Bindura University of Science Education

Faculty of Science Education

BACHELOR OF SCIENCE EDUCATION HONORS DEGREE IN MATHEMATICS

Assessment of Teacher's Adaption to Information and Communication Technology in Secondary School Mathematics Teaching. A Case of Tsholotsho District

Submitted by:

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A dissertation submitted in partial fulfilment of the requirements of the Bachelor of Science Education Honors degree in Mathematics.

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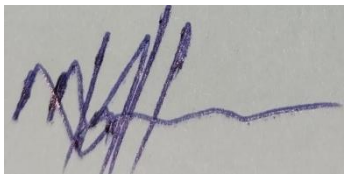

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Registration Number: B225497B

Dissertation Title: Assessment of teacher's adaption to information and communication technology in Secondary school mathematics teaching. A case of Tsholotsho district

Degree title: Bachelor of Science Education Honors Degree in Mathematics

Year of Completion: 2024

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Abstract

Information and Communication Technology (ICT) has provided a new kind of support for instruction in this 21st century era. The study assessed the adaption of teachers to ICT in the teaching of mathematics at secondary schools in five selected schools in Tsholotsho district. The study adopted a convergent research design which is located within the mixed methods research approach. The study was guided by the Technology Acceptance Model in order to answer the research question. Stratified sampling was used to select 25 participants comprising of 20 teachers and 5 school Heads. The study used semi structured interviews questions, focus group discussions and closed questionnaires for collection of data. Collected data was analysed quantitatively using descriptive statistics and qualitatively using thematic analysis. The data was presented in tables and figures. The study found that teachers were not ready to use ICT in teaching Mathematics at Secondary Schools in Tsholotsho due to these factors which included teacher's lack of ICT knowledge and skills, lack of infrastructure, unavailability of electricity, and lack of funding. It is recommended that the school administrators, parents, policy makers and other education stakeholders develop strategies such as electrifying all secondary schools, source ICT gadgets needed for teaching mathematics and staff develop teachers that lack the pedagogical skill needed for integrating ICT in mathematics.

ABBREVIATIONS ACRONYMS

ICT	Information and Communication Technology.
MOPSE	Ministry of Primary and Secondary Education.
NGOs	Non-Governmental Organisations.
O- Level	Ordinary Level
SDC	School Development Committee
TAM	Technology Acceptance Model

Contents

LIST OF TABLES

LIST OF FIGURES

Dedication

This dissertation is dedicated to my mother, wife and son who have been the pillar of strength and encouragement.

Acknowledgements

First and foremost, l would like to thank the Almighty for giving me the strength and wisdom to navigate through this study. My sincere gratitude goes to my supervisor Dr L Mukavhi for his unwavering and valuable support throughout this journey of doing the research. It was not easy but under his guidance, with his support and patience he showed me and l managed to sail through.

My appreciation also goes to the Ministry of Primary and Secondary Education for granting the permission to carry out the study in Tsholotsho district. Special thanks go to those individuals who agreed to be participants in the study, without their valuable contributions the research study would have been incomplete. Another special thanks goes to my family and friends, for their love and prayers throughout the course of the study. Credit to my beloved mother Lister Ndlovu, wife Thandeka Tshuma and son Thandolwethu Q Ndlovu, and family who motivated me throughout the course. Without them l could have quit the course.

CHAPTER ONE: INTRODUCTION OF THE STUDY

1.0 Introduction

This chapter provides an overview on the background to the study, purpose of the study and statement of the problem. It also looked at the research objectives, significance of the study, delimitations, limitations and organisation of the study. Lastly, key terms in this study are going to be defined.

1.1 Introduction of the study

In today's educational landscape, Information and Communication Technology (ICT) is a cutting-edge concept that facilitates the acquisition of new knowledge, skills, and concepts relevant to everyday life. ICT encompasses a broad range of technologies used for communication, information sharing, and storage, including radio, TV, video, phones, computers, and network infrastructure. According to Becta (2003), ICT is defined as technologies that enable the transmission, storage, creation, sharing, or exchange of information. Technology is now deeply ingrained in our daily routines, making it hard to imagine completing even the simplest tasks without using devices like cell phones, laptops, and computers. While people of all ages rely on technology for routine tasks, children are among the most frequent users of technology, as noted by Das (2019).

