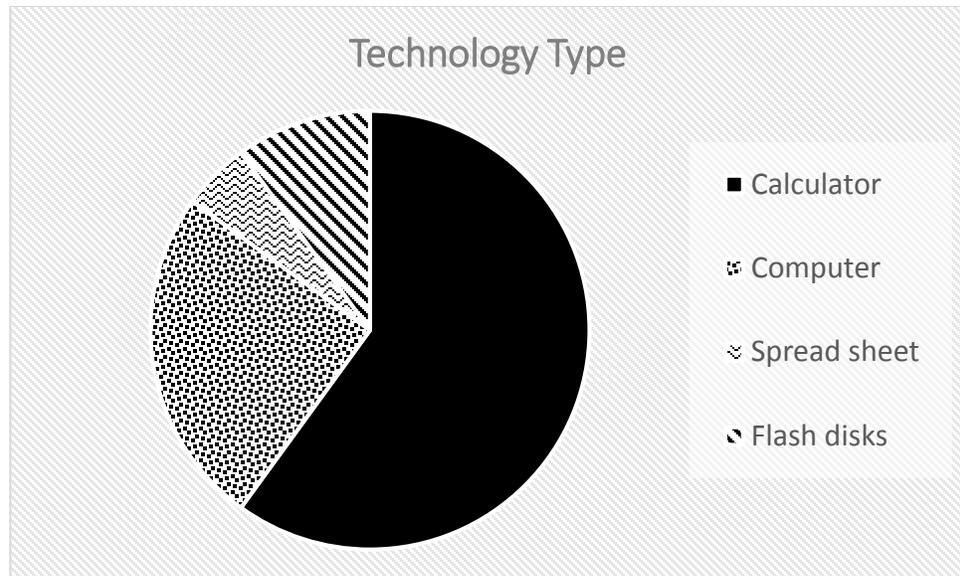


Figure 8: Distribution of technology type use

Results from Figure 8 revealed that 60% of the teachers interviewed were using calculators in the teaching process while 25% were using computers, 10% using spreadsheets and 5% were using flash drives.

The last two themes address objective and research question three:

4.2.6: Factors hindering effective ICT in Education subject implementation

The study sought to establish some of the challenges schools were facing in effectively implementing the ICT in education subject(s), therefore, head teachers, teachers and pupils were asked to state some of these factors. The responses from the three (3) respective groups were summarized and are shown in Table 11 on the following page.

Table 11: Factors affecting effective ICT in education subject(s)

Category	Factors affect effective ICT implementation
Head teachers	Inadequate resources i.e books Lack of computers and maintenance Lack of teacher training/trained teachers
Teachers	Shortage of trained ICT teachers and resources Lack of furniture in the computer labs Lack of other ICT tools like projectors High computer to pupil ratios
Pupils	Lack of time for practical lessons Shortage of computers Practical lessons only begin at grade 8 level

Results from Table 11 revealed that the factors affecting effective implementation of the ICT in education subject are similar and this was echoed through the responses of both teachers and pupil. The study further sought to establish the computer to pupil ratio in primary schools in the study sample. In addition to reviewing records and independent observations, ICT teachers were asked to state the computer to pupil ratios in their respective schools and the findings are depicted in Table 12 on the following page.

Table 12: Pupil – Computer ratio per school

School	Average No of Pupils per class	No of Computers in school	Pupil-Computer ratio
A	50	9	5:1
B	60	10	6:1
C	53	15	4:1
D	50	15	3:1
E	60	10	6:1
F	50	25	2:1
G	50	30	2:1
H	40	10	4:1
I	50	25	2:1
J	50	10	5:1

Results from Table 12 indicate that the number of computers is still low in most schools and the pupil computer ratio is still high.

4.2.7: Remedies of improving the implementation of the ICT in education subject.

In addition to finding out the factors schools are facing in effective implementation of the ICT in education subject(s), the study sought to bring out suggestions from the respondents on what could be done to overcome the challenges.

