

**THE IMPACT OF COMPULSORY COMPUTER STUDIES AT JUNIOR
SECONDARY ON ICT LITERACY IN SECONDARY SCHOOLS IN
LIVINGSTONE DISTRICT**

By
Leslie Simulwi

**A dissertation submitted to the University of Zambia in Partial fulfilment of the
Requirements of the degree of Master of Engineering in Information and
Communication Technology**

**The University of Zambia
Lusaka
2019**

DECLARATION

I, Leslie Simulwi, declare that this dissertation is my own work which has not previously been submitted for a degree at this or any other University and does not incorporate any published work or material from another dissertation.

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APPROVAL

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Examiner 1: Signature: Date:

Examiner 2: Signature: Date:

Examiner 3: Signature: Date:

Chairperson

Board of Examiners: Signature: Date:

Supervisor: Signature: Date:

ABSTRACT

In 2014, the Zambian Government through the Ministry of Education introduced ICT as a compulsory subject at junior secondary despite schools having inadequate facilities. This was a source of concern to many. The study aimed at investigating the impact of making ICT Subject Compulsory at Junior Secondary. The specific objectives were to investigate the availability of specialised ICT Teachers, to find out the availability of ICT Equipment and Infrastructure and to establish the impact of making ICT subject compulsory at junior secondary on ICT Literacy.

The study was mainly qualitative using Primary Data with a component of Quantitative using Secondary Data. On purpose, the Examination Standards Officer (ESO) and Statistician at DEBS, 15 Head teachers, 26 teachers were selected while 40 pupils in groups of 10 were randomly selected. Data was collected through Interviews, questionnaires, focus group discussions and observations. Thematic analysis and quick impressionist summary in form of narrative reports were mainly used to analyse Primary Data. For Secondary Data in form of G9 ICT ECZ Examination Results, descriptive statistics using Microsoft Excel was employed.

Findings indicated that of the 15 Public Secondary Schools surveyed, three (03) (20%) had specialised ICT teachers while 12 (80%) Schools had no specialised ICT Teachers employed by the MoGE. Furthermore, results showed that 11 (73%) Schools had 20 computers or more, three (20%) Secondary Schools had 10 computers or more but less than 20 and one Public Secondary School had less than 10 computers. It was also established that the introduction of compulsory ICT Subject had a positive impact on Teachers' Literacy and Competences in ICT and Pupils' Literacy in ICT, but had a negative impact on Pupils' Performance in the Final ICT Examinations due to lack of ICT Equipment. Findings may be used by Standards Officers, Head teachers and teachers to improve the management of ICT subject in the schools and as reference for further studies. The study concluded that the transfer of ICT literacy skills to Pupils may not have been effective due to lack of Specialised ICT Teachers and Equipment.

Keywords: Specialised ICT Teachers, ICT equipment, Examination results, ICT Literacy, Zambia.

ACKNOWLEDGEMENTS

I would like to express my appreciation and sincere gratitude to the following: my supervisor Dr Evaristo Musonda for his advice and guidance to the success of this study, my colleagues Mr Liston Kaputula and Ms Natasha Nyanja for their encouragement and inspiration, The Zambia Air Force through its Training Department for sponsoring me to study at the University of Zambia. I also want to thank the Officials at DEBS, all Head Teachers, Teachers and Pupils in Public Secondary Schools of Livingstone District for the valuable information they provided. Special thanks goes to my wife Rabecca Zulu Simulwi, my daughters Zoe and Mudenda Simulwi and my niece Precious Malumbe for their moral support.

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ABBREVIATIONS

ADSL	Asymmetric Digital Subscriber Line
APU	Academic Production Units
CATT	Computer Assisted Teacher Training Activity
CDC	Curriculum Development Centre
CEC	Copperbelt Energy Corporation
CS	Computer Studies
DEBS	District Education Board Secretary
DESO	District Education Standards Officer
DSTV	Digital Satellite Television
DVD	Digital Versatile Disc
ECT	Electronic Communications and Transactions
ESO	Examination Standards Officer
GILO	Girls' Improved Learning Outcomes
ICT	Information and Communication Technology
ISP	Internet Service Providers
IT	Information Technology
LIS	Library and Information Services
MOE	Ministry of Education
MoGE	Ministry of General Education
NIED	National Institute of Educational Development
NGO	Non-Governmental Organisation

PD	Primary Data
SD	Secondary Data
TTI	Teacher Training Institute
UN	United Nations
UNZA	University of Zambia
UPS	Uninterruptable Power Source
USA	United States of America
ZAMTEL	Zambia Telecommunications
ZICTA	Zambia Information and Communication Technology Authority

CHAPTER ONE: INTRODUCTION

1.1 Overview

This chapter introduces the study by discussing background of the Problem, defining the problem the study attempted to solve and state the objectives to indicate the directions the study took. Furthermore, the chapter outlines the questions the study sought to answer followed by justifying the study and lastly but not the least, outlining the limitations of the study.

1.2 Background of the Problem

For quite some time now, Information and communication technologies (ICTs) have been considered as a necessity to education as they are seen to have the potential to transform education and student learning, especially in developing countries [1]. In Zambia, many efforts have been made to integrate ICTs in the Education sector. In 2006 a project called iSchool was established for the purpose of delivering the National curriculum online, this project aimed at changing the pedagogies used in schools and deliver exciting, hands-on learning to students of all ages or ability across the country [2]. This is a good program which encourages the use of ICTs to customise learning and teaching but does not emphasises on integrating ICT as a Subject. However, the iSchool Project would help to successfully integrate ICT Subjects in Schools and further promote ICT literacy among Teachers and Learners. Efforts to integrate ICTs in Schools have been faced with some challenges such as insufficient ICT equipment and lack of electricity in some Schools mostly those in rural settings.

By 2010, sixty Percent of the country's population was still leaving in rural areas [3], this may be an indication that most people in the country were not accessing ICT efficiently due to lack of electricity, therefore most of them remained ICT illiterate since most ICT equipment require the use of power. The integration of ICTs in learning and teaching practice was very limited in the beginning, but after the introduction of Computer Studies (CS) as a compulsory Subject, the situation started changing [4] thereby promoting ICT literacy among Teachers and Learners.

The Government of the Republic of Zambia has made significant reforms to improve the ICT sector in the country, this is partly demonstrated by the adoption of ICT as

the priority sector in the Fifth National Development Plan (FNDP) (2006-2010), the introduction of Teacher Education in ICT at all teacher training Institutions (TTI) in the country, developing a national ICT curriculum, implementing special schemes and policies to facilitate easy acquisition of ICT Equipment for both learners and teachers and promoting internet access at all levels of the education system [5].

In view of the above stated adoption and approval of the National ICT policy, the Zambian Government through the Ministry of Education (MOE) introduced ICT subjects in the Schools in 2014 and made the subject compulsory at Junior secondary [6], with the ICT subject at Junior Secondary being called Computer Studies (CS). The introduction of this subject was a source of concern to many due to the fact that some rural areas of the country were not electrified and other issues of concern were that of lack of computers and incompetence of many teachers in most schools who would need training before teaching their classes. Reference [7] Stats that, “It has been observed by members of society that the introduction of Information and Communication Technology (ICT) subject in schools under the new revised curriculum has led to different outlooks, especially in Educational institutions in Zambia”.

1.3 Related Works on ICT Subject in Schools

Banda [8] investigated whether or not the teachers and pupils were using ICTs in their teaching and learning of other curricula subjects, what materials were available in the implementation of ICTs in Primary Schools, challenges teachers were experiencing in the implementation and interventions to improve the delivery of ICTs. The study states that there was low availability of ICT Teaching and Learning Materials including poor infrastructure in Schools. Findings of the study also suggested that some teachers resorted to using some personal ICT materials to help in teaching and that some schools were not electrified. Findings also indicate that the teachers were lacking knowledge and skills in ICT, but had much interest in teaching the subject. On the other hand Mulenga [9] tried to investigate whether the implementation of Computer Studies curriculum was a failure or a success, the study was conducted in Ndola District and indicates that the implementation of the curriculum faced a number of challenges which included: Inadequate funds to purchase ICT Equipment, lack of Infrastructure such as Computer Laboratories,

lack of trained Teachers to teach the subject and inadequate Books and other Materials. The study concluded that the implementation of CS curriculum was a failure in Ndola District.

Furthermore, study [10] was conducted in Mwanabombwe District and investigated barriers to effective implementation of CS curriculum in selected Junior Secondary Schools. The study indicates that there was lack of ICT equipment and Basic Infrastructure in Schools to support the implementation process and further highlighted on the effects of teacher training and exposure to ICT by teachers. The study employed descriptive statistics to analyse the data collected and it establishes that only about 10% of the Schools investigated had successively implemented the Curriculum. Major challenges outlined in the study include inadequate funds to procure ICT equipment, lack of computer laboratories, lack of trained computer teachers and lack of revision materials [10]. The study did not indicate whether transfer of ICT literacy skills was taking place effectively.

Pelekole [11] investigated experiences of teachers and learners in the teaching and learning of Computer Studies at Junior Secondary School level in three selected Secondary Schools of Luanshya District. Findings indicate that the teaching and Learning of CS had positively empowered Teachers and Learners with various long life technological skills such as browsing, typing and researching via internet. The study further states the benefits of CS to Teachers and Learners and further indicates challenges being experienced by Teachers and Learners which included lack of teaching and learning equipment and other ICT facilities, incidences of power outages, lack of modern school computer laboratories, inadequate trained personnel, negative attitudes from parents toward the teaching and learning of computer studies, lack of funding from Government, overcrowding of classes and high rate of theft of computers in schools among others challenges [11]. This study also under objectives one and two established that most Secondary Schools in Livingstone District lacked specialised ICT teachers and ICT equipment and infrastructure.

A study which was conducted in Mazabuka district investigated teachers' and pupils' perceptions of Information Communication Technology (ICT) as an examinable curriculum Subject in Secondary Schools [12], the study utilised descriptive research design. Findings of the study indicate that both the teachers and pupils had positive

perceptions towards ICT as an examinable curriculum Subject as most of participants were of the view that current times demanded for ICT knowledge and skill in order for one to be effective and contribute positively in the world of work. The study also established that; lack of trained ICT teachers, inadequate computer hardware and software and irregular power supply were some of the challenges secondary schools faced in the management of ICT Subject. However, the study did not state whether positive perception by both teachers and pupils translated into effective ICT literacy skills transfer of which this study established.

Nyanja [13] employed a descriptive survey design to explore effects of the implementation of the ICT Subject(s) in primary education in selected Schools under Lusaka Province. Results of the study indicated that different schools had implemented ICT in Education subject(s) differently; findings of the study also showed that schools in peri-urban areas had low availability of ICT infrastructure compared to schools in urban areas which have been receiving support in form of computers and other ICT Equipment from corporate firms and Non-Governmental Organisations (NGOs). The study also indicated lack of qualified teachers, inadequate resources and lack of electricity in some peri-urban areas as some of the challenges schools are facing in successful implementation of the ICTs in education subject(s).

From the related works, it was noted that all studies investigated and state the challenges the schools, teachers and pupils were facing in the implementation of ICT as a curriculum subject, these included lack of specialised ICT teachers and lack of ICT equipment and infrastructure in most cases. This study also established under objectives one and two that, this was also the case with most secondary schools in Livingstone District. however, Mulenga [9] specifically states that implementation of ICT curriculum was a failure in Ndola District and [10] further highlights the effects of teacher training and exposure to ICT on implementation of the ICT curriculum, this study also highlighted the training in ICT, competences and exposure to ICT of teachers teaching ICT subject which is cardinal in imparting ICT literacy skills to learners. Pelekole [11] states the experiences teachers and pupils had in learning and teaching of ICT and also reports the benefits of ICT subject to teachers and pupils. Study [12] was conducted in Mazabuka District which is under the same Provincial Management with Livingstone District where this study was conducted, however,

Moono [12] investigated the perception of both teachers and learners on ICT as an examinable curriculum subject while this study looked at the impact of compulsory ICT subject at junior secondary on ICT literacy in Secondary Schools.

It was therefore observed that related studies did a recommendable job in investigating the implementation of ICT as a curriculum subject and challenges which were being faced in the schools regarding teaching and learning of ICT subject which eventually were likely to affect the transfer of ICT literacy skills to learners. However, it appears no study looked at the impact of making the subject compulsory at junior secondary on ICT literacy which this study established. In addition, this study further indicated how the above stated challenges had the potential to affect the performance of the pupils in the grade nine (9) Examination Council of Zambia (ECZ) Final Examinations.

1.4 Statement of the Problem

Since the introduction of ICT as a compulsory subject at junior secondary by the Ministry of Education (MOE) in 2014 [6], studies including [8],[9],[10],[11] and [12] have been conducted in different districts of the country to investigate the implementation of the ICT curriculum in selected Primary and Secondary Schools. Ref [9] states that the implementation of the ICT curriculum was a failure in Ndola District and other studies outline many challenges that were faced by Schools in the implementation process. Related studies further indicate that, apart from insufficient ICT equipment in some Schools and lack of electricity in most rural based schools, trained Teachers in ICT are not available to teach the subjects in the Schools. If these challenges are not attended to accordingly, this could negatively impact the teaching of ICT Literacy Skills thereby affecting the performance of most pupils in the Final ICT Examinations. In this regard, it appears little has been done to investigate the impact of making ICT Subject compulsory at Junior Secondary on ICT Literacy in the Schools. It was therefore necessary to conduct this study.

1.5 Purpose of the Study

The Purpose of the study was to establish the impact of making ICT Subject compulsory at Junior Secondary on ICT Literacy in Secondary Schools of Livingstone District.

1.6 Specific Objectives

1.6.1 To investigate the availability of specialised ICT Teachers in Secondary Schools of Livingstone District

1.6.2 To find out the availability of ICT Equipment and Infrastructure in Secondary Schools of Livingstone District

1.6.3 To establish the impact of making ICT Subject compulsory at Junior Secondary on ICT Literacy in Secondary Schools in Livingstone District.

1.7 Research Questions

1.7.1 How available are specialised ICT Teachers in Public Secondary Schools in Livingstone District?

1.7.2 What ICT Equipment and Infrastructure is available in Secondary Schools to support the teaching and learning of the subject in Livingstone District.

1.7.3 What is the impact of making ICT Subject compulsory at Junior Secondary on ICT literacy in Secondary Schools of Livingstone Districts?