1.2 Background of the study

In the field of education, use of ICT has made teaching interesting and mastery of difficult learning areas made easy. Long back learners were taught mathematics in groups according

to ability, and they learnt mathematical concepts through repetition, multiplication tables and timed drills. Teachers perceptions towards the integration of ICT tools in mathematics instruction Fayanto (2019), found out that poor performance in Mathematics at ordinary level is attributed to inadequate textbooks and too many terminologies that attract disinterest among Mathematics learners. Shurygin (2020), however suggests that there is need for teachers to seek appropriate alternatives to get rid of the problems and promote a suitable learning environment for Mathematics. Moreover, Holthaus (2018), states that most schools face challenges of inadequate Mathematics tools leading to dismal performance in Mathematics. To overcome this problem, Bimha (2018), suggests that the administrators need to prioritize Mathematics when making school budgets to ensure adequate Mathematics equipment are available.

In agreement, Parra (2012) views schools as places where technology has had the greatest impact. Proficiency in basic ICT skills and concepts is now widely recognized as a fundamental aspect of education, essential for students worldwide. The integration of ICT in education is growing rapidly, and it's increasingly viewed as a vital tool for enhancing and improving education globally, providing opportunities for students everywhere to access quality learning (according to UNESCO, 200. A number of developing and developed countries have made strides in incorporating technology into education. Some of the countries that have made strides are; United Kingdom, Ghana, Uruguay and South Africa. Latin American countries such as Uruguay have made strides in integrating ICT into the curriculum with the learner computer ratio being 1:1 in primary and secondary schools (UNESCO Institute of Statistics, 2012). The African continent has also made some achievements in integrating ICT into the curriculum. The African Continent Integrated Strategic Plan of 2015-2020 emphasised on investment of ICT infrastructure to promote implementation of ICT into the curriculum.

In the United Kingdom, steering committees were set out to create working groups that looked into the infusion of e-learning platforms and this also included integrating ICT in the teaching and learning of mathematics in secondary institutions. These committees went a long way in fusing ICT in mathematics. Tearle (2003) states that almost all staff in United Kingdom are now using ICT to enhance teaching in their teaching areas. Mathematics is a subject in Ghana that is required at all pre-university levels (Ampiahand, 2018). Recognizing its significance, the government is dedicated to enhancing mathematics education through the integration of e-learning platforms, complementing traditional teaching methods. This effort is part of the New Educational Reforms (Anamnah-Mensah National Educational Review Committee Report, 2002), which focuses on developing skills, creativity, and critical thinking through e-learning. The government views ICT and e-learning as key drivers of rapid development. In line with the suggestions made in the ICT4AD document and the report published by the National Education Review Committee in 2002 , Ghana incorporated e-learning technology system in September 2007, making ICT a part of the school curriculum, emphasizing the importance of technology in education.

South Africa has also made strides in integrating ICT in teaching. Integration was also put into test due to closure of school as a result of COVID -19 that affected most South Africa as compared to other countries in Africa. This meant that they had to adopt a more robust lockdown programme to mitigate against the effects of the Corona Virus. With schools closed and learners confined to their homes learning just like in other countries had to take place. Their government through the Department of Basic Education in collaboration with the South African Broadcasting Cooperation (SABC) introduced televised lessons in various learning areas dubbed “Catch up Matric”. This of course is complementing other platforms like social media, e-learning and Goggle Classroom. To date the television programme has a huge following in South Africa as learners get instructed by a variety of teachers and this adds

variety to their learning experiences. This programme has a following in Zimbabwe as well as some subjects like Pure Mathematics, Physics, Chemistry, Biology, Accounting and Economics transcend geographical boundaries. All this shows that integration is progressing.