The following remedies were proposed:

i. Government Support

All the respondents involved in the study that is, head teachers; teachers and pupils proposed that the government should do the following:

1. Provide adequate ICT resources that is textbooks for schools
2. Provide schools with grants to procure more computers and setup infrastructure such as computer labs.
3. Expedite the process of recruiting qualified ICT teachers to schools
4. Employ technical staff to computer maintenances and repairs

ii. Teacher In-service training

In-service programs include seminars, workshops and conferences. The findings established that over 70% of head teachers and teachers proposed that the ministry of general education (MOGE) should organize regular seminars and workshops to sensitize head teachers and other stakeholders of the importance of implementing the ICT in education subject(s). Other suggestions proposed over 80% teachers was that primary school teachers engaged in teaching ICTs should be sponsored to acquire training in ICTs.

iii. Administrative support

Findings in the study indicated that all the respondents representing 100% suggested that school administrators in schools were all supporting the ICT in education subject(s) curriculum implementation. All the head teachers indicated that they were coming up with initiatives to source funds to purchase the required resources and infrastructure to support the ICT in education subject(s) implementation.

iv. Other Suggestions

One head teacher suggested that there was need for all schools to put up fundraising ventures through PTA and raise funds to purchase the required resources and infrastructure for effective implementation of the ICT in education subject(s) curriculum. With regards to the pupils' focus group discussions, it was discussed and suggested by 90% of the pupils that the ICT in education subject should not be made compulsory at grade 8 and 9 when practical lessons commence until all schools had acquired the necessary ICTs infrastructure. Other suggestions by more 60% of the pupils indicated that practical ICT lessons should begin from as low as grade 5 to ensure pupils have a feel of both theory and practical lessons as currently practical lessons begun at grade 8 level.

4.3 Chapter Summary

This chapter has presented the findings in the study as gathered from the respondents during interviews, observations carried out and also from pupils during focus group discussions. The findings on the resources and infrastructure indicated that though they are available in schools, they are inadequate. The number of computers in schools was not enough and this was shown through the high computer pupil ratio. The number of teachers trained to teach ICTs was very low. On remedies to improve implementation on the ICT in education subject(s), it was suggested the government should support the ICT in education subject(s) implementation by providing resources and grants to schools for procuring required infrastructure and quicken the process of recruiting trained ICT teachers. It was further suggested that the administrative support must be enhanced and technical staff hired for computer maintenances and repairs. These findings were presented in form of tables and graphs based on emerging themes and verbatim statements.

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

This chapter discusses the findings of the study presented in chapter four. The discussions will be done under the emerging themes headings: types of resources available, teacher capacity, types of infrastructure, successful ICT curriculum implementation, ICTs Usage by teachers, factors hindering effective ICT implementation and remedies of improving the implementation of the ICT in education subject.

The first three theme headings outlined below correspond with objective and research question one:

5.1 Available ICT Resources

From the findings in the study, majority of the respondents (head teachers, teachers and pupils) and independent observations indicated that resources such as textbooks were available, however, they were inadequate compared to the number of pupils per given class. This was indicated by an average ratio of ICT textbooks to pupils of 2:5 while the worst ratio reported was 1:12 (textbooks/pupils). This is likely to affect the implementation of the ICT in education subject(s) a great deal since effective implementation requires availability of teaching and learning materials. These findings concur with researchers who observed that there was outcry from teachers on lack of basic resources like textbooks, which affect any new curriculum implementation [54].

5.2 Teacher Capacity

The findings from the observations showed that the way in which the schools under the study sample had implemented the ICT in education curriculum differed based of availability of ICT teaching staff and their computer literacy levels. It was further

observed that in schools where primary schools teachers were not knowledgeable on ICTs or were not comfortable with teaching the ICT subject; one or two teachers who had interest in ICTs were designated as the ICT teachers whereas, in other schools all teachers were expected to teach the ICT in education subject regardless of whether they were knowledgeable or not. This pattern would disadvantage pupils taught by a teacher with little or no computer literacy at all. Findings further revealed that in schools where only one teacher was designated as the ICT teacher for all grades that is, 2-9, pupils were left handicapped when that teacher ever fell ill or went on annual leave especially pupils in grades 8 and 9 as the ICT subject is not only compulsory subject but also examinable. Further observations showed that teachers with lower qualifications that is certificates and diplomas were not very comfortable to teaching the ICT in education subject(s).