1.8 Significance of the Study

The study will inform the standards officers and curriculum developers on the availability of specialised ICT Teachers and Equipment availability in Schools and further inform them on the impact of compulsory ICT Subject on ICT literacy in Secondary Schools. Findings of this study will also help School Managers and Teachers identify areas where they might be lagging behind regarding teaching and learning of ICT literacy skill and make adjustments to improve or sustain good performance. It is also hoped that the Study will contribute to the body of knowledge in ICT that could be used as reference for future research

1.9 Conceptual Framework

The successful implementation of any education curriculum is dependent on the availability of input resources and is best measured by the output performance of the learners in the Final Examinations. In this case, the successful implementation of ICT as a Compulsory Subject in Secondary Schools will help to successfully impart

ICT literacy skills in learners and is dependent on availability of specialised ICT Teachers and ICT Equipment. This has an impact on ICT literacy in Schools and is best measured by pupils' performance in the Final ICT Examinations. Figure 1.1 bellow shows the structural representation of the Conceptual Framework. The structure is a three (03) tier, with tier one discussing input resources necessary to successfully implement the ICT curriculum in Schools which is represented at tier two (02). At tier three (03), the structure talks about ICT Literacy in Schools and output performance of the pupils in the final ICT examination. Performance of the pupils can also be used to measure ICT literacy levels of the pupils.

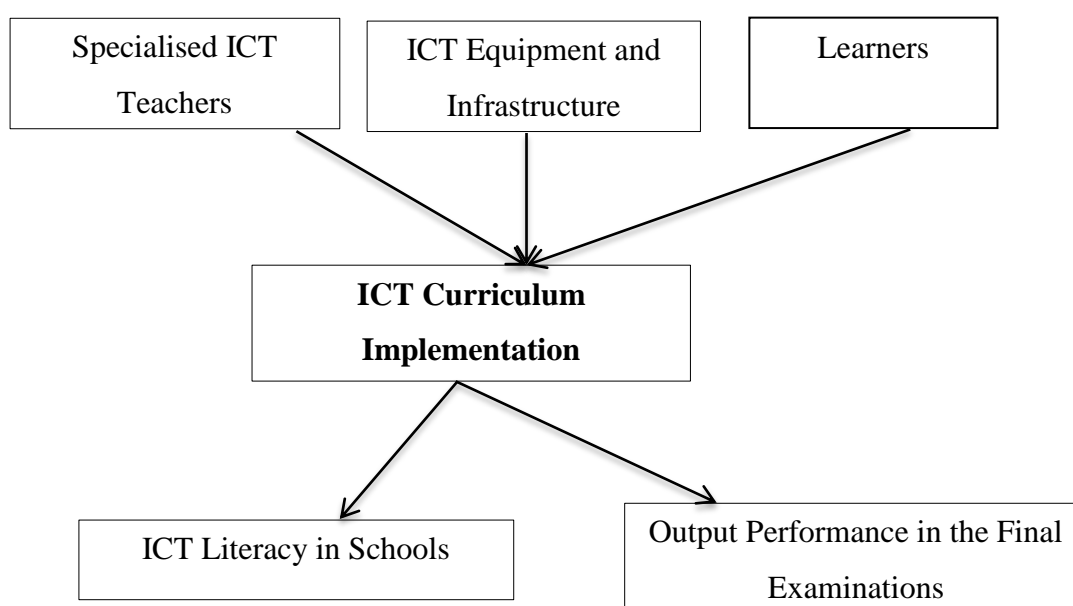


Figure 1.1: Structural Representation of Conceptual Framework

1.10 Operational Definitions

In this study, key terms will mean:

Information and Communications Technologies (ICTs): To include all Internet Service Provision (ISP), Telecommunications Equipment and Services, Information Technology (IT) Equipment and Services, Media and Broadcasting, Libraries and Documentation Centres, Commercial Information Providers, Network-Based Information Services and other related information and communication activities

ICT Literacy: Using digital technology, communications tools, and/or networks to Access, Manage, Integrate, Evaluate, and Create information in order to function in a knowledge society and numeracy, as well as critical thinking and problem solving

1.11 Ethical Considerations

The researcher explained to all participants the purpose of the study and what would be done with the data to uphold confidentiality. All respondents consented before data was collected and all Public Secondary Schools surveyed were coded from 1 to 15 to protect the identity of the Schools. Ethical clearance was obtained from the University of Zambia (UNZA) Ethics Committee.

1.12 Dissertation Organisation

This Chapter introduced the study by outlining the background of the problem, then stated the problem statement, thereafter listed the specific objective and questions, stating the importance of conducting the study and then discussed the conceptual framework the study adopted. The rest of the report is organised as follows: Chapter two discusses literature review; Chapter three outlines the methodology; Chapter four presents the findings of the study; Chapter five discusses the findings and lastly but not the least Chapter six presents the conclusion and recommendations. At the end the references and Appendices are presented.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview

This chapter outlines literature review, starting with a brief background on ICT in Zambia, followed by literature review as guided by the research objectives of the study. Information was gathered from books, Journals, PDF downloads and some useful internet websites.

2.2 Information and Communication Technology in Zambia

ICT phenomenon covers a wide scope but the United Nations (UN) considers ICTs as to include Internet Service Provision (ISP), Telecommunications Equipment and Services, Information Technology Equipment and Services, Media and Broadcasting, Libraries and Documentation Centres, Commercial Information Providers, Network-Based Information Services and other related information and communication activities [14]. Most developed countries' ICT sectors are well established, for example United States of America (USA), Russia and Great Britain among others as outlined by literature review. However, for some developing nations like Zambia the ICT industry is still growing.

Development of ICTs in Zambia started gaining momentum in the 1990s when the country was among the early Sub-Saharan Countries to embrace the internet with the installation of Dial-up and Satellite Technology at the University of Zambia [15]. The Zambian Government recognises ICT as a contributing factor to economic development, and as such in 2006, the Government launched the ICT Policy which focuses mainly on three core thematic areas and thirteen pillars. The three core areas are Capacity Building, a Competitive and efficient ICT sector and an Effective Legal and Regulatory Framework [16].

ICT in Zambia has been developing steadily and at a relatively fast rate due to a number of contributing factors among them increasing presence of Internet Service Providers (ISPs). Not long ago, the country had six wholesale ISPs namely; Airtel Zambia, Zamtel, MTN Zambia, Fibrecom Zambia (a subsidiary of ZESCO) and CEC Liquid [16], however, in 2016, Vodafone Zambia joined the market to offer broadband and network services bringing the total number of ISPs to seven [17]. In

the last four years, the Nation has seen substantial investments in fibre technologies by carrier of carriers like Fibrecom Zambia and CEC Liquid [16].

Other notable factors that have aided the rapid growth of ICT sector include measures put in place by the Government of the Republic of Zambia such as among other documents the approval of the Electronic Communications and Transactions (ECT) Act No. 21 of 2009. These documents established a new institutional, legal, and regulatory environment for ICT development [15].

2.3 Information and Communication Technology in Schools

Information and communication technology (ICT) has become, within a very short time, a necessity in building any modern society. Countries in the world regard understanding ICT literacy skills and mastering the basic skills and concepts of ICT as central in any education system, alongside reading, writing and numerical competency [18]. It is with this perspective that many governments both developed and developing have adopted ICT subjects in their schools.

2.3.1 ICT Subjects in Developed Nations

Early research on ICTs indicate that in Europe, Sweden is one of the Countries standing out at the top regarding the use of ICT as a tool for socio-economic development, one of the contributing factors to this status is that, the Swedish Government introduced ICT Subject in the curriculum across all Schools as early as 1994 and most Schools were targeting that by 2015, each pupil should have a tablet for the school which the learners would take home to continue with school work, Apple was the targeted brand [19]. Today many other developed nations have utilized opportunities ICTs present to develop their economies to where they are. They have put in place policies which have promoted ICT Literacy from the grassroots. For instance, the Swedish Government has taken advantage of the opportunities that digitisation offer by introducing and promoting a strategy called “ICT for everyone” a Digital Agenda for Sweden and further proposed a new goal for the national ICT policy which states that “Sweden should become the best in the world at exploiting the opportunities of digitisation”, with a vision that all learners upon completing Primary and Lower Secondary School, must be ICT Literate and be able to use modern technology effectively and efficiently [20]. This may indicate

that in order to effectively achieve any ICT policy goal, education provided across the country should be uniform regardless of the area.

In Bulgarian Schools, the ICT Subject was formally introduced in the Schools in 1998 when the first national strategy for ICT was devised, the Subject was handled as an independent curriculum subject with its own allotted teaching time and new pedagogies which promote a project oriented approach with an emphasis on ‘hands on’ [21]. The ICT Subject in Bulgaria is called Technology, and is one of the compulsory subjects being offered from Grade 1 to 10 [22]. However, this study investigated the impact of making ICT subject compulsory at Junior Secondary.

In this age, information technology competencies are at the front among new competencies, therefore broadly understood information literacy, ICT literacy, or digital literacy became to be seen as the second literacy. In the Czech Republic, the ICT curriculum has been adopted in Primary and Lower-Secondary Schools in a more extended spectrum through compulsory and elective subjects as follows: ICT, integrating informatics or ICT topics into other subjects and using ICT in other subjects [23]. Just like at Junior Secondary in Zambia, at lower secondary level in Czech Republic, ICT subject is compulsory in all cases and is considered not only as an independent School subject but as a tool for problem solving and as a basis for enhancing teaching and learning [24].

Furthermore on ICT as a Subject, the Norwegian Government promotes an education system which is based on the principle of equal and adapted education for all in an inclusive, unified school, and as such all Public Education in Norway from Primary to Upper Secondary is free, and all children are guaranteed and obliged to complete ten years of basic education from the age of six [25]. In order to achieve these pillars, the Norwegian Government has identified some issues that need to be put in place which include: ensuring that the whole of Norway has access to broadband internet; ensure target universally-designed technology; to strengthen the commitment to Literacy/Digital Skills in the population and intensify ICT commitments in education [25].

In the United States of America (USA), in some curricula ICT is not taken as a clear cut Subject in the Schools but as learning and teaching tool where learners and teachers are expected to acquire ICT Literacy skill in the process, while in some it is

presented as a subject which need to be taught with six basic foundational standards that students must grasp from Grade four (4) to Grade 12 which require students to acquire certain knowledge in relation to ICT [26]. In the United Kingdom (UK), ICT and Computer Science are considered as separate subjects that overlap especially in the early stages of education, but as the learners advance toward specialised stages deferring characteristics emerge which defines the two as separate subjects [27].

Following the introduction of the first Government Policy on ICT in Education in 1997, massive investment were made on ICT Facilities and Training in Irish Schools, however, these investments started in the late 1990s because Ireland also recognizes that if its young people have to remain relevant in this world of technology, they have to acquire ICT Literacy Skills at quite an early stage [28]. This demonstrates that before the ICT Subject was introduced as a Compulsory Subject in schools, all necessary equipment and infrastructure were put in place.

In South Korea, ICT Education is protected and safeguarded by a number of laws and regulations such as Article 23 of the Basic Law of Education though most of the laws and regulations promote the use of ICT in schools as opposed to adopting ICT as a subject, however, the Ministry of Education Science and Technology (MEST) recommended that ICT subject be integrated in primary and secondary schools in 2000 [29].

From the literature reviewed on these few countries it can be seen that the current status of ICT Subjects in the Education Sector varies from one Country to another. The Countries that have been discussed have adopted different strategies to try and facilitate the integration of ICT in the schools both as a subject and a tool for learning and teaching. A small-scale international comparative study that was conducted in the UK in 2011 indicates that, different terminologies are used in different countries worldwide to describe the subject areas of ICT and Computing, these include: Technology or Technology Literacy, Informatics and Computer Sciences, Computer Studies or Computer Engineering Technology and many others, however the ICT subject is not represented at all in some curriculum, while in some it is optional and in others mandatory, also the age at which ICT Subjects are introduced to Pupils differs from one Nation to another [30]. However, most

countries have the common goal of promoting ICT literacy among Teachers and Learners in Schools which is believed to have positive impact on Socio- economic development.

2.3.2 ICT Subject in Developing Nations

Many Sub-Saharan African countries are progressing well in promoting ICT literacy by integrating Information and Communication Technologies (ICTs) into their education systems especially in Primary and Secondary Schools Curricula. In Cameroon, ICT subjects were officially introduced in schools in 2001 and since then many educational reforms have been made, however, successful implementation was hindered by some challenges such as lack of infrastructure, insufficient ICT equipment, inadequate number of qualified teachers and out dated pedagogies among other challenges [31]. While in South Africa, a 2004 White Paper on e-Education introduced the new Strategy (2013-2025) which serves as a plan for the implementation of e-Education in the Education Sector and the outcome of the plan is to integrate ICT into all levels of Education and Training sectors through training of Teachers in ICT and Professional Development, and to ensure that ICT Equipment and Infrastructure are implemented in all Districts and Schools in order to improve the standards of teaching and learning [32].

In Egypt, the impressive development in application and usage of ICTs were encouraged by the technical and institutional growth initiated by the government in 2000, however, preparations for a technology education started in the late 1990s [33]. Recently the Government of Egypt through its Ministry of Education (MOE) made efforts to promote all ICT in Education through its guiding principles of Standards-based Content, Active Learning Methodology, Integration of ICT and Learning Materials [34]. The aforementioned and discussed efforts and strategies demonstrate the seriousness of the Egyptian Government to integrating ICTs in schools though mostly as a tool to improve learning and teaching and not entirely as a subject. However, these strategies will encourage ICT literacy among Teachers and Learners.

Furthermore on ICT subject in schools, even though massive ICT Equipment roll out and other forms of investments in the Nigeria's Education system did not yield much results when compared to similar investments made in other sectors of the country's

economy [35], the Government realised the importance of ICT in Education, and therefore, concluded the development of the National Policy on Computer Education which started its development in 1988 and was designed to promote the integration of ICT into the educational system in order to equip Pupils with ICT Literacy skills [36]. Furthermore, the Nigerian National Policy for Information Technology (IT) emphasised three major objectives as follows: to empower youths with ICT literacy skills, integrate ICT into the mainstream of education and establishment of multifaceted ICT institutions such as Centres of Excellence of ICT [37]. However, the integration of ICT in the education sector of Nigeria has not been a smooth one due to some challenges such as unavailability of ICT Equipment among other challenges [38] which are synonymous with challenges many Schools are facing in many parts of Zambia as indicated by findings of related works.

In Namibia, a number of studies have reviewed that, there are documents which support the introduction of the ICT curricula in the education sector such as; Vision 2030, Strategic plan for The Ministry of Basic Education (2001 – 2006), National ICT Policy and the ICT Strategy for Ministry of Higher Education among others [35]. The Namibian Government through the National Institute for Educational Development (NIED) which functions under the Ministry of Basic Education, developed a National Policy for ICT in Education in 1995, the Policy was updated by the two Ministries in charge of Education in 2004 and stated the justification for introducing ICT Subjects in the Education System and further outlined the policy options, software and hardware requirements, training needs and qualitative estimates of costs [39].

Furthermore on Namibia, the ICT Literacy Syllabus for Primary and Secondary Schools aims at; equipping the learner with knowledge in ICT tools and how to use them, also to enable the learner be able to utilise ICT tools after they have graduated either for further studies or in their everyday work and further help learners who would want to take up careers in technologies have a foundation to build on and capacity to be able to communicate locally and internationally effectively [40]. From literature reviewed, it can be noted that lack of ICT equipment in schools is a common challenge to many developing nations and not the case with developed nations as earlier highlighted.