Zimbabwe has a comprehensive national ICT policy, established in 2005, which prioritizes the integration of ICTs in education. The primary objective of this policy is to develop an education system that empowers students to graduate as proficient, creative, and resourceful users of modern technologies, including ICTs, and equips them with a deep understanding of the social implications and benefits of these technologies. It is also the goal of the educational system to produce pupils who can support the country's economic blue print, Zim-Asset, through their abilities to independently display their capabilities to create, innovate and manipulate job opportunities and help sustain the country's economy.

The update of ICT improved during the COVID-19 pandemic, as the mathematics face to face lessons came to a standstill. Schools could not function as they used to. A number of higher learning schools and institution were temporarily closed. The suspension of in-class teaching was necessary to contain the outbreak and prevent further transmission. It was during the covid period that a lot of emphasis was placed on the topic of technology integration as the best way of teaching and learning. Also, the integration of ICT was put into test whether teachers are ready to move from the old fashioned approach of using the textbook to innovative digital solutions. It is upon this background that the researcher intends access the use and level of teachers to use ICT in teaching mathematics in Tsholotsho district.

1.3 Statement of the problem

The call to adopt ICT in education has gained recognition in many countries all over the world and Zimbabwe is not an exception. Traditionally, the resources that were available in the classroom for teaching were textbooks from the library in the Tsholotsho district. Uptake

of ICT by mathematics teachers was very low because of hurdles like lack of teacher confidence, lack of teacher ICT skills, limited access to internet coverage, insufficient training in educational techniques. Nowadays 90% of the schools in Tsholotsho district have installed Wi-Fi and power systems have improved, which has been taken advantage of to adopt ICT in teaching. Integration of ICT in Zimbabwean is not yet embraced fully as it should be as advocated by 2015-2022 new Zimbabwean curriculum framework. Though ICT resources and infrastructure have had a major effect on successful merging of ICT in education. Many teachers struggle to adapt their teaching practices to incorporate the use of ICT tools in teaching and learning process. A preliminary survey indicated that some schools which received computer donations especially in rural areas are not been able to implement ICT into learning. This study therefore sought to assess adaption of teachers to ICT tools in teaching mathematics at secondary schools in Tsholotsho district.

1.4 Purpose of the study

The study sought to determine the teachers' levels of access and use of ICT in the teaching of mathematics at secondary school level in Tsholotsho district. It also sought to suggest solutions to the prevailing challenges with integrating ICT in the teaching and learning of mathematics.

1.5 Objectives of the study

The study aims to determine the levels of access and use of ICT in the teaching of Mathematics by the teachers in the district. In order to achieve this, aims the following objectives of the study will be as follows:

1. To find out what physical ICT infrastructure are present in the Tsholotsho district schools,

2. To assess the levels of use and access ICT in the teaching of Mathematics by teachers in Tsholotsho district,

3. To find out the teachers' challenges towards the use of ICT in the teaching of mathematics

4. To determine the teachers' level of knowledge on the use of ICT in the teaching and learning of mathematics,

1.6 Significance of the study

According UNESCO (1994), every child is entitled to quality basic education. Furthermore, the government of Zimbabwe since independence has erected policies that gave every child the right to 'free' education. Teachers are therefore mandated to accommodate the needs and interest of all learners through integrating ICT in their teaching. In today's knowledge-driven economy, access to information is crucial for economic growth and development. Technology has made it easier and faster for people to access information, and educational systems aim to produce individuals who can effectively utilize this information to make informed decisions and solve problems. The merging of Information and Communication Technology (ICT) in teaching mathematics is essential, as it not only enhances the classroom atmosphere but also enables students to expand their knowledge, acquire new skills, and develop lifelong learning habits. ICT also plays a vital role in providing educational opportunities to remote and rural areas, which cannot be overlooked (Güzeller & Akin, 2014). This study aims to investigate teachers' preparedness to integrate ICT in mathematics teaching, including their skills, available resources, and stakeholder support. Despite the potential benefits, technology is often underutilized or ineffectively used by teachers, which can negatively impact student performance, particularly in subjects like mathematics and science where student achievement is often a concern (Polly et al, 2010). This is a pressing issue, particularly in

science and mathematics, where students are struggling with poor academic achievement. This research might give teachers a chance to contribute by highlighting the challenges that they face and changes needed for addressing the challenges. It might go a long way in equipping teachers with required skills needed for them to be efficient facilitators and match global standard that is moving from the traditional teaching methods to modern ways of teaching.