5.3 Types of Infrastructure

Findings in the study indicated that majority of the respondents advised that ICT infrastructure such as scanners/photocopiers, computers/laptops; projectors; printers and computer labs were available though they were inadequate to cater for the high number of pupils. This was further illustrated by the wide computer to pupil ratios, the highest being a ratio of 6:1 (computer/pupil). These findings are in line with researchers and authors who have argued that lack of physical educational facilities, like buildings and computer labs is a major hindrance to implementation of ICT in schools in Africa [55]. ICTs require supporting physical infrastructure in place before they can be implemented. However, for many schools in developing countries like Zambia, there is no free room and in some schools, no suitable building at all that can be turned into a computer laboratory. However, based on observations made by the researcher, computers and computer labs were

available in some schools though all of them were inadequate. The findings in this study were in agreement with another researcher who indicated that there were inadequate resources such as computer laboratories in 33.3% of schools in poor countries which was a major setback in the implementation of ICT studies [56]. The findings were also in line with a funded research carried out in African countries, which pointed out that, in any given educational system, the level of available resources places a restriction on the degree to which any new subject can be introduced into the school curriculum [57].

The following two theme headings outlined below correspond with objective and research question two:

5.4. Implementation of the ICT in Education Curriculum

From the findings of the study, all respondents that is, head teachers, ICT teachers and pupils indicated that they had implemented the ICT in education subject(s) curriculum and it was being offered as a single subject with varying names from grade 2 – 9. The findings from the observations showed that the ICT in education subject(s) was available on all timetables from grades 2-9. However, the rate of successful implementation differed from school to school. The criteria used to assess successful implementation composed of checking not only the availability of resources, which included ICT textbooks, computers, computer laboratories etc. but also checking the quality of the available materials. The ratio of ICT textbooks to pupils and computer to pupil ratios also played a vital in determining whether a given school had successfully implemented the ICT in education subject(s). Out of the ten schools under the study sample, six had successfully implemented the ICT in education subject to a degree of over 60% while the remaining four schools were lagging behind. In the schools that had successfully implemented the

ICT in education subject(s), other ICT related activities were observed in addition to the teaching of other subjects using ICTs.

5.5 ICTs Usage by teachers and pupils

The effective implementation of the ICT in education subject can also be determined by the extent to which both teachers and learners use ICTs in schools during the teaching and learning process. From the findings, the study established that ICTs in primary schools were not largely used due to the scarcity of ICT materials. Teachers and pupils alike expressed their eagerness to learn and use ICTs when readily available and given the opportunities. Some pupils and teachers confirmed using or having access to ICTs in their homes especially for schools in the urban setting. It is evident from the findings that the most used technology type by both pupils and teachers is a calculator followed by a computer. While calculators and computers were actively used, teachers had no access to using projectors, white boards or typing work for their students. Findings further indicated the preparation or typing of monthly or termly tests were left to teachers that were more conversant with ICTs.

From the pupils point of view, the situation was similar as all pupils interviewed from peri-urban areas had no access to computers at home, which clearly showed that their hope to learn of or use computers was at school. The low usage of ICTs is as a result of inadequate ICT materials as discussed above.

The last two theme headings outlined below correspond with objective and research question three:

5.6 Factors hindering effective ICT in Education subject implementation

The study in seeking to identify the challenges schools faced in implementing the ICT in education subject(s) curriculum established that, lack of ICT skills among primary school teachers, shortage of resources and learning materials, lack of computers and maintenance and poor physical infrastructures were among the challenges to the implementation of the ICT in education subject(s) curriculum. The findings in this study conquer with results obtained from similar studies conducted in different provinces of the country [45] [46] [47]. From pupils' point of view, it was indicated that there was shortage of computers as well as lack of time for practical computer lessons.