2.4 Teacher Training and Competences in ICTs

2.4.1 In Developed Nations

A Trained Teaching Staff and Competences in the use of ICTs are some of the requirements in the successful implementation of the ICT curriculum in the schools, many countries which have fared well in adopting ICT Subjects in their education sectors made significant reforms by introducing ICT training in most Teacher Training Institutions (TTI), for example, in 2006 the Norwegian Ministry of Education and Research introduced a new educational knowledge promotion reform which highlights five important skills that should be imparted to a teacher during initial training, one of the five skills is “ Being able to use digital tools.” [41]. Such reforms promote Teachers competence in ICT, and this will enable teachers to effectively impart ICT literacy skills to learners in the Schools when they graduate.

Regarding competences and literacy of Teachers in ICT in Ireland, Only 30% of Primary School Teachers rated their ICT competences and skills either “Average” or “Above Average”, however, most of them were newly graduated teachers, the survey also indicate that a good number (40%) of teachers lack intermediate or better ICT literacy skills and competences and the few who are competent do not use them in their teaching practice [28].

In Sweden teacher training is considered a long programme, students who intend to teach at early childhood education (ECE) or Children from the ages of one year to twelve years do their training for three to five years while those intending to teach teenagers and above do their training for four to five years, and to obtain a teacher’s degree, the student teacher must be ICT literate and be able to use information technology in teaching [42]. Therefore in Sweden, it is a standard that everyone with a teaching degree has basic literacy skills in ICT and this makes it easy to successfully adopt ICT subjects in the schools.

Bulgaria launched the National Strategy for the introduction of ICT in Education in early 2000, this was followed by educational reforms which were aimed at supporting the implementation process, one of the reforms was to train teachers in ICTs and equip them with necessary skills cardinal to the successful integration of ICTs in the education system [43]. This is because human factor cannot be neglected

in this whole process that is the willingness and enthusiasm by teachers to acquire skills in ICTs which they will competently apply in their teaching process.

In other countries like the USA, the government emphasises that there should be specialised teachers who teach ICT in Public Schools, however the Government further encourages that this should not be left as a sole responsibility of ICT Teachers or Technology Teachers, but that every Teacher should have the knowledge of the ICT content [26]. Therefore in the USA all teachers are encouraged to have basic knowledge and Literacy Skills in ICT as opposed to only Teachers Teaching ICT subjects, because it is expected that every teacher should use ICTs to enhance their teaching.

A study conducted to analyse country reports mostly of Developed Nations indicated that many students in the these Countries showed interest in learning ICT and most of them had ICT equipment such as Laptops and Desktop Computers and some even had both, the study states that, in the United Kingdom, the end of course ICT audit for the 2008-2009 period outlined that, at the start of the Course at one of the Training Institution, 84% of the student teachers owned a laptop, rising to 99% by the end of the course. In Sweden and Denmark 99% of the students reported having either a Laptop or a Desktop Computer at home, and a third reporting having both [44]. Thus, in order for a teacher to be comfortable and effective in implementing ICT curricula and be able to incorporate ICTs in teaching activities, continuous and sustained training is needed [45].

2.4.2 In Developing Nations

A programme for professional staff development should be put in place the moment the ICT Curriculum for schools is being developed. However, in order for this staff development programme to be successful, there are some preliminary issues that should be done such as, creating awareness among Teachers regarding available Technologies and how they may be used in their professions [38]. The Government of Rwanda uses enhancing teacher capabilities in and through technologies as one of the strategies to develop a high quality skills and knowledge base and training for all Teachers to increase the resource base and improve education delivery at all levels of the education system [46], therefore making it possible to successfully integrate ICT subjects in the schools.

Literature review has demonstrated that there is no single way of conducting professional development programmes, some governments encourage Schools to organize meetings and sessions or in-service courses when teachers are not occupied where they can be trained by an expert colleague or an expert from a training institution on how to use particular software or any other ICT operations. On the contrary, as much as this initiative is helpful and cost effective, it is recommended that a systematic Programme of Professional Development for Teachers be organised to equip all teachers with sufficient skills and knowledge for successful implementation of the ICT curriculum and promotion of ICT literacy at all levels of the education system [38].

In Namibia, ICT was adopted as a subject in 2003 but efforts to integrate ICT subjects in the education sector had already started by 2001, since then, the USAID supported three successive initiatives related to the integration of Information Technology in the Education Sector in Namibia, among these was the Computer Assisted Teacher Trainer Activity (CATT) under the LearnLink program which is the initiative for Namibian Education Technology (iNET) and was implemented from 2003 to 2006 and helped to boost the implementation process by training some teachers and teacher educators in ICTs both as a subject and a tool for all curricula [47]. In general sense, it has been emphasised that teachers should be guided on how to integrate the ICT curricula and be encouraged to apply ICTs in their teaching activities.

On the other hand, teacher Development Programs which only aim at training Teachers how to use ICTs do not help much in the successful integration of ICT Subjects in the Schools, because every program should first aim at answering common concerns most Teachers have such as what computers do, how to set up my class to facilitate use of computer etc. [48]. The other way to promote ICT Literacy skills development among Teachers and Learners is to integrate ICTs in the schools where computers and the internet are used as learning and teaching tools across all curricula which is the strategy used in other parts of the US as indicated earlier in the literature review.

Similarly in Zambia, in addition to introducing ICT at all TTIs and introducing Teacher professional development programs, the Zambian government need to

encourage the use of ICTs as learning and teaching tools across all curricula in order to speed up ICT literacy skills development and integration of ICT subject in the schools.

2.5 ICT Equipment in Schools

2.5.1 In Developed Nations

In Sweden most teacher trainers and students in TTIs have Personal Computers (PCs) which makes imparting of ICT Literacy skills and knowledge easier and helps student teachers to develop competences in ICT which helps them to successfully implement the ICT Curriculum in the Schools when they graduate, however, at a particular TTI the library alone offers 250 computers for the 7,600 students to use, and in addition, separate faculties and departments have their own Computer Labs [42]. In the United Kingdom, 65% of Primary Schools and 63% of Secondary Schools confirmed to have sufficient ICT Equipment and good Computer access for learners by 2011, this was an improvement compared to around 25% for Primary Schools and 18% for secondary Schools in 2005 [49]. This is a clear demonstration that in the last decade, the UK governments have invested massively in ICTs for Education.

The Government of the Republic of Czech devised a Government Informatics Policy in Education (GIPE) which was implemented in two phases from 2001 to 2006, during this period a total of 25, 000 computers were distributed in schools [50]. This may be considered as a significant investment in ICT in education and clear demonstration of Government's commitment to stock schools with necessary ICT equipment.

2.5.2 In Developing Nations

The Republic of Egypt through the Ministry of Education in partnership with GILO project ensured that necessary ICT Equipment were available in the Schools to support the successful integration of ICT Subjects and for use in teaching and learning of other subjects in the schools, this whole process took more than 18 months and was conducted in three main phases as follows: site preparation; procurement, installation and Internet connectivity; and training and asset management [34]. Some of the equipment that was installed in the GILO supported

Schools include: Desktop Computers (1,380), Notebook Computers (858), Projectors, Spare Lamp Bulb, Display Screen, Laptop, Laser Printers (332- 2 per school), Flatbed Scanners (330-2 per school), Universal Power Supply (UPS) 332, Digital Camera (166 -1 per school), Filtered Internet Service (target 50% of schools with ADSL coverage), Webcams and Headsets [34]. Despite the presence of all this much needed equipment in the schools, ultimately, the need for well trained and competent teaching staff in ICT cannot be ignored because it is from such a background that teachers draw confidence to deliver as expected.

In Nigeria, available ICT Equipment in the Schools include; Computers, Radios (tape recorders), Television Sets, Video Disc Players and Bullet Boards, while some facilities such as Projectors, Electronic Notice Boards, Internet Services and Filmstrips were scantily available in Schools [40]. However, most ICT equipment available is not sufficient as can be seen from Table 2.1 which outlines availability of ICT equipment in Secondary Schools of Nigeria, available Computers stand at 40.5% while Computers not available are at 59.5%. The rest of the ICT equipment available are as indicated in Table 2.1 below.

Table 2.1: Available ICTs in Secondary Schools of Nigeria

S/N	Items	Available	Percent	Not Available	Percent
1	Computer	146	40.5	214	59.5
2	Radio	208	57.8	152	42.2
3	Projectors	53	14.7	307	85.3
4	Television Set	212	58.9	148	41.1
5	Video	193	53.6	167	46.4
6	Slides	126	35.0	234	65.0
7	Film Trips	108	30.0	252	70.0
8	Electronic Notice Boards	56	15.6	304	84.4
9	Internet	83	23.1	277	76.9
10	Disc Player	146	40.5	214	59.4

Other studies revealed that in Yobe State of Nigeria most Technical Colleges lacked ICT Equipment and facilities to support Teaching and Learning [51]. In other states in Nigeria, such as Ardokola and Jalingo, availability of ICT resources in secondary schools was very low, and the utilization of these ICT resources in teaching and learning was very poor [52].

As observed from literature reviewed regarding ICT equipment in some schools of Developing Nations, it could be an indication that in most developing Nations ICT Equipment in schools may not be sufficient, and the available Equipment may not even be well utilised mainly due to lack of training and in most cases this equipment is not evenly distributed in the schools. For example, research in Uasin Gishu County in Kenya revealed that most schools in the area had inadequate ICT equipment and facilities to support teaching and learning of ICT [53]. On the other hand, in Nandi North Sub-County of Kenya, it was reviewed that utilisation of ICT equipment and facilities such as computers, Interactive radio, instruction for in-service management, Laptops and use of internet was much better and was considered very important by Teachers in Schools [54].

Several studies in Zambia have revealed that most Schools do not have sufficient ICT Equipment, however available equipment in Zambian Schools Included Computers, Digital Satellite Television (DSTV) kits, Digital Versatile Disc (DVD) players, Television Set (TV's), Printers, Photocopying Machines, Projectors and Scanners among other ICT Equipment, though in most cases these equipment are not sufficient in Schools and mostly available only in urban based schools and not rural based [55]. In Zimbabwe the situation is similar to that of Zambia where most schools urban Schools have ICT Equipment though in most cases the equipment is insufficient and underutilized mainly due to lack of ICT Literacy skills among learners and Teachers, ICT equipment and facilities available in secondary schools of Zimbabwe include computers, radios, televisions, networks, wireless technologies, interactive boards, internet, email, eLearning applications, video conferencing and projectors [56].

2.6 ICT Subject Outline in Zambian Schools

At Junior Secondary in the Zambian education system the ICT Subject is called Computer Science (CS). The CS Syllabus is not restricted to computers but covers a wide range of technologies with a purpose of equipping learners with necessary ICT literacy Skills for the world of work and enable them further their education within the discipline. The CS Syllabus for Junior Secondary offers a two year period of study and requires that four (04) 40 minute periods be conducted per week as follows: A single double period for practical and two single periods for theory. At

the end of the two year study period, learners are subjected to an examination which is divided into two components, the Theory Examination (Paper 1) which carries 60% and the Practical Examination (Paper 2) which carries 40% of the total mark [57], therefore it is expected that learners should have a practical touch of the technologies and not the theoretical only during the two year learning period at Junior Secondary.

2.7 Information and Communication Technology (ICT) Literacy

In January 2001, an institution called Educational Testing Service (ETS) organised an international panel whose purpose was to investigate the increasing importance of ICTs and their connection to literacy, the panel defined ICT literacy as “Using digital technology, communications tools, and/or networks to Access, Manage, Integrate, Evaluate, and Create information in order to function in a knowledge society and numeracy, as well as critical thinking and problem solving”[58]. Regarding the five elements used in defining ICT literacy, the panel agreed on the following definitions as indicated in Table 2.2 below.

Table 2.2: The Five Elements that Defining ICT Literacy [58]

Element	Definition
1. Access	Knowing about and knowing how to collect and/or retrieve information.
2. Manage	Applying an existing organizational or classification scheme.
3. Integrate	Interpreting and representing information. It involves summarizing, comparing and contrasting.
4. Evaluate	Making judgments about the quality, relevance, usefulness, or efficiency of information.
5. Create	Generating information by adapting, applying, designing, inventing, or authoring information.

Among other competencies, Digital and ICT literacy are among the most required literacies for one to be able to participate effectively in a knowledge economy and an information society, and as a result there is growing interest at National and International level to explore meaningful ways to measure how and to what extent literacy in ICT is being achieved [59].

It was observed by the European Commission that the inability to use or access ICT which has become an essential life competence in this information age has significantly become a barrier to social integration and personal development, this is because ICT literate students understand and articulate issues faster, are better problem-solvers and are able to effectively customise learning [60]. Outside school, ICT literacy is necessary if one is to be productive and remain marketable knowing that employers are looking for people with such skills.

Even though ICT Literacy skills may not appear to be among the much needed skills for today's workforce, efforts should be made to ensure the successful integration of these skills in all education curricula because ICT Literacy addresses the problems of information access, information overload, and information quality faced by students and workers alike [61]. As can be seen from the few references consulted, the importance of being ICT literate in today's information age cannot be over emphasised. This study however, outlined how likely and potentially to what extent ICT Literacy Skills are being transferred and how the stated challenges are affecting Pupil's performance in Public Schools of Livingstone District.

2.8 Qualitative and Quantitative Research Methods

The Qualitative and Quantitative study designs are similar in processes but differ in approaches they use, Qualitative procedure utilise much of text and image data and employ unique methods of data analysis, mostly this data is collected from participant in the locations where the phenomenon being investigated is experienced and in many instances the participants and study sites for a qualitative study are purposively selected so that information collected can be very relevant to the study [62]. This was the case with this study for selecting Secondary Schools of Livingstone District as the research site. Creswell [63] defines qualitative design as "Qualitative research begins with assumptions, a worldview, the possible use of a theoretical lens, and the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem". Qualitative research is also referred to as inoperative research because it relies much on the researcher's interpretations of what they see and hear [64].

On the other hand, Quantitative research tries to quantify data using questions such as ‘how long’, ‘how many’ or trying to measure “the extent to which” and generalise results from a sample of the population under study [65].

2.9 Qualitative Data Analysis

Qualitative data deals with meaning, and there are many ways of analysing this kind of data, however data analysis is basically breaking the data into smaller components to review the characteristic elements and then putting the components together to make a desired body of knowledge [66]. When data have been divided up into sizable bits, each bit can then be linked to a research question, the other method of analysing qualitative data is to use language where we look for catchwords, commonly used words or commonly used metaphors. Themes are also regularly used to analysis qualitative data, these are simply smaller codes aggregated to make a general idea [67].

Before data analysis can be done, data needs to be organised by transferring it from written or spoken, thereafter decide whether to analyse the data by hands which is mostly suitable when dealing with small database say below 500 pages of data or when the researcher is not comfortable using computers or using computer programs, however these only store, organize, code and help in searching through the data and not analysing the data [68].