Studies by Sang et al (2009) and Zhao and Cziko (2001) have shown that teachers' educational beliefs and values play a significant role in shaping their use of information and communication technology (ICT) in the classroom. This might be due to the fact some teachers do not put much effort in embracing technology as some claim to be 'old' to use ICT tools. This research serves to address the deficiency gap and motivate teachers to embrace technology.

Learners might also benefit as they might be equipped to embrace ICT in the teaching-learning of Mathematics. The exposure might improve the pass rate of mathematics that has been low compared to other learning areas. This exposure might address one of the goals of the new curriculum that states that learners should become effective and active participant citizens who can bring authentic, research-based solutions to socio-political and economic issues of the nation (Curriculum Framework, 2012). Furthermore, this research might help the Ministry of Primary and Secondary Education (MOPSE) to assess whether the resources that are required for proper integrating of ICT are available in schools. This study established the physical ICT infrastructure present in schools that facilitate ICT integration in the learning and teaching of Mathematics on selected rural schools in Tsholotsho. This will help the responsible ministry MOPSE to plan on how best the integration can be improved. It is also hoped that it will help MOPSE in identifying the pedagogical skills needed by facilitators. This information may provide a base for revisiting the recent ICT policy in alignment to get

past the challenges of ICT integration in education. Lastly, the findings of this study will assist other researchers who will want to carry out a research on the same topic with a basis on which to build new knowledge upon. This could empower mathematics teachers to become more effective educators by leveraging available ICT infrastructure and tools, thereby enhancing their teaching methods and engaging students in a more interactive and technology-driven learning experience.

1.7 Delimitations

The research focuses on teacher levels of access and utilizing Information and Communication Technology (ICT) resources to enhance mathematics education in secondary schools within the Tsholotsho district For this reason, the study is delimited to secondary schools with ICT facilities and delimited to five secondary schools in Tsholotsho district, in Zimbabwe in the mathematics subject area.

1.8 LIMITATIONS OF THE STUDY

The potential weaknesses of this research study that may distort the true outcomes where as follows:

1. The time that was taken to complete the research study was limited as the researcher was concurrently concentrating on studies, teaching and researching. Basically time factor distorted results and lead to wrong conclusions as this resultantly produce narrow results.

2. Funding for the research was very difficult since the researcher is committed to both his studies and family.

3. Secondary schools involved in the research where very few, hence may not be a true representation of ordinary level teachers and learners. This may produce biased results

in the sense that, the researcher is only bound to a small geographical area that would not offer the general scope of the responses.

1.9 Definitions of key terms

The following terms mean what is herein defined and that will facilitate a common understanding of the study

- **ICT**

The term ICT stands for Information and Communication Technology. According to Ndawi, Thomas and Nyaruwata (2013) ICT (Information and Communication Technology) refers to any device or system that can capture, store, process, or transmit data. Examples include computers, the internet, mobile devices, and email. In essence, ICT encompasses a broad range of technologies used to create, share, display, process, store, or exchange information electronically.

1.10 Chapter summary

This chapter set the stage for the research by discussing the background, problem statement, purpose, objectives, significance, delimitations, and limitations of the study. It also clarified key terms and outlined the organization of the study. The next chapter will delve into a review of the relevant literature, providing a critical analysis of existing research in the field. The next chapter will focus on the literature review

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter will focus on the reviewing literature to the study. This chapter will look at theoretical framework and conceptual framework that guided the study and related literature to the research problem.

2.2 Theoretical Framework

The Technology Acceptance Model (TAM) serves as the theoretical foundation for this study, guiding the investigation of factors that affect teachers' acceptance and usage of ICT in mathematics teaching. This model was developed by Davis in 2003. The model is used to describe how individuals accept new technologies. Although the Technology Acceptance Model (TAM) has its limitations, it provides a valuable foundation for understanding the factors that influence older adults' willingness to adopt technology. Despite its shortcomings, the TAM has been effectively applied in numerous studies to investigate the factors that shape older adults' intentions to use technology, as noted by Braun (2013).