i. Computer Pupil Ratio

The findings revealed that the computer pupil ratio was high due to the inadequate number of computers that the schools under study reported. However, even though the computer pupils ratios are high, the findings in this study dispute findings by a researcher who established that more than 50% of schools had students to computer ratios of 1:30 [58]. There has been steady decrease in the computer pupil ratios since the implementation of the ICT in education subject curriculum in Zambia [59] and the highest ratio currently shows six (6) pupils sharing one computer. For schools with such high ratios however, pupils getting hands-on experience by touching different gadgets and monitoring what was happening on the screen proved difficult and such pupils suggested that the ICT in education subject(s) should be made optional especially at grade 8 and 9 where pupils are expected to have practical lessons.

ii. Distribution of Computers in Schools

From the findings of the study, all schools under study had at most 30 computers. These findings are in line with another researcher who establish that more than 40% of schools in Kenya had less than 10 computers and only 4.5% of the schools had more than 20 computers [60]. The ICT in education subject(s) is a practical subject; hence, it requires hands-on experience by pupils in order for them to grasp concepts easily. The population of pupils is very high in schools; hence, the number of computers available in schools is inadequate to enhance effective teaching and learning. From the study, it is evident that most schools under peri-urban areas did not have enough computers to use and hence this affected their learning of the new subject.

5.7 Remedies of improving the implementation of the ICT in education subject

i. Government Support

Pertaining to the remedies to enhance effective implementation of the ICT in education subject(s) curriculum in Lusaka province, strategies proposed included provision of grants to purchase resources and setup infrastructure such as computer laboratories and provision of technical staff. The findings in the study also revealed that there is need for the government to expedite the process of recruiting qualified ICT teachers in schools. This is important in the implementation of ICT studies as a new subject in the curriculum because the government is in charge of employing teachers in public government schools. It is therefore cardinal that in order to implement the ICT in education curriculum effectively, trained and qualified teachers are required to teach the new subject to ensure the right and correct information is transferred to pupils.

ii. Teacher In-service Training

The findings in the study revealed that the majority of teachers did not attend any in-service training in ICTs. Further, the majority of the respondents indicated that it was important for them to attend in-service training such as short courses, seminars, workshops and conferences where they could learn new ideas and techniques from each other as teachers and be equipped with the necessary ICT knowledge. It is through the in-service training that teachers get the opportunity to advance their knowledge in areas of specialization. Findings in the study are supported by previous researchers who stated that a more conventional way of introducing teachers to new ideas, techniques and methodologies in education is through courses such as seminars, workshops and conferences [61]. During these sessions, teachers get the opportunity to advance their knowledge on their area of specialization hence improving the quality of curriculum implementation. The findings in this study are also similar to those by a researcher who reported that lack of professional development programs for teachers to upgrade their skills on emerging technologies is a hindrance to ICT implementation [62] [63]. Hence in-service of teachers greatly affect the quality of new curriculum implementation.

iii. Administrative Support

From the findings, it was established that majority of the respondents indicated that administrators in schools were supportive of the ICT in education subject(s) implementation in schools. The findings are in line with other authors who argued that in many instances, school leaders support the implementation of technology in their school through acquiring the required infrastructure [64]. The findings are similar to something mentioned by another author who stated that administrative support was an enabling factor

to successful implementation of computer studies in schools [63]. He further stated that implementation of ICT studies in education is one of the top priorities supported by school head teachers. Another researcher said that administrative support could also take the form of policy enactments where ICT competence is made mandatory for schoolteachers, as this could be an effective measure to improving teachers' ICT knowledge and skills [65] further supports the findings.

5.8 Chapter Summary

This chapter has presented the discussion of the findings of the study. From the findings gathered, it can be seen that resources and infrastructure were available in schools though they were inadequate and this affected effective implementation of the ICT in education subject(s) curriculum. Furthermore, findings in the study indicated that the ICT in education subject(s) was implemented differently depending on available resources in schools.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusion and recommendations of the study based on the findings and discussions on the implementation of the ICT in education subject(s) curriculum in public primary schools in Lusaka province.