Qualitative Data analysis may also mean making sense from various data forms which may include images and text data, preparing the data for analysis and thereby deeper understanding of the data, the whole process can be tedious filled with reading the data, reflecting on the literature, thinking, talking, note-taking, writing, and thinking some more [69].

2.10 Summary

This Chapter outlined literature review by first reviewing literature on ICT in Zambia, followed by literature on ICT subjects in schools for both Developed and Developing Nations. Furthermore, the study discussed literature on training and competences of teachers in ICT and availability of ICT equipment in Schools. The chapter also looked at strategies adopted and regulations that were put in place by other countries especially developed ones in order to promote ICT Literacy Skills

transfer to learners in schools. Literature reviewed under this chapter helped to understand the Impact of Compulsory Computer studies on ICT literacy in Schools and necessary regulatory reforms that can be put in place to promote ICT Literacy among Learners and Teachers in Schools. The next chapter discusses the methodologies and methods that were employed in this study.

CHAPTER THREE: METHODOLOGY

3.1 Overview

This Chapter discusses how the study was conducted and outlines the methods followed in this order: Research Design, Research Site, Study Population, Sampling Techniques, Research Instruments, Data Collection Procedures and finally discusses the Data Analysis.

3.2 Research Design

The study was mainly qualitative design using primary data. This design was more appropriate because the researcher collected data by enquiring opinions and experiences of the respondents through interviews, questionnaires and observations [62]. However, the study also had a component of quantitative design using secondary data in form of Grade Nine (9) ECZ ICT Examination Results for Public Secondary Schools collected from the DEBS's office in Livingstone District.

3.3 Research Site

The study was conducted in Livingstone District of Zambia. The District covers an area of about 695 square kilometres [70], sharing boundaries with Kazungula andimba Districts and shares boarder with Zimbabwe. Conducting the study in this area enabled the researcher to compere the findings of this study to the findings of other studies which were conducted in other districts thereby giving a picture of what was obtaining at National Level regarding teaching and learning of ICT Subjects in schools.

3.4 Study Population

The study population [71] covered Officials at DEBS, Head teachers, Teachers and Pupils in Schools of Livingstone District.

3.5 Sampling Techniques

Livingstone District has 54 Schools which have a Junior Secondary section. Of these 10 are Private Schools and 44 are Public Schools broken down as follows; 15 Public Secondary Schools and 29 Basic Schools. This study however, targeted all 15 Public Secondary Schools to avoid outliers and employed Non-Probability Purposive

Sampling [71] to select the Examination Standards Officer (ESO) and the Statistician at DEBs, 15 Head Teachers of all Public Secondary Schools and 26 Teachers who teach ICT Subjects at Junior Secondary in Livingstone District. In addition, forty (40) Pupils in groups of 10 were randomly selected in four different schools for group discussions, bringing the sample size to 81 respondents.

3.6 Research Instruments

The study utilised Interview Guides, Questionnaires, Classroom Observation Guides and Focus Group Discussion Guide [71]. For head teachers, Interviews were used for the sake of clarification were necessary. Low response rate on the questionnaire was not expected since the study was not a country wide or over a very large area. For site visit to the computer lab or classroom observations, observation guide was used.

3.7 Data Collection Procedure

Before data collection was conducted, the researcher ensured that participants and sites to be studied were identified, research permits were obtained, data types to best answer the research questions were considered and all protocols and instruments for data collection were designed [68]. Thereafter, the instruments were tested in a pilot study involving two Secondary Schools of Mumbwa District. Weaknesses in the instruments were identified and necessary adjustments were made so that the instruments would be able to collect data necessary to this study. Then the researcher proceeded with data collection after being cleared by the District Education Standards Officer (DESO) at DEBS.

3.8 Data Analysis

The study utilised the following techniques, using notes from interviews with Head Teachers documents were generated and then thematic analysis was used. For data gathered from questionnaires and notes made from classroom observations a Quick Impressionist Summary in form of narrative reports was used [71]. In addition, direct interpretation was employed where necessary [72]. For secondary data (SD) in form of ECZ ICT Examination results, descriptive statistics [73] using Microsoft Excel was employed. Table 3.1 shows the methods of data collection and analysis that were used to achieve each objective.

Table 3.1: Summary of the Research Methodology

	OBJECTIVE	METHOD	ANALYSIS
1	To investigate the availability of specialised ICT Teachers in Secondary Schools of Livingstone District	<ul style="list-style-type: none"> ▪ Interviews with Head Teachers ▪ Questionnaire to Teachers. 	<ul style="list-style-type: none"> ▪ Thematic analysis. ▪ Quick impressionist summary in form of narrative report.
2	To find out the availability of ICT Equipment and Infrastructure in Secondary Schools of Livingstone District	<ul style="list-style-type: none"> ▪ Interviews with Head Teachers/School managers. ▪ Questionnaire to teachers ▪ Classroom observation 	<ul style="list-style-type: none"> ▪ Thematic analysis. ▪ Narrative report ▪ Direct interpretation
3	To establish the impacts of making ICT subject compulsory at Junior Secondary on ICT Literacy in Secondary Schools of Livingstone District.	<ul style="list-style-type: none"> ▪ Using findings from Objectives 1 and 2, ▪ Focus group discussions ▪ Grade Nine ECZ ICT examination results for Livingstone District. 	<ul style="list-style-type: none"> ▪ Narrative report. ▪ Descriptive statistics using Microsoft Excel

3.9 Limitations of the Study

The study sample comprised respondents from Livingstone District; this is likely to limit the generalization of the results to other parts of the Country. However, this study consulted other related studies which were conducted in other Districts to have a general overview of the management of ICT Subjects in the country.

3.10 Summary

This Chapter discussed the research methods, study design and then stated the site where the study was conducted. The Chapter also highlighted the sampling

techniques which were used to come up with eighty one (81) respondents and furthermore, stated the instruments which were used to gather data. Lastly but not the least, the Chapter discussed how both primary and secondary data were analysed.

CHAPTER 4: PRESENTATION OF FINDINGS

4.1 Overview

This Chapter presents the demographic Information of the participants and the findings guided by the objectives. Primary Data (PD) findings are presented under emergent themes then information is tabulated or presented in graphical form for clarity. For Secondary Data (SD), the outcome of the Grade 9 ECZ ICT Examination Results analysis is presented in charts and graphs for easy understanding.

4.2 Demographic Information of the Participants and Sources of Data

Statistical information gathered from the Statistician at DEBS indicated that Livingstone District had forty four (44) Public Schools with a Junior Secondary component broken down as follows, fifteen (15) Public Secondary Schools and twenty nine (29) Basic Schools. Furthermore, the District had ten (10) Private Schools with a Junior Secondary component bringing the total of Schools with a Junior Secondary section to 54. However, this study surveyed 15 Public Secondary Schools that is Government sponsored and Grant Aided Schools to eliminate the problems of outliers which was common with basic Schools. Table 4.1 below summarises schools with junior secondary section in Livingstone District.

Table 4.1: Schools with Junior Secondary Section in Livingstone District

S/No	Category of School	No. of Schools
	Public Schools	
1	Secondary Schools	03
2	Primary and Secondary Schools (upgraded)	08
3	Grant Aided (Mission) Secondary Schools	04
4	Basic Schools/Upper Primary	29
	Total	44
	Private Schools	
1	Secondary Schools	02
2	Upper Primary/Basic Schools	08
	Total	10
	GRAND TOTAL	54

All fifteen (15) Public Secondary Schools both Government and Grant Aided were visited for data collection, to uphold confidentiality Public Schools were coded from 1 to 15.

Fifteen Head Teachers were interviewed, 08 were female and 07 were male as summarised in Figure 4.1.



Figure 4.1: Gender of the Head Teachers Interviewed in this Study

The period the Head teachers had served as managers of the schools is as indicated in Table 4.2 below.

Table 4.2: Period of Service as Head teachers at The School

Period of Service	Number of Head teachers
Below 1 Year	4
1 - 5 Years	7
6 - 10 Years	3
11-20 Years	0
Above 20 Years	1
Total	15

Statistics show that the Head Teachers who participated in the study were well gender represented with 53% representing females and 47% representing male Head Teachers. Also information collected showed that four (4) had been managing the schools for less than one year, 7 had been managing the schools for over a year but

not more than 5 years while 3 of them had been managing the school for over 6 years but not more than 10 years, one Head Teacher had been Head of the School for over 20 years. This could contribute to the reliability of the findings of this study since most of the Head Teachers had been managing the schools for over one year.

Furthermore, it was established that twenty nine (29) Teachers were involved in the teaching of ICT Subject at Junior Secondary in the District. Twenty six (26) Teachers were given questionnaires while the other three were not available during the period of data collection. The response rate for this instrument was 100%. Demographic information of the Teachers who participated in this study is tabulated in Table 4.3 below.

Table 4.3: Demographic Information of Teachers

Gender	No. of Teachers	Percentage
Female	12	46%
Male	14	54%
Total	26	100%
Age		
19-25 Yrs.	02	8%
26- 35 Yrs.	14	54%
Above 35 Yrs.	10	38%
Total	26	100%
Period of Service		
Below five (5) Yrs.	13	50%
5-15 Yrs.	08	31%
16-25 Yrs.	05	19%
Above 25 years	00	0%
Total	26	100%
Highest Academic Qualification		
Certificate	00	0%
Diploma	18	69%
Bachelor's Degree	08	31%
Masters' Degree	00	0%
	26	100%

Information shows that gender was well represented among the teachers who were consulted in this study, twelve (12) were female and fourteen (14) were male

Teachers. This demonstrates that ICT subject has been well received by teachers with no gender limitations. Therefore, findings had both female and male perspective of the phenomenon under study. Statistical information also indicated that only 8% of the Teachers were below 25 years of age, 54% were above 26 years but below 35 years old and 38% were above 35 years. This shows that most Teachers who participated in the study were experienced in teaching and therefore information collected from them could be reliable thereby contributing to the credibility of the study.

Focus Group discussions of ten (10) Pupils per group in four (04) Secondary Schools were conducted, bringing the total number of pupils consulted to forty (40). Schools were selected on purpose so as to have a good representation of pupils from all three categories of Public Schools namely Secondary Schools, Primary and Secondary Schools and Grant Aided/Mission Secondary School. Figure 4.2 below shows the gender of the pupils who participated in the focus group discussions.

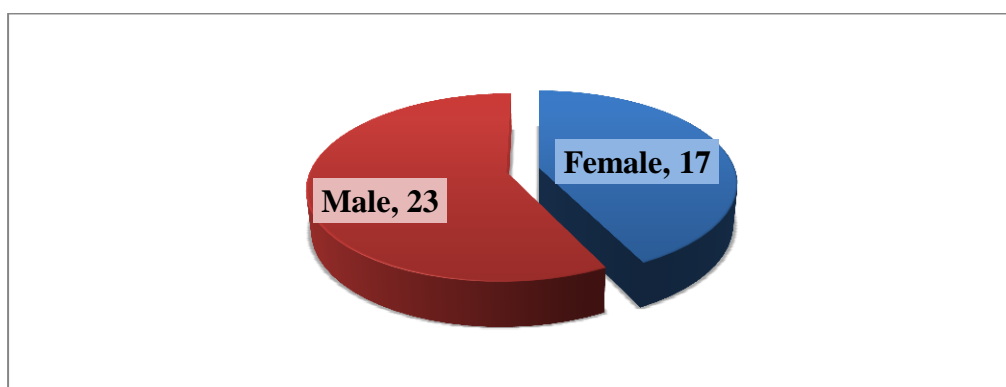


Figure 4.2: Gender of Pupils

4.3 Availability of Specialised ICT Teachers in Secondary Schools

To determine the availability of specialised ICT Teachers in Public Secondary Schools of Livingstone District, Head Teachers were asked how many teachers they had at the school that were trained to teach ICT at Junior Secondary. Responses from Head teachers were analysed under four (04) themes as follows:

1. Trained to teach ICT
2. Trained to teach other Subjects

3. Employed on Parents and Teachers Association (PTA) Basis
4. Teachers' Background and competences in ICT

4.3.1 Trained to Teach ICT

Head Teachers from three (03) Secondary Schools indicated that they had at least one teacher trained to teach ICT who were employed by the MoGE; one Head Teacher said “We have one trained teacher the other one is training now”. While the other Head Teacher stated that “I have four trained ICT teachers”. However, it was noted that of the four only two were specially trained to teach ICT while the other two had done ICT during their initial teacher training in Business Studies.

4.3.2 Trained to Teach Other Subjects

Head Teachers from eight (08) Secondary Schools indicated that they had no teachers who were trained to teach ICT Subject at the School so they had engaged teachers trained in other fields to handle the ICT Subject. One Head Teacher said “They are not trained to teach ICT, they are just knowledgeable”. Two other Head Teachers also argued that the teachers handling ICT had general knowledge in ICT.

4.3.3 Employed on Parent and Teachers Association (PTA) Basis

Four (04) Head Teachers representing 27% Secondary Schools indicated that they had ICT Teachers who were employed by the school on PTA basis just to cushion the lack of trained ICT Teachers at the School. All four (04) Schools had one (01) ICT Teacher each employed on PTA basis. Table 4.4 summarises the training of Teachers who were participating in Teaching ICT Subject at Junior Secondary and how they were distributed in the Schools.

Table 4.4 Training and Distribution of Teachers Teaching ICT

Training of Teachers	Teachers		Schools	
	Number	Percent	Number	Percent
Trained to Teach ICT	04	14%	3	20%
Trained to Teach other Subjects	21	72%	8	53%
Employed on PTA Basis	04	14%	04	27%
TOTAL	29	100%	15	100%

4.3.4 Teachers' Background and Competences in ICT

Under this objective teachers were asked whether they had done any form of training in ICT or at least did ICT during their initial teachers training, twelve (12) Teachers indicated yes, while the other fourteen (14) indicated that they had no training in ICT and were just teaching out of interest. Figure 4.2 shows teachers' background in ICT.

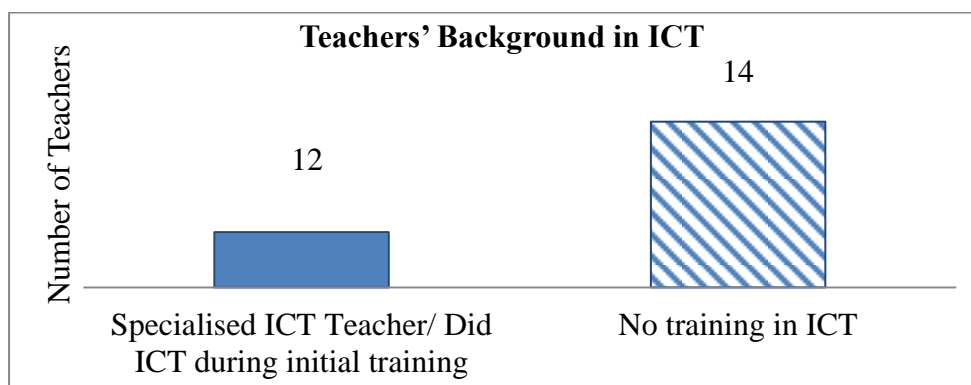


Figure 4.3: Teachers 'Background in ICT

When the teachers were asked how they would rate themselves in terms of skills and competences in ICTs, eight (08) indicated "Above Average", eighteen (18) indicated "Average" and none indicated "Below Average". Figure 4.4 below shows the competences and skills of the Teachers as rated by the themselves.