The main aspects of the TAM according to Eugenia, Shroff and Lim (2013) are Perceived Usefulness, Perceived Ease of Use and Attitude towards Usage. According to San & Yee (2013), The Technology Acceptance Model (TAM) is a framework that examines how individuals adopt and utilize new technology. It identifies the main factors that influence user acceptance, including the design of the system, how useful and easy to use it is perceived to be, and the user's attitude towards using it, ultimately affecting their actual usage behaviour The model is shown diagrammatical as follows

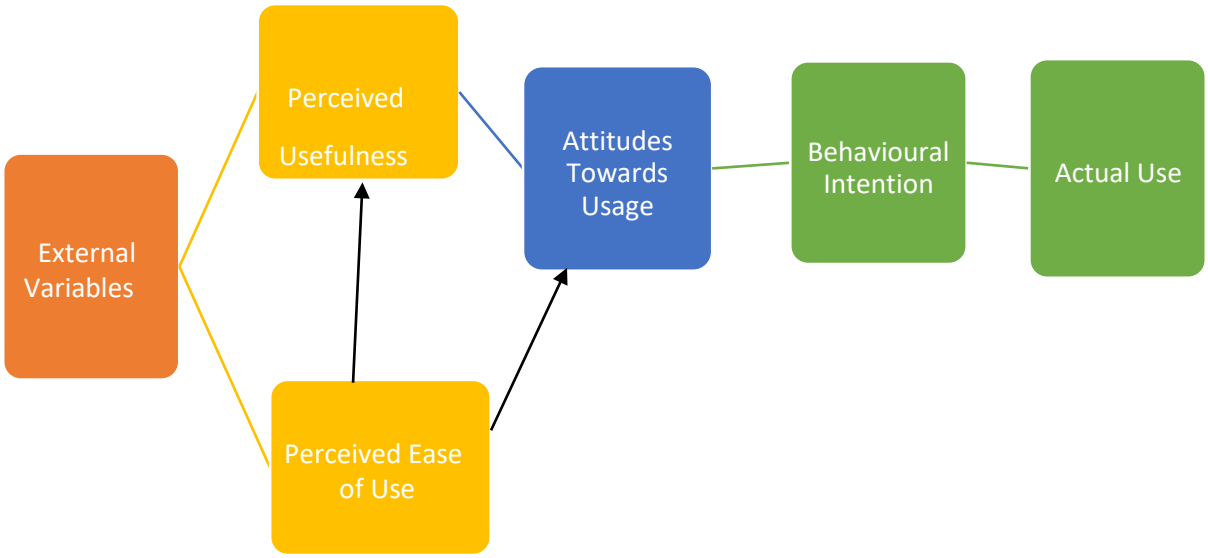

Figure 1 Technology acceptance model

The model was used in the study to assess the levels of use and access of teachers to use ICT in teaching mathematics at secondary school in Tsholotsho district.

2.2.1 Factors that influence individual attitudes.

External factors are factors outside an individual which might influence their beliefs towards new technology. The external factors may include the availability of ICTs, training, computer experience and support from the administrators. External factors according to Teo (2013) have an impact on how easy or useful a technology is perceived to be, and also shape attitudes towards using the technology, ultimately influencing whether or not it is adopted and used . Within the school system, teachers that have some computer experience are likely to perceive the use of ICTs as useful and also easy to use hence they are more likely to use ICTs in the teaching-learning process.

2.2.2 Perceived Usefulness

Davis (2000) cited in Chutter (2009) Perceived usefulness relates to the extent to which a person believes that using a specific system or technology would improve their work efficiency, productivity, and overall performance. If the teachers believe that the use of ICT

compared to the traditional way of teaching may be useful in the teaching-learning process, then they may opt to integrate ICTs during lesson delivery. This study, therefore argues that if teachers find ICT useful in the teaching of Mathematics, they will embrace it.