6.1 Conclusions

From the research findings, the following conclusions were made:

This study revealed that post the ICT in education subject(s) curriculum implementation phase, there has been steady progress in the new ICT subject adoption rate. It can be concluded that all schools in the study sample had implemented the ICT in education subject(s) curriculum though a number of factors had hampered the implementation process such as inadequate funds to procure computers, lack of trained ICT teachers, inadequate resources and infrastructure required for implementation of the ICT in education subject(s) curriculum. However, it further be concluded that the challenges highlighted throughout the study were more prominent in peri-urban area schools under the study.

The following sub-headings offer conclusions on the main objectives of the study:

6.1.1 Types of Resources and Infrastructure

The types of resources and infrastructure which were available in a number of schools for the implementation of the ICT in education subject(s) curriculum in public schools in Lusaka province include computers, computer laboratories, printers/scanners, projectors and ICT text books. The resources and infrastructure which were available in the study sample of the schools were reported to be inadequate. Thus it can be concluded that

without proper infrastructure and adequate resources, it is difficult for the country to achieve 100% adoption rate for the ICT in education subject(s) curriculum implementation.

6.1.2 Teachers' Skills and training in ICT

It was established that the level of the teacher's skills and training in ICT had an influence on the implementation of the ICT in education subject(s) curriculum in public schools in Lusaka province. It can be concluded that there were inadequate numbers of trained ICT teachers. Most teachers teaching the ICT in education subject(s) were not trained to teach this subject but had other subjects for which they had acquired training. It was further discovered that in schools that had no qualified ICT subject(s) teachers, the head teachers asked any teacher with some ICT knowledge to handle all ICT classes and lessons. Furthermore, it was established that lack of training resulted in teachers lacking the necessary skills and competences to teach pupils.

Therefore, it can be concluded that without training and qualified teachers in ICT, it is impossible to effectively implement the ICT in education subject(s) curriculum.

6.1.3 Use of ICTs

The use of ICTs among teachers and pupils in primary schools is low. The study substantiated that the most used ICT material by both teachers and pupils were calculators which are not useful to the primary sector. However, a considerable number of teachers indicated using computers and the internet via personal mobile phones. Due to this, pupils end up learning about ICTs in abstract, which robs them of an opportunity to have hands-on experience.

6.1.4 Factors hindering effective Implementation

The study identified and concluded that the following are the challenges schools are facing in implementing the ICT in education subject(s) curriculum effectively:

- i.** Lack of ICT skills among primary school teachers,
- ii.** Shortage of resources and learning materials,
- iii.** Lack of computers and maintenance and
- iv.** Poor physical infrastructures

6.1.5 Remedies

Lastly, to enhance the effective implementation process of the ICT in education subject(s) curriculum, respondents proposed that the government:

- i.** Should be involved in giving support by offering grants to schools to enable them procure computers and infrastructure,
- ii.** Should provide and facilitate teacher in-service training,
- iii.** Should expedite the process of recruiting qualified ICT teachers and consider employing technical staff for computer repairs and maintenances;
- iv.** Should ensure there is administrative support in schools and regularly sensitize all stakeholders on the importance of implementing the new curriculum.

The factors affecting effective implementation and proposed remedies to be considered by GOV are summarized in Table 13 on the following page.

Table 13: Summary of factors affecting effective ICT subject implementation and proposed remedies

No	Limiting Factor	Proposed Remedies
1	Lack of ICT skills among primary school teachers	- teacher in-service training - Expedite ICT teacher recruiting
2	Shortage of resources and learning materials	-Distribute more ICT textbooks -Offer grants to schools to procure additional learning materials
3	Lack of computer maintenance	-Deploy technical staff for computer repairs and maintenances
4	Poor physical infrastructures	- Setup of computer laboratories in all schools

6.2 Recommendations

In light of the findings, the following recommendations were made:

- i. The government should consider providing funds through grants to schools to procure computers and accessories to setup adequate ICT infrastructure.
- ii. The government should make an official plea to corporate organizations and NGOs for donations of used and new computers and ICT infrastructure.
- iii. The government through Ministry of General education should expedite the recruitment of trained ICT teachers to all public primary schools.
- iv. Continuous professional development should be a must for all teaching staff to stay acquainted with the evolving nature of ICTs.

- v. Finally, MOGE should organize regular seminars and workshops to train teachers, head teachers and other stakeholders on the importance of implementing the ICT in education curriculum in primary schools.