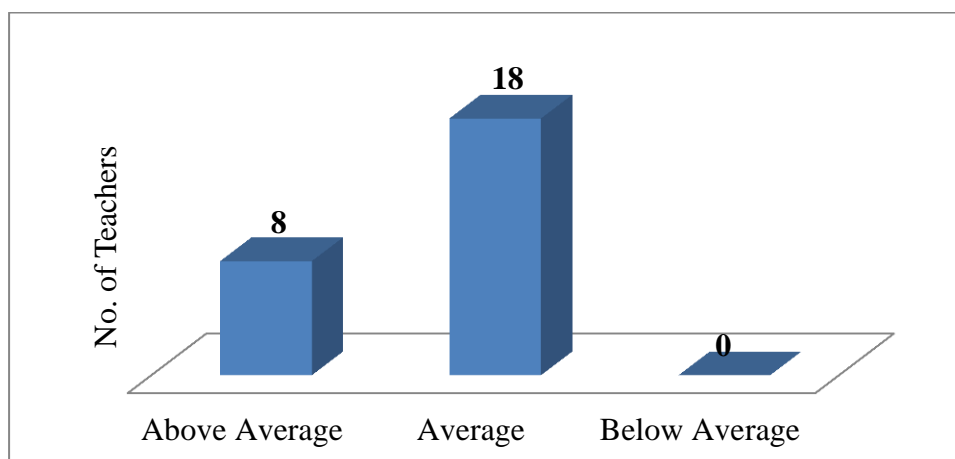


Figure 4.4: Self-Rating of Competences and Skills by Teachers

4.4 Availability of ICT Equipment and Infrastructure

Under this objective Head Teachers were asked the number of computers and classes the schools had at Junior Secondary and what infrastructure was available to

facilitate the teaching of ICT Subject at the School. Findings were analysed under the following emergent themes:

1. Computers are Not Sufficient.
2. Internet Connectivity.
3. Specialised Computer Laboratories.
4. Backup Power Supply.

4.4.1 Computers are Not Sufficient

Head Teachers from two (02) Secondary Schools indicated that they had enough computers. One Head teacher said “I am not sure of the number I need to find out how many are working but we have enough computers.” She further stated that the school had a whole block dedicated to ICTs with three (03) Computer Laboratories and over 40 Computers in total and that the school had four (04) classes of Grade 8 and four (04) classes of Grade 9 excluding APU. The other Head Teacher said “We have about forty (40) computers which should be functioning quite well and in each class we have about forty (40) to forty two (42) pupils, so we have enough computers.”

Head Teachers from six (06) Secondary Schools stated that they had computers but the computers were not enough, one Head teacher had this to say “We have computers but I wouldn’t say they are enough, we need more”

The other seven (07) Head Teachers indicated that, their Schools had serious challenges with computers; one head teacher said “It has been a challenge, we are using refurbished computers which are not enough, they are only 15 and we have 4 streams of classes at Junior with two streams of APU”. Table 4.5 shows availability of Computers in Public Secondary Schools of Livingstone District.

Table 4.5: Availability of Computers in the Public Secondary Schools

School No.	Number of classes		Pupils in a Class	Number of Computers		Computer to Pupil ratio in a Lesson Class	Computer to Pupil ratio at G9 Examinations
	G8	G9		2014	2018		
1	3	3	46	32	32	1:2	1:4
2	4	4	40	48	48	1:1	1:2
3	2	2	47	13	25	1:2	1:4
4	4	4	43	6	15	1:3	1:11
5	3	3	40	4	10	1:4	1:6
6	3	3	45	30	42	1:1	1:3
7	1	1	45	20	20	1:2	1:3
8	3	3	45	0	20	1:2	1:7
9	2	2	40	0	24	1:2	1:3
10	3	3	45	20	20	1:2	1:7
11	1	1	40	0	9	1:4	1:4
12	4	4	42	42	42	1:1	1:4
13	3	3	43	20	42	1:1	1:3
14	3	3	40	0	28	1:2	1:5
15	1	1	28	N/A	16	1:2	1:2
TOTAL				235	377		

Findings indicated that at inception of the ICT subject in 2014 seven (07) Schools had 20 Computers or more. Two (02) Schools had less than ten (10) computers while the other six (06) Schools had no Computers accessible to Pupils. Findings further indicated that later schools started acquiring computers and at the time of this study, eleven (11) Schools had 20 computers or more representing 26% increase in the number of schools with 20 Computers or more. Three (03) Schools had ten (10) Computers or more but below twenty (20) while one (01) School had less than 10 Computers.

Findings further highlighted that four (04) Schools had Computer to Pupil ratio of 1:1 in a lesson class, two (02) Schools had Computer to Pupil ratio of 1:4 in a lesson class, and one (01) school had 1:3 computer to pupil ratio while the other 08 schools had 1:2 computer to pupil ratio in a lesson class. Findings also showed that at Grade nine (9) ICT Examinations, ten (10) Schools had Computer to Pupil ratio of 1:4 or less while five (05) Schools had Computer to Pupil ratio of 1:5 or higher in an examination class.

Under this objective teachers were asked the number of computers which were accessible to learners at their schools. Teachers from three (03) Secondary Schools indicated that they had 5 – 15 computers, teachers from six (06) Secondary Schools indicated that they had 16- 25 computers at their schools, Teachers from another six (06) Secondary Schools indicated that they had more than twenty five (25) computers available but less than forty five (45) and none indicated that the school had more than forty five (45) computers. The findings were consistent with findings from the Head Teachers. Table 4.6 summarises the availability of computers in the Secondary Schools of Livingstone District.

Table 4.6: Summary of Availability of Computers in Schools

Number of Computers	Number of Secondary Schools
5-15	03
16-25	06
26-45	06
Above 45	00
Total	15

4.4.2 Internet is A Challenge

Head Teachers from six (06) Secondary Schools indicated that it was very costly for the school to meet internet subscription charges therefore internet connectivity was not available at all times at the school. One head teacher said “I wish we had funds specifically meant for such facilities and equipping the computer lab”, the other Head teacher said “Right now we are connected by ZAMLINK and the school is paying so much money almost Kwacha Six Thousand (K6, 000.00) plus per month” she further stated that “This is the area where I feel the government should come in and reduce cost of installation and subscription of internet services”. On the other hand Head Teachers from nine (09) Secondary Schools indicated that they had no internet connectivity at the school, one (01) Head teacher said “We don’t have internet”. Figure 4.5 shows availability of internet connectivity in Public Secondary Schools of Livingstone District.

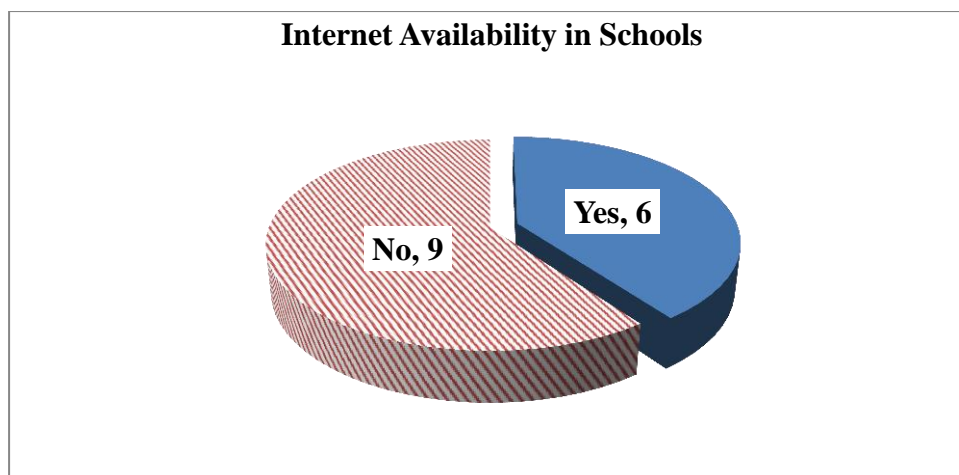


Figure 4.5: Internet Availability in Secondary Schools

4.4.3 Specialised Computer Laboratory

Three (03) Secondary Schools indicated that they had specialised Computer Laboratories, eight (08) Secondary Schools had converted regular classroom space to be used as Computer Laboratories, one Head teacher said “We have had a lot of challenges since inception, it would be better if you have a well-equipped computer lab”. The other four (04) Secondary Schools indicated that they had serious challenges with space to be used as a computer lab even infrastructure such as computer desks was a problem. Figure 4.6 illustrates available specialised Computer Laboratories in Public Secondary Schools and Figures 4.7, 4.8, 4.9 and Figure 4.10 show pictures of computer laboratories in some selected Secondary Schools of Livingstone District.

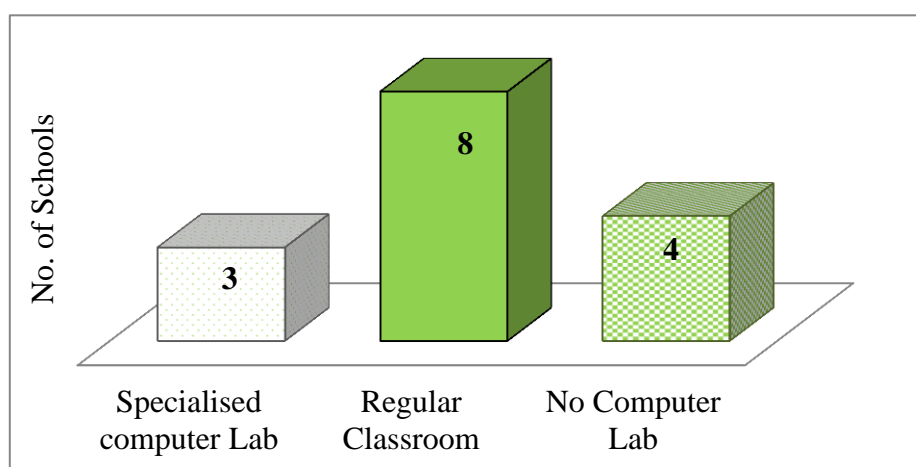


Figure 4.6: Availability of Computer Laboratories in Schools



Figure 4.7: Computer Laboratory at one of the Secondary Schools



Figure 4.8: Computer Lab at one of the Upgraded Primary and Secondary Schools



Figure 4.9: Computer Lab at a Grant Aided Secondary School



Figure 4.10: Classroom used as Computer Lab at an Upgraded Primary and Secondary School

4.4.4 Back-Up Power Supply

Two (02) Secondary Schools indicated that they had Back-Up Power Supply to power the Computer Laboratory during Zambia Electricity Supply Corporation (ZESCO) power outages. The other thirteen (13) had no back-up power sources, one Head teacher said “The challenge has been with the back-up power supply, like last year during practical exams power went and was only restored around 11:00 hours”.

4.4.5 Additional ICT Equipment and Infrastructure

Teachers were asked what other equipment and infrastructure was available at the school to facilitate the teaching of the ICT subject. Twenty two (22) Teachers indicated that the schools had a wide range of ICT Equipment but the quantities were not sufficient. It was also established that, all Secondary Schools in the district were connected to the ZESCO power grid which is a much need resource in the teaching of the subject. It was reviewed that six (06) Secondary Schools had internet, while nine (09) Secondary Schools did not have internet connectivity. This is consistent with findings from Head teachers. Teachers from two (02) Schools indicated that they had no Projectors while Teachers from 13 (87%) Secondary Schools stated that schools had Projectors.

Furthermore, teachers from thirteen (13) Schools indicated that schools had Photocopying Machines, though in most cases the Machines were for administrative use and were positioned in the secretary’s office, while Teachers from two (02) Schools indicated that schools did not have Photocopying Machines. Teachers from all schools indicated that they had ICT text books for both Learners and Teachers, though these Text Books were not enough. In one case, the schools had 20 Text Books for G8 and 20 for G9 with three (03) streams of classes at Junior Secondary. Some Schools also had other equipment such as Printers and Scanners. Figure 4.11 illustrates additional ICT Equipment and Infrastructure available in Public Secondary Schools of Livingstone District.

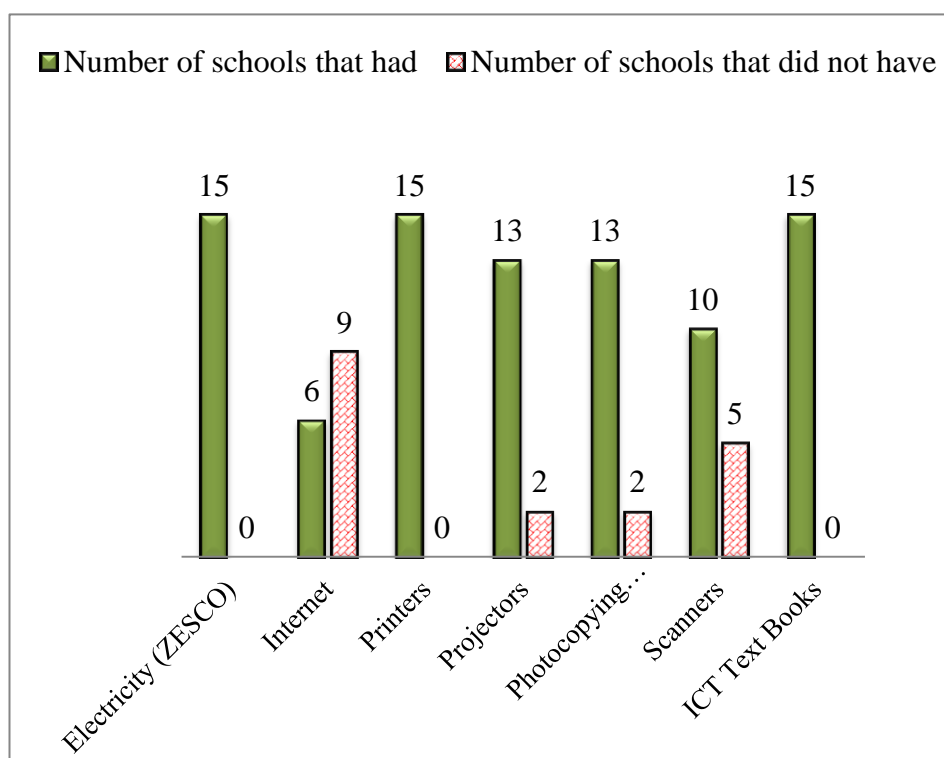


Figure 4.11: Additional ICT Equipment and Infrastructure in Schools.