2.2.3 Perceived Ease of Use

According to Davis (2000), as cited in Chutter (2009), perceived ease of use relates to the extent to which a person believes that using a particular system or technology would require minimal effort and be easy to navigate. When an application is perceived as user-friendly and easy to use, it is more likely to be widely accepted and adopted by a larger number of people. If teachers feel that they can easily use the ICT then the barriers are conquered hence they can adopt the use of ICTs in education. However, if they think using ICTs will be a challenge, they will resist using the ICTs for fear of embarrassment.

2.2.4 Attitude towards Usage

Both practical advantages and user-friendliness have a bearing on attitude towards usage. Attitude towards usage deals with an individual's feelings when carrying out a certain task. These attitudes can either be negative or positive. Attitude towards usage in the TAM model is defined by Wang (2008) as the mediating affective response between perceived usefulness and perceived ease of use and behavioural intention to use new technology. In other words, the teacher's overall attitude toward using ICT in the teaching and learning processes leads to the intentions to whether or not adopt the TAM model. Attitude towards usage depends on whether the teachers see the perceived benefits of using ICTs compared to other methods. If the benefits are clear, then attitude towards usage will be positive, thus at the end of the day ICT will be integrated in the teaching and learning process. In addition, when the teachers perceive that ICT are easy to operate, they will have a more positive attitude, hence they will merge ICT in the teaching and learning process. Contrary, if teachers have negative attitudes in using ICT then the teachers will be hesitant to use ICT in the teaching of mathematics.

2.2.5 Behavioural Intention to Use

Attitude towards use and perceived usefulness both influence behavioural intention to use. Walker and Pearson (2012) cited in Durodulo (2016) describe behavioural intention to use as the extent to which an individual is deliberately prepared to carry out or not carry out a particular action. They go on further to point out that behavioural intention to use can affect the actual usage of a particular technology. The teacher's participation and interaction with others who have the skill to use ICTs creates a base for behavioural intention to use the new technology. Such behavioural intentions are very important as they create zeal on teachers to use ICT in teaching mathematics.

2.3 Availability of ICT tools in schools

Effective integration of ICT in mathematics teaching relies heavily on the presence of a robust and high-quality ICT infrastructure (Rudra et al., 2018). In other words, without a reliable and efficient ICT infrastructure in place, it is impossible to achieve successful and meaningful ICT integration in mathematics education. Availability or access to ICT tools plays a significant role in the utilization of ICT in the learning and teaching of mathematics at secondary education level. (Obi, 2019). Exposure to ICT tools normally has a positive influence on both teaching and learning of mathematics. Under normal circumstances this improves learner's performance. According to Dumbo, (2020) computer use has a number of benefits to include motivating learners, making learners self-reliant and knowledgeable and fostering positive attitudes towards the learning and teaching of mathematics basically, this has a great potential in enhancing learner achievement.

Nations committed to effectively integrating ICT into their education systems recognize the importance of investing in advanced ICT infrastructure, including reliable electricity, high-

speed internet, and modern facilities equipped with cutting-edge technology (ITU, 2018; Ministry of Education, Singapore, 2016; U.S. DOE, 2017). This infrastructure is crucial for supporting the successful implementation of ICT in education It is very important for schools to be equipped with relevant ICT gadgets such as laptops, smartphones and suitable mathematical software such as Geogebra, marple, java and many other relevant mathematical software.as stated by the British Educational Communications and Technology Agency (Becta) in 2003, various ICT tools can be utilized to enhance teaching and learning including interactive whiteboards, Encarta software, online learning platforms and computer based productivity tools. This means for effective usage of ICT in teaching mathematics required ICT tools should be available at schools.

Government participation is crucial in ensuring that schools are resourced for ICT integration. Through the Ministry of Primary and Secondary Education (MOPSE), the government of Zimbabwe has invested in the financing and resourcing of ICTs for some secondary schools. To equip schools with ICTs, the Presidential Office launched an initiative to provide computers in schools across the country in 2005. This initiative according to Gomba (2016) necessitated the use of technology in the teaching and learning process. The donated computers were however not put into use especially in rural schools and some urban schools which are not electrified and also due to resistance to integrate ICTs in the teaching and learning process by teachers. The effect of this was that, the donated computers gathered dust as they remained idle for long periods and this in turn affected ICT integration in the learning and teaching process.