6.3 Suggestions for further research

This research focused on investigating the effects of the ICT in education subject(s) curriculum implementation under Lusaka province. Similar studies conducted in a few other districts agree with the findings of this study. It therefore be assumed that the findings in this study can be generalized to other provinces to a given degree; however, a comprehensive study to sample all the provinces is required in order to get exactly what is happening on the implementation of ICTs in the primary education curriculum.

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APPENDIX A: RESEARCH BUDGET

Description	Unit	Unit Price	Total
Stationery	- Paper	K 60	K 180
	- Pens	K 30	K 30
Typing/photocopying	- Research instruments	K 100	K 400
	- Project report	K 500	K 2500
	- Binding	K 200	K 800
	- Poster	K 500	K 500
Tools	- Recorder	K 1000	K 1000
	- Memory stick	K 200	K 200
	- Camera	K 1500	K1500
Transport/fuel	- 1 Researcher	K 300	K 3900
Food	- 1 Researcher	K 500	K 2000
Contingency	- Assorted	K 1000	K 1000
Total			K 14,010

APPENDIX B: QUESTIONNAIRES

THE UNIVERSITY OF ZAMBIA

SCHOOL OF ENGINEERING

DAPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

RESEARCH TOPIC: Effects of ICT in Education Subject Implementation in Zambia

Dear respondent,

You have been selected to participate in this research through the completion of this questionnaire. Therefore, you are requested to assist by answering the questions on the above topic. While you help, be assured that the information provided will be kept with maximum confidentiality. To this effect you are requested not to write your name or leave any mark that could lead to your identification.

Instruction(s)

1. Do not write your name
2. Tick were applicable
3. Try to be honest

BACKGROUND INFORMATION (TEACHERS)

1. What is your gender?

1. Female

2. Male

2. Which residential area do you belong to?

1. High density area

2. Middle Density area

3. Low Density area

3. Do you have a computer or laptop at home?

1. Yes

2. No

4. How many pupils do you have in class.....

5. How long have you been teaching?

1. Less than 5 years

2. 5 years up-to 10 years

3. 10 years and above

THANK YOU FOR YOUR PARTICIPATION

APPENDIX C: INTERVIEW SCHEDULE FOR TEACHERS

1. How would you define ICT?
2. What do you think about how the ICT subject(s) is being taught?
3. Is it necessary to teach ICT in primary schools that is between grades 2-9? If yes, why?
4. What materials are available for the teaching and learning of ICT?
5. Do you have the infrastructure for the teaching of ICT?
6. What level of education between grades 2-9 are practical lessons introduced to pupils if possible?
7. What challenges are you facing in the teaching and learning of ICT?
8. Are you comfortable teaching ICT? Reasons.
9. What do you think can be done to improve the delivery of ICTs?
10. What is your opinion on the best way the ICT subject can be implemented?
11. Are there any other issues that you would like to raise in connection to implementation of ICT in primary schools?
12. Do you use any ICT tool to monitor student work and progress?

THANK YOU FOR YOUR PARTICIPATION.

APPENDIX D: INTERVIEW GUIDE FOR ADMINISTRATORS

1. Has your school implemented computer studies curriculum? If not, why?
2. How do you perceive the teaching and learning of information communication technology?
3. How do you find the teaching of ICT?
4. How helpful is ICT to pupils?
5. What materials are available in the teaching and learning of information communication technology?
6. Do you have the infrastructure for the teaching and learning of ICT?
7. What challenges are you facing in implementing the teaching and learning of ICT?
8. Do you think teachers/you are comfortable in teaching ICT? Reasons.
9. What do you think could be done to improve the delivery of ICT at your school?
10. Do you think it is necessary to train teachers in ICT?
11. What measures are you planning to put in place to change the current scenario?
12. What advice if any can you give the government on the way ICT should be implemented?
13. Are there any other issues that you would like to raise in connection with implementation of ICTs in primary schools?

THANK YOU FOR YOUR PARTICIPATION.