4.5 The Impact of Compulsory ICT Subject at Junior Secondary on ICT Literacy

Using findings of objectives 1 and 2, the impacts of compulsory ICT Subject at Junior Secondary were established and analysed under the following themes,

1. Impact on Teachers literacy and Competences in ICT
2. Impact on Pupils' Literacy and Exposure to ICT
3. Impact on Availability of ICT Equipment and Infrastructure
4. Impact on Pupils' Performance in the ICT Final Examinations

4.5.1 Impact on Teachers Literacy and Competences in ICT

Findings showed that in 2014 when the ICT Subject was introduced as a Compulsory Subject at Junior Secondary only one (01) secondary school had two (02) Trained ICT Teachers but the number had risen to four (04) trained ICT Teachers in three (03) Schools by June 2018. Findings further reviewed that in 2014 Teachers who had

no training in ICT started teaching out of interest, however, by June 2018, seven (07) Teachers had done short courses in ICT and four (04) Teachers were pursuing Bachelors' Degree Courses in ICT with various institutions on Distance Basis. This may be a clear indication that, after the introduction of ICT Subject, Teachers developed interest in ICT and were acquiring knowledge and becoming competent in the subject as illustrated in Table 4.7.

Table 4.7: Teachers' Training and Professional Development in ICT

Teachers' Training in ICT	Year	
	2014	2018
Trained to Teach ICT	02	04
Short Courses in ICT	00	07
On Courses in ICT	00	04

4.5.2 Impact on Pupils' Literacy and exposure to ICTs

To investigate the Pupils background in ICTs, forty (40) Pupils were consulted whether they had a Personal Computer (PC) or if they had access to one at home, two (02) said they had Personal Computers (PCs), eight (08) said there was at least a PC at home while thirty (30) said they had no Computers or access to a Computer while at home. Table 4.8 shows the number of pupils who had computers or at least had access to a computers while at home.

Table 4.8: Pupils' Access to Computers at Home

Access to Computer at Home		Pupils	
		Number	Percent
YES	Owen Computer	02	5%
	Others' Computer	08	20%
No		30	75%
Total		40	100%

Pupils were further asked what other ICT Equipment and facilities were available at home, responses were as shown in the Figure 4.12 below.

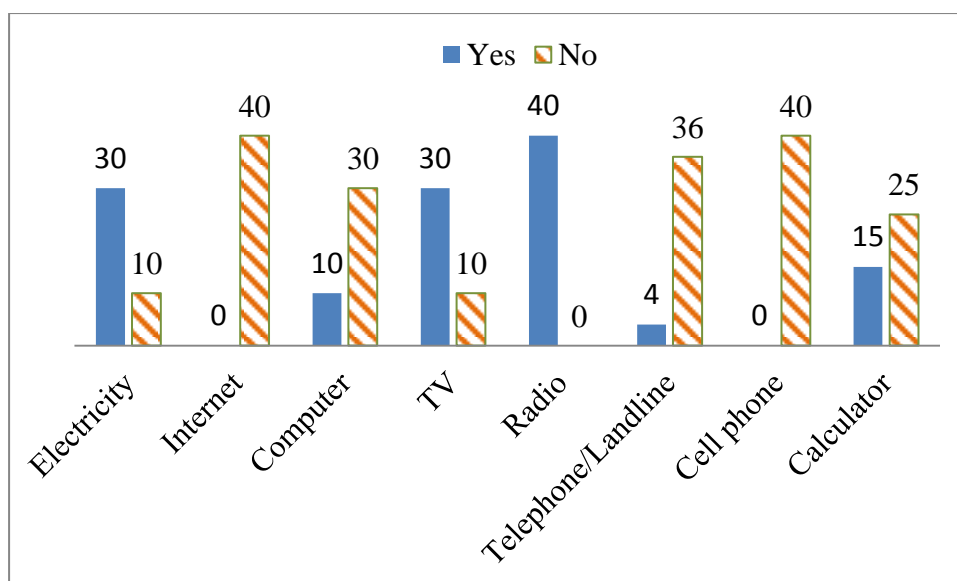


Figure 4.12 ICT Equipment and Basic Facilities at homes where Pupils live

Head Teachers were asked when the School had started offering ICT subject, Two (02) Head Teachers stated that the Schools were offering ICT Subject to their pupils even before it was introduced in the curriculum though it was not examinable, eleven (11) Head Teachers said they started offering the subject in 2014 when the subject was introduced in the curriculum and two (02) Schools indicated 2015 and 2016 respectively. Table 4.9 below shows when schools started offering ICT Subject to Pupils.

Table 4.9: Integration of ICT Subject in Schools

Year	Number of Schools
Before 2014	02
2014	11
2015	01
2016	01
TOTAL	15

Head teachers were further asked what their opinion was regarding making ICT Subject Compulsory at Junior Level. Thirteen (13) Head Teachers indicated that it was a good idea because it was good for the pupils and the teachers as well. The other Head teacher emphasised her point by sharing her experience while in Norway, a nation which is indicated in the literature review as one of the countries at the top of using ICTs in almost all sectors of the country's economic. She said "I would love to see that ICT starts from grade one," she further said "When I was in Norway I was

amazed to see that even Pre-Scholar are using Computers so I thought maybe that is why our friends are more developed”. On the other hand, two (02) Head Teachers argued that making ICT Subject compulsory was not a very good idea because it had introduced “have” and “have not” among Schools which defeated the Government Strategy named “Education for All”.

When head teachers were asked what their experience had been from the time ICT subject was introduced as part of the curriculum, all fifteen (15) Head Teachers stated that the Pupils loved the subject and that it was well received. All twenty six (26) Teachers also confirmed that Pupils loved the subject and that they were eager to learn, one teacher said “Being a new subject many pupils are eager to learn”, the other teacher expressed that learners were so interested that even when most of them did not have any back ground in ICT they were quick to learn.

Pupils were asked what experience they had learning the ICT subject thirty eight (38) of the forty (40) Pupils who were interviewed said it was “Exciting”, the other two (02) said “Very Exciting” and none said “Not Exciting”. When the pupils were asked what exam they were looking forward to thirty six (36) said both practical and theory while four (04) Pupils said the practical only. Furthermore, Pupils were asked how they would want to use the skill and knowledge they gain in ICT, 80% said they would use ICT or knowledge to enhance their skills in other fields while 20% said that they would want to take up ICT as a career. Table 4.10 below shows Pupils experiences in learning ICT as a subject.

Table 4.10: Pupils’ Experiences in Learning ICT Subject

Pupils Experience	Pupils	
	Number	Percent
Not Exciting	00	0%
Exciting	38	95%
Very Exciting	02	5%

4.5.3 Impact on Availability of ICT Equipment and Infrastructure.

Findings indicate that following the introduction of ICT Subject, there has been an increase in number of Computers in the Schools. Total number of computers at inception was two hundred thirty five (235) computers in all Public Secondary Schools under study, but this number increased to three hundred seventy two (372)

by June 2018, in increase of one hundred thirty seven (137) computers. Table 4.11 below illustrates the increase in number of computers in Schools.

Table 4.11: Increase in Number of Computers Accessible to Pupils

Computers Accessible to Pupils	Number of Schools	
	2014	2018
Above 20	4	8
11-20	4	5
1- 10	2	2
0	5	0
TOTAL	15	15

4.5.4 Impact on Pupils’ Performance in the ICT Final Examinations

When enquiring on how ICT Practical Exams were conducted, Head Teachers from two (02) Secondary Schools indicated that it had been okay from the beginning, thirteen (13) of the fifteen (15) Head Teachers said that 2015 and 2016 was a challenge due to lack of equipment and infrastructure, one (01) Head teacher stated that “It was very difficult at first but from the time ECZ gave us the guidelines that we can conduct exams in three days it has relieved the pressure because at first we could even knock off at 02:00hrs”.

Furthermore, findings indicated that in 2017 the situation had improved since ECZ Practical Examinations were conducted in three (03) days due to lack of ICT Equipment in Schools, however, this development was not received well by some schools. Nine (09) Head Teachers argued that their Schools still had challenges conducting ICT Examination due to inadequate trained Personnel and ICT Equipment. Head Teachers were further asked to give their opinions regarding the performance of pupils in the national ICT examinations at their school, five (05) Head teachers said results for their schools were very good, eight (08) Head teachers stated that results were average while two (02) said that results for their schools were not good.

To appreciate the impact of making ICT subject compulsory at Junior Secondary on Pupils’ performance in the ICT Final Examinations when Schools did not have well trained ICT Teachers and adequate ICT Equipment, results analysis for the Grade

Nine (9) Examination Council of Zambia (ECZ) ICT Examinations Results was done using Microsoft Excel, the outcome of the analysis is as indicated in Table 4.12.

Table 4.12: Grade Nine ECZ ICT Examination Results Analysis

SCHOOL	MARKS/STANDARDS-2015					Total No. of Pupils Who Sat	MARKS/STANDARDS-2016					Total No. of Pupils Who Sat	MARKS/STANDARDS-2017					Total No. of Pupils Who Sat
	100-75 (%)	74-60 (%)	59-50 (%)	49-40 (%)	39-0 (%)		100-75 (%)	74-60 (%)	59-50 (%)	49-40 (%)	39-0 (%)		100-75 (%)	74-60 (%)	59-50 (%)	49-40 (%)	39-0 (%)	
	1	2	3	4	F		1	2	3	4	F		1	2	3	4	F	
1	2	19	10	6	4	41	0	6	25	16	4	51	1	5	28	57	35	126
2	38	42	13	15	32	140	40	23	2	0	0	65	60	43	4	0	0	107
3	1	4	17	14	3	39	0	7	14	9	2	32	0	16	24	28	15	83
4	0	9	29	42	34	114	0	33	29	12	2	76	2	6	27	36	44	115
5	0	0	3	19	164	186	1	12	23	70	63	169	0	3	41	66	56	166
6	0	6	21	63	61	151	0	19	40	24	9	92	0	14	30	37	29	110
7	0	10	37	46	66	159	5	15	15	13	12	60	0	6	43	85	33	167
8		2	10	21	69	102						0	0	2	20	30	31	83
9	0	1	23	43	87	154	2	23	39	53	56	173	0	2	7	29	90	128
10	0	0	11	19	16	46	0	6	17	15	5	43	0	0	4	13	29	46
11	1	58	66	33	8	166	21	94	28	3	0	146	8	112	35	6	0	161
12	1	41	43	45	17	147	27	69	38	11	12	157	6	49	49	18	8	130
13	0	5	6	13	3	27	8	47	48	15	3	121	0	22	54	29	13	118
TOTAL	43	197	289	379	564	1472	104	354	318	241	168	1185	77	280	366	434	383	1540
Percentage	3%	13%	20%	26%	38%	100%	9%	30%	27%	20%	14%	100%	5%	18%	24%	28%	25%	100%

The outcome of the analysis showed that in 2015 when the first exam was conducted, performance of the Pupils was the worst, failure rate was highest at 38% while pupils who got 75% to 100% was at 3% in all Public Secondary Schools of Livingstone District which was again the lowest. The outcome of the analysis also showed that in 2016 performance of the Pupils had improved with failure rate reducing to 14% and Pupils who got 75% - 100% increased to 9% indicating a 3% increase. However, in 2017 the performance of the Pupils went down, failure rate increase from 14 % in 2016 to 25% when it was expected that Pupils would do much better considering that condition in the Schools were improving. In 2017 pupils who got 75% - 100% had reduced to 5%. Figure 4.13 illustrates the overall performance of the Pupils in the Grade nine (9) ECZ ICT Examination since the first ICT Examination was conducted for Public Secondary Schools in Livingstone District.

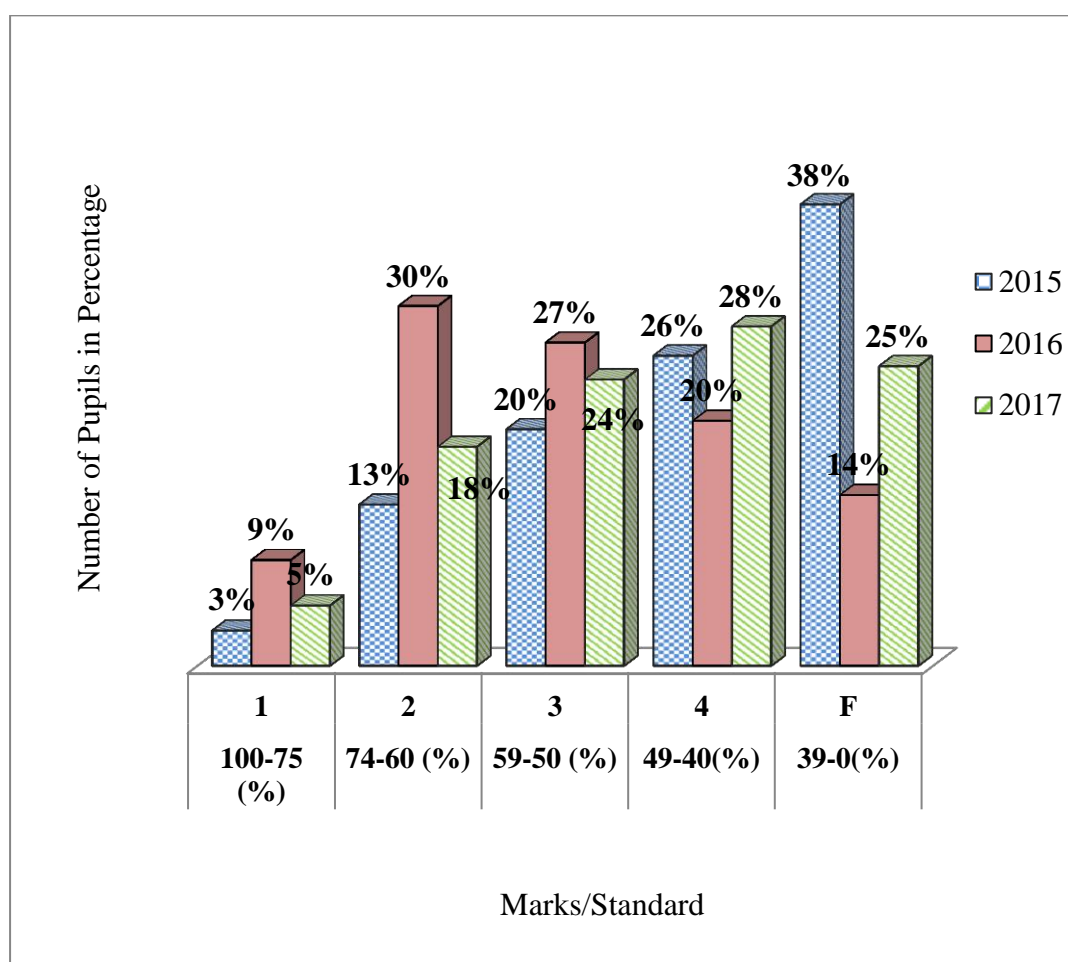


Figure 4.13: Overall Performance of the Pupils in the ICT Final Examinations

The outcome also reviewed that, in 2015 some schools were more affected than others due to insufficient equipment in such schools. Mostly affected were the Upgraded Primary and Secondary Schools. To further appreciate the correlation of availability of ICT Equipment to Pupil's performance in the Final ICT Examination, performance of Pupils in four (04) selected Schools 1, 3, 8 and School 9 was plotted. Table 4.13 shows number of computers accessible to pupils in the four selected Schools and Figure 4.14 shows failure rate for Pupils in the selected Schools in the ICT final examinations.