For ICT to be properly integrated in the teaching-learning process, secondary schools need to be well equipped with the needed resources. It is therefore the mandate of the school heads to see to it that the school are resourced in order to facilitate ICT merging in the teaching and learning process. Schiller (2013) purports that the school administrators have the

responsibility to ensure that the school has enough ICT equipment and facilities so that ICT integration in the teaching-learning process is possible for schools to be resourced with ICTs there is need for the school administrators to engage the parents through the School Development Committee (SDC) in acquiring the needed ICT resources. For this to be possible, both the school administrators and SDCs should have a clear understanding of the benefits of using ICTs in the teaching-learning process versus the traditional approach. This is important as the school administrators and SDCs have an influential role to play in the acquisition of school resources.

According to the provisions of the statutory instrument 379 of 1998 one of the functions of the SDC is to promote, improve and promote development and upkeep of the school by ensuring that fees are paid. It is the responsibility of the SDC to ensure that the school has enough resources. It is also the responsibility of the SDC to purchase ICT facilities, and to see to it that the school has adequate infrastructure to accommodate ICTs. The SDC should make development to the educational institution in the best involvement of the present and future learners, in collaboration with the headmaster and subject to approval of the Secretary. The provisions of the instruments mean that the government has left the accountability of acquiring ICT resources to the parents. Kungeni (2017) argues that, this is a challenge as most parents especially in government run secondary schools fail to pay the school payments delayed due to economic hardships in the country. Even if special levies are charged towards the purchase and maintenance of ICT facilities and equipment, the majority of the parents will be unable to pay since they are struggling to pay up the tuition fees.

The private sector also has a role to play in ensuring that school are adequately resourced to facilitate ICT integration in the teaching mathematics as the government cannot do it alone. International organisations like Ruckus Wireless Company have come into partnership with local companies like ProComm and Frolgate to ensure that there is internet connectivity in

schools. Ruckus Wireless Company through local partnership has brought Wi-Fi access to students at St George's College. Econet Wireless a giant telecommunication and internet service provider company in the country has also embarked on resourcing schools with ICTs via its electronic-learning (e-learning) platform Ruzivo which can be used by both teachers and students.

In some cases, the Alumni (Old Students Association) have played a leading role in ensuring that their former schools have up-to-date ICT facilities and equipment. The Alumni have mobilised their personal funds to acquire ICT equipment such as computers (desktops and laptops), projectors, interactive whiteboards, and printers among others. The Non-Governmental Organisations (NGOs) have also been involved in resourcing secondary schools with ICTs for use in the teaching-learning process. NGOs such as Celebration, Outreach Zimbabwe and Capernaum Trust to mention a few have gone on board to donate computer resources to schools. They have not only donated computers, but they have go on to design school websites, train teachers and students on how to use ICTs on outreach programs centred on facilitating the uptake of ICT in schools (Ganyani, 2016).

2.4 Teacher adaption towards ICT integration

Integrating ICT in the teaching of mathematics is a complex process that requires adaption to the teacher so that learning can be meaningful and fruitful. As postulated by Ramirez-Montoya, Mena, and Rodriguez-Arroyo (2007) teacher's adaption to the successful integration of ICT in education, alongside the development of digital competence, is vital for creating effective teaching practices that promote student learning. To achieve this, teachers must receive comprehensive training on ICT tools and technologies, allowing them to seamlessly integrate technology into their mathematics teaching, leading to enhanced student learning experiences. The success of mathematics teaching and learning relies entirely on

teacher's ability to adapt to ICT tools. According to a study conducted by Tanui, (2015), some mathematics teachers are not well versed with ICT technology. This acts as an impediment to the lesson delivery as the teacher lacks technical knowhow on the application of ICT.