APPENDIX E: INTERVIEW SCHEDULE FOR PUPILS

1. Date of interview

2. What does ICT stand for?

3. Have you ever seen a computer/laptop before?

1. Yes

2. No

4. From the time you came to this school have you used a school computer/laptop?

1. Yes

2. No

5. Have you at any time learnt about ICT or computers at this school?

1. Yes

2. No

6. What ICT tools have you ever seen in this school?

7. How many are you in class?

8. How helpful do you think ICTs/technology are to you?

THANK YOU FOR YOUR PARTICIPATION.

APPENDIX F: FOCUS GROUP DISCUSSION GUIDE WITH PUPILS

Name of School.....

Dear Pupils,

This Focus Group Discussion (FGD) guide's intent is to investigate how the computer studies curriculum implementation has been conducted in primary schools. Your assistance is therefore, sought in this regard. Your contribution in this discussion is highly valued and the information recorded will be treated confidentially. The discussion constitutes two questions only and time allocated to each question is 20 minutes.

Discussion Questions:

1. In your opinion, what challenges does Computer Studies teaching and learning face in primary schools? (Questions to probe further discussions will be whether: pupils have easy access to computers; pupils access the computer laboratory; enough time to learn the subject; it should be a compulsory or optional subject)
2. What measures should be taken to improve the situation? (Probe questions will be on what pupils would like: what the government to do; what the school should do; what other stakeholders should do).

Thank you.

APPENDIX G: OBSERVATION CHECKLIST

1. Does the school have ICT tools available?
2. Availability of various ICT infrastructure including projectors, printers, computers/laptops, text books etc.
3. Does the school have a computer laboratory for practical lessons?
4. What is the ratio of computers to pupils?

APPENDIX H: PERMISSION LETTER A

*All correspondence should be addressed
to the District Education Board Secretary*

Telephone: 0211 - 240250/240249/0955 621749
E-mail: debsmk@zabsa.co.zk



REPUBLIC OF ZAMBIA

MINISTRY OF GENERAL EDUCATION

DEBS/101/1/19

22nd June, 2018

DISTRICT EDUCATION BOARD SECRETARY
P.O. BOX 50297
LUSAKA

Ms. Natasha Nyanja
Engineering Student

usf: The Head of Department
School of Electrical and Electronic Engineering Department
University of Zambia
P.O. Box 32379
LUSAKA

RE: REQUEST TO CONDUCT RESEARCH ON THE TOPIC, "EFFECTS OF ICT IN EDUCATION SUBJECT IMPLEMENTATION IN ZAMBIA: A CASE OF SELECTED SCHOOLS IN LUSAKA DISTRICT UNDER CHILENJE AND MUMUNI ZONES."

Reference is made to the letter dated 4th May, 2018, from the Head of Department – School of Engineering, Department of Electrical and Electronic Engineering, (UNZA) in which you wish to conduct a research project in Schools under Chilenje and Mumuni Zones, Lusaka District.

I am pleased to inform you that permission has been granted for you to carry out your project. However, ensure that your programme does not interfere with the learning schedule.

Through this letter, Headteachers are informed to welcome and give you all the necessary support accordingly.


B. Mwanza (Mr.)
**DISTRICT EDUCATION BOARD SECRETARY
LUSAKA DISTRICT**

sw*

APPENDIX I: PERMISSION LETTER B

All communication should be
Addressed to the DEBS

Telephone / Fax: +260 211 311386
E-mail: debskafue@yahoo.com



REPUBLIC OF ZAMBIA
MINISTRY OF GENERAL EDUCATION

In reply please quote

No:.....

Kafue District Education Board Office
P.O. Box 360296
KAFUE

DEBS/101/4/8

12th June, 2018

The Head, Electrical & Electronic Engineering,
University of Zambia,
School of Engineering,
LUSAKA, ZAMBIA.

RE: AUTHORITY TO CARRY OUT A RESEARCH PROJECT: NATASHA NYANJA

Reference is made to your letter dated 4th May, 2018 in which you requested for
Natasha Nyanja to undertake a research.

I am pleased to inform you that permission has been granted.

Teddy Chibwe
DISTRICT EDUCATION BOARD SECRETARY
KAFUE DSISTRICT

/mnz