Table 4.13: Computers Accessible to Pupils in Four Selected Schools

School	Number of Computers	
	2014	2018
1	32	32
3	13	25
8	0	20
9	0	24

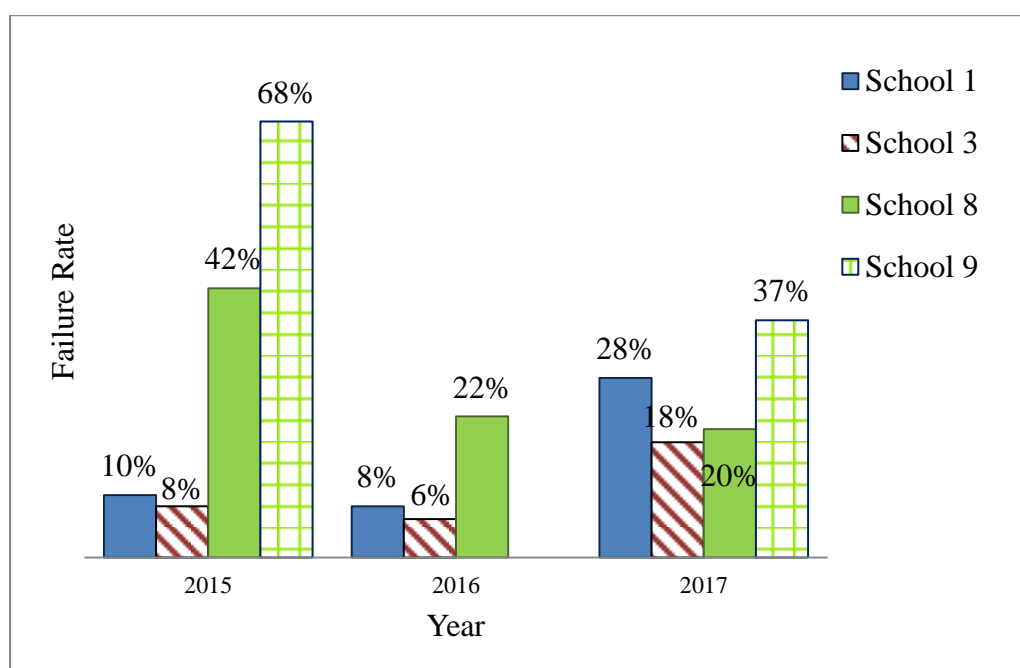


Figure 4.14: Failure Rate of the pupils in the Grade 9 ICT Final Examinations in Selected Schools

Findings reviewed that in 2016 Pupils at Secondary School No. 9 did not write ICT ECZ Examinations due to lack of ICT Equipment.

4.6 Summary

The main purpose of this chapter was to present findings of the study as guided by the specific objectives. The chapter started by presenting the demographic information of the respondents followed by the findings. Qualitative information was presented in narrative form and then in tables or graphs for clarity. Furthermore, descriptive statistics was used to presented quantitative information.

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.1 Overview

This Chapter discusses the findings as presented in Chapter Four by comparing and contrasting the findings of this study with findings of Related Works and findings of other studies which were conducted in other countries. The discussion will be guided by Specific Objective as follows, Availability of specialised ICT Teachers, Availability of ICT Equipment and Infrastructure and the Impact of Making ICT Subject Compulsory at Junior Secondary on ICT Literacy.

5.2 Availability of Specialised ICT Teachers

5.2.1 Trained to Teach ICT

Findings in Section 4.2 reviewed that three (03) Public Secondary Schools in Livingstone District had trained ICT Teachers to handle the ICT Subject at Junior Secondary. Furthermore, findings indicated that, not only were the schools with trained ICT Teachers few, but that these specialised ICT Teachers were not sufficient in that only one Secondary School had two (02) well trained Teachers to teach ICT Subjects, the other two schools had one (01) ICT trained Teacher each against at least three (03) streams of classes at Junior Secondary.

Findings further reviewed that, there were twenty nine (29) Teachers who were teaching ICT subject at junior level in Public Secondary Schools of Livingstone District, of these, four (04) were trained to teach ICT, twenty one (21) Teachers were trained to teach other subjects and another four (04) Teachers were employed on PTA Basis, of these some were trained while others were not trained to teach ICT. This means that 14% Teachers were trained to teach the subject and employed by the MoGE while 86% were not well trained to teach ICT Subjects.

Even though these finding may not be generalised to other districts, this result is consistent with the findings of other studies such as [9] and [10] which were conducted in other districts, giving an impression that the lack of specialised ICT Teachers in secondary schools might be a National challenge which require urgent attention otherwise could negatively impact the teaching and learning of ICT Literacy Skill in schools. This is because teachers who are not trained to teach ICT

subjects could possibly be incompetent to handle the subject [42], this eventually is likely to compromise the quality of service delivery.

5.2.2 Trained to Teach other Subjects

Findings in section 4.2 further indicated that eight (08) Public Secondary Schools did not have specialised ICT Teachers and were using teachers trained in to teach other subject to handle ICT subjects. Other than the incompetence that may be displayed by the teacher who is not trained in managing the subject [42], these teachers are more likely to be over burdened with work load since they have to teach their specialised subject alongside managing the ICT subject, this eventually is likely to effect the teaching and learning of ICT literacy skills thereby negatively impacting the performance of the pupils in the ECZ Examinations.

Findings further reviewed that some teachers had done short courses in ICT which had helped them to have general knowledge in ICT. As much as this strategy may be helpful, [39] states that a systematic and organised training for Teachers is required to fully equip them with necessary Literacy skills in ICT, in addition, [74] argues that, a well organised training programme is necessary for Teachers in any discipline.

This finding does not agree with findings of [26] which indicates that the US Government puts much emphasis on the availability of Specialised Teachers to teach ICT in Secondary Schools. This is a clear demonstration that technology alone cannot have much effect in the implementation of the ICT Curriculum, therefore the availability of well trained Teachers in ICT cannot be done away with if we are to have a positive impact on ICT literacy in the schools [75]. Also time spent during short course may not be sufficient to fully equip a teacher with necessary ICT literacy skills.

5.2.3 Employed on PTA Basis

Findings in section 4.2 further showed that four (04) Public Secondary Schools had employed at least one (01) Teacher on PTA Basis to teach ICT subject. Further inquiries revealed that two (02) of these teachers employed on PTA basis were not ICT trained Teachers but had done some courses in Computers and lacked teaching methodologies, a skill necessary to manage a class effectively. While some Schools

were able to employ Teachers on local basis, some Schools that did not have trained teachers in ICT and did not have the capacity to employ Teachers on local arrangement due to limited resources, such schools will have to rely on the available Teachers who are trained to teach other Subjects as discussed earlier. This further demonstrates that pupils in Public Secondary Schools of Livingstone District are potentially not equally advantaged.

Findings indicated that in terms of skills and competences in ICTs, eight (08) Teachers rated themselves as “Above Average”, eighteen (18) indicated “Average” and none indicated “Below Average”. It was noted that most of the Teachers who had indicated above average were those who had Bachelors’ Degree and Diploma in CS and a few who had Bachelors’ Degree in Business studies and those who indicated averages are those who had no formal training in ICT. This may mean that those who had formal training in ICT exhibited confidence in their teaching of ICT while those who were not trained to teach the ICT Subject exhibited low levels of confidence in handling the subject which may disadvantage pupils under their care, since confidence is as important as competence [18].

5.3 Availability of ICT Equipment and Infrastructure

5.3.1 Computers are Not Sufficient

Findings indicated that more than 80% of the Public Secondary Schools in the District had challenges with computers. This is likely to affect the exposure of pupils to computers and many Schools may not be able to achieve the minimum requirement of four (04) periods per week broken down as a Single Double Period for practical and two (02) Single Periods for theory lessons as stipulated in the Computer Studies Syllabus for Grade 8 and 9 [57] where a period is forty (40) minutes, therefore, this could be a hindrance to the smooth transfer of ICT literacy skills to Pupils.

These findings agree with findings of studies which were conducted in other parts of the country such as [10] and [11] and also agree with results of [56] conducted in Kwekwe, Zimbabwe and findings of [31] which was conducted in Cameroon. However, this finding is not consistent with findings of [76] which was conducted in UK and Findings of [42] which was conducted in Sweden. This gives an impression

that the problem of insufficient ICT equipment in Secondary Schools could be common to most developing Countries but not developed ones, and as such developing Countries need to invest more in ICT in Education if they are to benefit from the opportunities ICT presents.

Findings further indicated that Computer to Pupil ratio in most schools was very high. This may mean that pupils in most Public Schools are not exposed to hands on as much as may be required due to the computer to pupil ratio which is high when compared to UK which is one of the countries in the world with low computer to pupil ratio of 1 Computer to 3 Pupils in Secondary Schools [76] against 1 Computer to 11 Pupils in an Examination class in some cases in Zambia. This shows that some (47%) Schools may need five (05) sessions or more to conduct Practical Examinations. This could imply that Secondary Schools which need 5 sessions or more to conduct the practical examinations may need more than a day of conducting Practical Examinations which is likely to have a negative impact on the performance of the Pupils in the ICT Practical Exam Therefore, if fairness has to be assured then pupils should be writing the same examination under the same conditions. But this can only be possible if school have all necessary ICT equipment in place.

5.3.2 Internet is a Challenge

Findings further reviewed that six (06) Public Secondary Schools were connected to the internet while nine (09) Public Secondary Schools did not have internet services. ICT being a field where technological advancements are fast one needs to remain abreast with global technological changes taking place in the ICT world. This may mean that Teachers and Pupils may not have quick access to latest information and be able to share resources with the rest of the world.

5.3.3 Specialised Computer Laboratory

Findings reviewed that twelve (12) Public Secondary Schools did not have Specialised Computer Laboratories, this indicates that most schools were not ready at the time the subject was introduced and most of them are still facing challenges to conduct ICT Practical Lessons and Examinations. This finding is in line with findings of [10] and confirms that Pupils in different Schools were potentially not

equally advantaged which was a challenge to the achievement of fairness in Education as stated in the Zambia Education Curriculum Frame Work 2013 [6].

5.3.4 Back-Up Power Supply

Findings indicated that thirteen (13) Public Secondary Schools in the District did not have Back-Up Power Sources. Since all schools use ZESCO electricity as their main source of power, this means that whenever there is ZESCO power outage, all lessons and activities in the Computer Laboratory that require the use of power have to be halted. This is likely to negatively impact the smooth running of ICT lessons thereby slowing down the learning process and also create a crisis if a power outage was to occur during an ICT Practical Exam as was the case with some schools during the 2017 final ICT practical examinations.

5.3.5 Additional ICT Equipment and Infrastructure

Findings showed that most Public Secondary Schools indicated that, they had other ICT Equipment and Infrastructure though in most cases the Equipment was not sufficient. Thirteen (13) Public Secondary Schools stated that they had Photocopying Machines while Teachers from two (02) Public Secondary Schools indicated that their schools had no Photocopying Machines, however, it was observed that, schools that had Photocopying Machines were using them mainly for administrative purpose and most of these Photocopiers were positioned in the secretary's office. This is likely to make it difficult for teachers in such schools to print some practical work for pupils to enable them effectively assess the pupils.

Teachers from all Schools indicated that they had ICT text books for both learners and Teachers, though these text books were not enough. In one case, the schools had twenty (20) text books for G8 and 20 for G9 with three streams of classes at junior secondary which makes it difficult for pupils to share and use these text books for studying.

The findings of this study are consistent with findings of other studies which were conducted in other countries such as [77] which was conducted in Meru County in Kenya and reports that most schools had challenges implementing the ICT Curriculum due to lack of resources to purchase ICT Equipment and Infrastructure and lack of ICT specialised teachers. This is a clear demonstration that most

developing Zambia inclusive need to invest more in ICT in education if they are to experience effective ICT Literacy Skills transfer to learners in the Schools.

5.4 The Impact of Making ICT Subject Compulsory on ICT Literacy

Objective 3 sought to establish the impact of making ICT Subject compulsory at Junior Secondary on ICT Literacy in Secondary Schools in Livingstone District. Using findings of Objectives 1 and 2, the impact was established and discussed under the themes Impact on Teachers' Literacy and Competences in ICT, Impact on Pupils' Literacy and Exposure to ICTs, Impact on ICT Equipment and Infrastructure and Impact on Pupils' Performance in the National ICT Examinations.

5.4.1 Impact on Teachers Literacy and Competences in ICT

Findings reviewed that in 2014 when the ICT Subject was introduced as a compulsory subject at Junior Secondary one (01) Schools had 02 ICT Teachers but the number had risen to four Teachers in three (03) Public secondary Schools by June 2018. Findings further reviewed that in 2014 Teachers who had no training in ICT were teaching out of interest, however, by June 2018 seven (7) Teachers had done short courses in ICT. Findings further indicated that four (04) Teachers were at the time pursuing Bachelor's Degree Courses in ICT with various Institutions on Distance Basis.

Findings demonstrate that after the introduction of ICT as a compulsory subject, most likely teachers had started developing interest in ICT and were acquiring ICT literacy skills, knowledge and becoming more competent in ICT. This has the potential to increase the awareness among teachers of the benefits ICT brings to education thereby encouraging the use of ICT in the teaching and learning of other subjects. This is in line with the findings of [75] which indicate that 110 teachers in Sweden became aware of the benefits of ICT after being trained in ICT.

5.4.2 Impact on Pupils' Literacy in ICT

The introduction of ICT as a Compulsory Subject at Junior Secondary had given the pupils an opportunity to be exposed to ICTs mostly computers and acquire the much needed ICT Literacy Skills. This was demonstrated by the findings which indicated that ten (10) Pupils had a PC or had access to a computer while at home and thirty

(30) Pupils had no access to a Computer while at home. Therefore, most pupils had access to a computer only at school.

Findings further showed that two (02) Public Secondary Schools started offering ICT Subject to their Pupils even before it was introduced in the curriculum, and that thirteen (13) Public Secondary Schools started offering the Subject after it was introduced in the curriculum in 2014 or later. This finding further confirmed that before the subject was introduced in the curriculum few Pupils had access to computers but after the introduction of ICT subject more pupils had an opportunity of being exposed to ICTs especially computers thereby learning ICT literacy skill.

Findings further reviewed that all pupils had no access to internet while at home. These findings further confirm that pupils could only have access to internet for accessing new information and sharing resources while at School. From the results of this study it may be stated that the Zambian government is on track regarding the use of ICT as an enabler to socio-economic development. If all necessary measure are taken care of this will help to build a well informed and ICT competent society which is the case with many developed nations as reviewed by [78] which was conducted in Sweden.

Findings also reviewed that all Head Teachers and Teachers stated that Pupils loved the Subject and they were eager to learn it.

Findings also showed that all Pupils were interested to learn ICT and that thirty six (36) Pupils were looking forward to both Practical and theory Examinations and four (04) Pupils were looking forward to the Practical only. This may mean that provided all resources are in place imparting ICT Literacy Skills in learners would be easy since the learners were interested and eager to learn.

These findings are consistent with findings of the study [78] which was conducted in Sweden, the study outlined that Pupils in Sweden are given tablets for the school and are highly motivated and looked forward to doing their homework. This indicates that children love technology and it encourages them to learn it and later use it as a tool to further their studies or effectively use it for the world of work which is the purpose of the Junior Secondary CS Syllabus [57]. Findings also indicated that three (03) Pupils have developed interest to taking up ICT as a

profession while the other 37 Pupils would like to use ICT as a tool to further their studies. Therefore, making ICT Subject compulsory at Junior Secondary provided an opportunity for Pupils to have a good foundation in ICT.

5.4.3 Impact on ICT Equipment and Infrastructure in Schools

Findings stated that, at inception seven (07) Public Secondary Schools in Livingstone District had 20 Computers or more, by June 2018, this number had increased to eleven (11) Public Secondary Schools with 20 Computers or more, findings also showed that at inception total number of computers in Public Secondary Schools was 235, but this number had increased to 372 by June 2018, an increase of 137 computers.

Findings demonstrate that the introduction of ICT as a Compulsory Subject at Junior secondary had a positive impact on equipment availability in Public Secondary Schools which is definitely need to effectively impart ICT Literacy Skills to Pupils.

5.4.4 Impact on Pupils' Performance in the Final ICT Examinations

Findings reviewed that two (02) Public Secondary Schools indicated that conducting ICT Practical Examinations had been okay from the beginning, while thirteen (13) Public Secondary Schools stated that conducting ICT Practical Exams was a challenge mainly due to lack of ICT Teachers and ICT Equipment and Infrastructure. This could have contributed to the Pupils' poor performance in the Grade Nine (9) Final ICT Examinations as indicated by the outcome of the Final ICT Examinations Results Analysis. This shows that making the ICT Subject Compulsory at Junior Secondary when schools did not have specialised ICT Teachers and sufficient ICT Equipment negatively impacted the performance of the Pupils in the Final ICT Examinations especially in Schools which had no Computers accessible to Pupils as further demonstrated by the performance of the Pupils in the Final ICT Examinations in selected Schools. The performance of the Pupils in the final examinations can be seen as a measure for ICT Literacy Skills transfer.

Results further showed that in 2017 failure rate had gone up, yet it was expected that Pupils' performance would further improve since teachers' literacy levels and competences in ICT and equipment availability in schools were improving. However high failure rate in 2017 could mainly be attributed to the manner in which ICT

Practical Examinations were conducted, practical examinations were written over a period of three days and on each day Pupils wrote a different paper.

5.5 Summary

This chapter discussed the findings of the study and then compared contrasted the findings of this study to findings of related works which were conducted in other districts of the country and other studies mainly discussed in the literature review section. The next section concludes the study, thereafter presents some recommendations arising from the findings of the study.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Overview

This Chapter presents the conclusion of the study, and then premised from the findings discussed in chapter five make some recommendations. All objectives of this study were achieved.

6.2 Conclusion

The study outlined that 80% Public Secondary Schools in Livingstone District had no Specialised ICT Teachers to teach the Subject at Junior Secondary. It was also established that Some Teachers who teach other subject had done short courses in ICT to facilitate teaching ICT Subject. As much as this may be a good initiative, it was noted that organised formal training for Teachers in ICT is required to equip them with necessary ICT Literacy Skills.

The study further outlined that Public Secondary Schools in Livingstone District had a wide range of ICT Equipment mainly Computers to support the teaching of the ICT subject, however, these equipment especially Computers were not sufficient; therefore the teaching of the subject and imparting of ICT Literacy Skills may not have been effective in most Schools.

It was further established that the introduction of compulsory Computer Studies at Junior Secondary in Secondary Schools in Livingstone had an Impact on Teachers' Literacy and Competences in ICT, provided Pupils with an opportunity to be exposed to ICTs mainly computer and become computer literate and had a positive impact on ICT Equipment availability in Schools. It was further established that compulsory Computer Studies at Junior Secondary amidst lack of specialised ICT Teachers and ICT Equipment negatively impacted the performance of the Pupils in the ICT ECZ Examinations.

6.3 Recommendations

Arising from the findings of the study, it was recommended that:

- i. The MoGE should prioritise training and deployment of specialised ICT Teachers in Secondary Schools for smooth management of the ICT curriculum.
- ii. Schools should embark on fundraising ventures to raise money to procure all necessary ICT Equipment and pay for Internet subscription to facilitate the effective teaching of ICT literacy skills in Schools. This would also enable schools be able to conduct ICT Practical Examinations in one day, since in 2017 Practical Examinations were conducted in three days due to insufficient equipment mostly Computers.
- iii. The MoGE should handle Building of Computer Laboratories in all Schools with urgency.

Future works would include:

- i. A study to investigate whether the content of ICT at Teacher Training Institutions during short courses in ICT is sufficient for one to effectively teach ICT at Secondary education.
- ii. Further research to investigate the learning gap created among learners in urban and rural settings by the introduction of compulsory ICT Subject at Junior Secondary should be conducted as this study just concentrated on Impact of compulsory CS on ICT literacy.

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APPENDICES

Appendix A: Timeline

The study took six (06) months from the day of developing the Questionnaire to the day of submission of the final report. Below is the Gantt chart to give the breakdown of the time period.

Table 1: Project Gantt chart

PROJECT GANTT CHART					
	S/N	Task Name	Duration	Start	Finish
	1	Develop Questionnaire	10 days	Mon,21.05.2018	Fri,01.06.2018
	2	Pre-test Questionnaire	5 days	Mon,04.06.2018	Fri,08.06.2018
	3	Finalise Questionnaire	2 days	Mon,11.06.2018	Tue,12/06/2018
	4	Print Questionnaire	1 day	Wen,13.06.2018	Wen,13.06.2018
	5	Filed Work	30 days	Thur,14.06.2018	Wen,25.07.2018
	6	Organise Data	2 days	Thur,26.07.2018	Fri,27.07.2018
	7	Enter Data on Computer	10 days	Mon,30.07.2018	Fri,10.08.2018
	8	Data Analysis	20 days	Mon,13.08.2018	Fri,07.09.2018
	9	Carry out Literature Review	30 days	Mon,10.09.2018	Fri,19.10.2018
	10	Final Data Analysis	16 days	Mon,22.10.2018	Fri,16.11.2018
	11	Prepare Final Report	20 days	Mon,19.11.2018	Wen,12.12.2018
	12	Print Final Report	1 day	Thur,13.12.2018	Thur,13.12.2018
	13	Submission of Report			Fri,14.12.2018

Appendix B: Budget

The budget cost was K 4, 730.00 as indicated in the table below

Table 2: Budget for the Project

S/N	Purpose	Activities and Location	Costing	Total Cost (ZMW)
1	Data collection	Trip to Livingstone, movements around Livingstone District for thirty (30) days.	300 Litres of diesel @K12.10/litre	3,630.00
2	Data analysis	Printing, stationary and Photocopying	One 085A-tonner @K850.00 each and K150.00 photocopying.	1050.00
3	Results presentations	Spirals and Transparencies	K50.00	50.00
	TOTAL			4,730.00

Appendix C: Sample Interview Guide for Head Teachers

Interview Guide for Head Teachers

Time of Interview: Date:

Place:

Interviewer:

Interviewee:

Position of Interviewee:

[Describe here the project, telling the interviewee about (a) the purpose of the study, (b) the individuals and sources of data being collected, (c) what will be done with the data to protect the confidentiality of the interviewee, and (d) how long the interview will take.] [Have the interviewee read and sign the consent form.] *[Ask interviewee if you can turn on the tape recorder and test it.]*

Gender of interviewee:

QUESTIONS:

1. For how long have you been the head teacher at this school?
2. When did you start offering ICT subject at junior level at this school?
3. What has been your experience adopting ICT as a subject at junior secondary?
4. What is your opinion on making ICT subject compulsory to all pupils?
5. What ICT equipment is available to facilitate the teaching of ICT subject at junior secondary? (Nos. of Computers in 2014 and 2018)
6. How many teachers are trained to teach ICT subject at junior secondary?
7. How many classes do you have at Junior secondary?
8. What have been your experience conducting ICT exams (Practical and Theory)?
9. What is your opinion on the past ICT exam results?

[Thank the individuals for their cooperation and participation in this interview]

Appendix D: Sample Questionnaire for Teachers

THE UNIVERSITY OF ZAMBIA SCHOOL OF ENGINEERING DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTIONNAIRE FOR TEACHERS

The questionnaire aims at getting your opinion pertaining to the adoption of information and communication technology (ICT) subject at junior secondary. The information you will give is for research purpose only. You may NOT write your name otherwise your identity will remain confidential. Feel free to give opinions in your responses. Please complete the following questionnaire by answering the questions. Be honest as much as possible

Section A: Personal Details

Place an [×] where appropriate.

1. Gender

- a) Male []
- b) Female []

2. Age

- a) Below 19 []
- b) 19 – 25 []
- c) 26 – 35 []
- d) Above 35 []

3. Period of service

- a) Below five (5) years []
- b) 5 – 15 years []
- c) 16 – 25 years []
- d) Above 25 years []

4. What is your highest Academic Qualification?
- a) Certificate []
- b) Diploma []
- c) Degree []
- d) Masters Degree []

Section B: Availability of Trained Human resource and Experience.

5. What has been your experience teaching ICT subject?

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.....

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6. How is the subject being taught?

- a) Compulsory
- b) Selective

7. What is the ICT subject called at junior secondary at your school?

.....

8. How many periods are allocated for theory lessons per week?

.....

9. How many periods are allocated for practical lessons per week?

.....

10. What is the duration of one period?

.....

11. What motivated you to teach ICT subject?

.....

.....

12. Did you undertake any ICT training during your initial teacher training?

.....

13. If any, what is your highest qualification in ICT?

.....

14. How would you rate your skills and competencies in ICTs? (*Tick where appropriate*).

a) Above average

☐

b) Average

☐

c) Below average

☐

15. What other subject(s) are you trained to teach?

.....

Section C: ICT equipment available in schools.

16. Does the school have a computer lab? (*Tick where appropriate*)

a) Yes

☐

b) No

☐

17. How many computers are available to the learners at your school? (*Tick where appropriate*)

a) Below 5

☐

b) 5 – 15

☐

c) 16 – 25

☐

d) Above 25

☐

18. How many pupils do you have in your class? (*Tick where appropriate*)

a) Below 10

☐

b) 10 – 25

☐

c) 26 – 40

☐

d) Above 40

☐

19. What is the computer to pupil ratio at your school?

.....

20. Do you have a personal computer (laptop or desk top)? (*Tick where appropriate*).

a) Yes

☐

b) No

☐

21. How many pupils in your class have personal computers? (*Tick where appropriate*)

a) None ☐

b) Below 10 ☐

c) 10 – 25 ☐

d) Above 25 ☐

22. Are the following basic facilities available at your school? (Tick where appropriate and give Quantity (QTY) where applicable).

	Infrastructure	YES	NO	QTY
A	Electricity			
B	Internet			
C	Printers			
D	Projectors			
E	Photocopying Machines			
F	Scanners			
G	ICT Text Books			

23. What other ICT equipment is available in the school to support the teaching of the subject?

.....

Section D: ICT Examinations.

24. How are ICT exams conducted? (*Tick where appropriate*).

a) Theory ☐

b) Practical ☐

c) Theory and Practical ☐

25. What is your opinion on how ICT exams are conducted?

a) Theory:

.....

b) Practical:

.....

26. What is your opinion on the past ICT exam results at junior secondary?

.....

.....

27. Are there any challenges being met in the teaching of ICT subject at your school? *(If yes list down)*

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.....

28. What do you think can be done to mitigate the challenges discussed above?

.....

.....

29. In your own opinion, what is the future outlook of the subject in the Zambian education system?

.....

.....

The End

Thank You for Your Support

Appendix E: Sample-Focus Group Discussion Guide for Pupils

Focus Group Discussion with Learners

Time of Discussion: **Date:**

Place: **Interviewer:**

Age group of the participants:

Composition of Participants (Ensure that the group is gender balanced)

a) Boys

b) Girls

Total

[Describe here the project, telling the learners about (a) the purpose of the discussion, (b) the individuals and sources of data being collected, (c) what will be done with the data to protect the confidentiality of the participants, and (d) how long the discussion may take.] [Request to turn on the tape recorder and test it.]

QUESTIONS:

1. Do you have a personal computer (*lap top or Desk top*)?

a) Number of pupils with personal computers

b) Number of pupils who don't have computers

2. Do you have the following basic facilities or ICTs at Home?

	Infrastructure	Yes	No
a	Electricity		
b	Internet		
c	Computer (Laptop or Desk top)		
d	TV(s)		
e	Radio		
f	Land line Telephone		
g	cell phones		
h	Calculator		
j	ICT text book		

3. What has been your experience learning ICT subject compared to other subjects?
4. How many times per week do you learn theory in ICT subject?
5. How many times do you go for practical per week?
6. What ICT exam are you looking forward to?
 - a) Theory
 - b) Practical
 - c) Theory and Practical
7. Are there any challenges you face in learning or studying ICT subject?
8. What do you think can be done to mitigate the challenges being met?
9. How do you want to use the knowledge you have acquired in ICT in the future?
 - a) ICT as a profession
 - b) ICT as a tool

[Thank the individuals for their cooperation and participation in this interview]

Appendix F: Proof of Journal Article Submission

“The Impact of Compulsory Computer Studies on ICT Literacy at Junior Secondary in Livingstone District”

Leslie Simulwi (2015131237)
Proof of Journal Article Submission (17/12/2018)



Dear Lesile Simulwi,

This email is to confirm that we received your manuscript submission, "The Impact of Compulsory Computer Studies on ICT Literacy at Junior Secondary in Livingstone District." Your manuscript will be evaluated by the journal's editor(s) and you will be advised as soon as possible through email of its status, as well as any revisions that may be necessary. Your manuscript can be managed from the Manuscripts page: <https://www.igi-global.com/submission/manuscripts/>. Please bookmark this page for easy access.

If you have any questions, please contact the journal editor, David Carbonara, atcarbonara@duq.edu.

If you need to contact IGI Global regarding your submission, please include the journal name and/or acronym and the title of your article in the subject line of all correspondence. This will ensure your correspondence reaches the correct Development Editor at IGI Global and will result in a much quicker response.

Thanks again for your submission - we look forward to working with you!

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