In various countries, including Syria (Albirini, 2006) and Saudi Arabia (Alwani, 2005; Almohaissin, 2006), teachers' inadequate technological expertise has been identified as a significant hurdle to integrating technology into education. Similarly, a report by Empirica (2006) A survey of educators from 27 European countries found that teachers who did not use computers in their classrooms cited a lack of technical expertise as a significant barrier to integrating technology into their teaching practices. As long as teachers do not have technological skills they will not be able to adapt in using ICT during teaching and will never be comfortable to use ICT tools for fear of embarrassment hence the need for teachers to have technological skills.

To overcome this transferred challenge, schools need to embark on staff developments, workshops and encourage team work. (Nja, 2017). This will ensure better understanding of ICT by teachers, hence performance improvement could be identified. According to Ambe (2020), teachers should be equipped with ICT knowledge through seminars and training.

2.5 Attitudes of teachers in ICT in the teaching of mathematics

Literature has indicated a number of challenges in the integration of ICT in the teaching and learning of mathematics. Teacher's confidence and attitude has a bearing on whether the teacher will be able to use ICT in teaching learning process (Dawes, 2001). The study conducted by Muhammad (2015), unveils that teachers' mindset towards the use of ICT can either be encouraging or discouraging mathematics learning. This implies that a positive

attitude promotes exploration for effective implementation of ICT into the teaching process. Becta (2004) suggests that a lack of confidence is the main obstacle preventing teachers from using ICT in the classroom, as identified by most researchers. According to Beggs (2002), this lack of confidence may stem from a fear of failure. Additionally, Balanskat et al. (2006) found that limited knowledge and experience with ICT can cause teachers to feel anxious about using it in the classroom, leading to discomfort and reluctance to integrate ICT into their teaching practices. Essentially, teachers' lack of self-assurance and familiarity with technology hinders their motivation to use ICT in the classroom.

A study by Newhouse (2002) in Australia found that many teachers lacked the necessary skills and knowledge to effectively integrate computers into their teaching practices, and were hesitant to adopt new technologies. Further research has shown that this barrier varies in severity across countries. In developing countries, a lack of technological expertise among teachers has consistently been identified as a major obstacle to adopting and effectively using ICT (Pelgrum, 2001; AlOteawi, 2002). For example, in Syria, teachers' inadequate technological skills have been identified as the primary barrier (Albirini, 2006), and in Saudi Arabia, a lack of ICT skills has been found to be a significant obstacle to integrating technology into science education (Al-Alwani, 2005; Almohaissin, 2006. As long as the teacher does not have the required pedagogical skill it will be difficult for the teacher to teach using the ICT tools for fear to be embarrassed in front of the learners. According to Thorndike theory of readiness one has to be ready and that readiness can only be achieved by having the required technical skill. Even in Zimbabwe some of the teachers especially in mathematics are facing challenges. Research conducted in Chipinge district found that computer technology was rarely used in the teaching and learning process, largely due to teachers' lack of confidence in their ability to effectively integrate technology (Konyana & Konyana, 2013). This suggests that teachers' limited competence in using technology may be

a significant obstacle to its integration in education. Furthermore, teachers' inadequate technological skills may also lead to their reluctance to adopt new technologies and modify their teaching methods. Therefore, the lack of teacher competence in technology may be a significant obstacle to the successful integration of technology in education. Additionally, this incompetence may also contribute to teachers' resistance to changing their teaching practices, making it a crucial factor in the barriers to educational innovation

Habibuetal (2012) highlight that inadequate training is a top reason why teachers don't utilize ICT in their teaching practices, as noted by Steketee (2006). Therefore, teacher training programs must prioritize equipping prospective teachers with the skills to effectively use various ICT tools. It is illogical to expect teachers to impart knowledge when they themselves lack the ability to use ICT. For instance, in Syria, teachers' technological incompetence has been identified as the primary hindrance to ICT integration in teaching, and similarly, in Saudi Arabia, a lack of ICT skills poses a significant barrier to effective technology integration in education.

Instead of just teaching teachers how to use ICT tools, it's crucial to provide them with pedagogical training that focuses on how to effectively merge technology into their teaching practices (Becta, 2004). Research by Balanskat et al. (2006) highlights that inadequate teacher training is a major obstacle to successful ICT integration in classrooms and lesson planning. This is because most training programs fail to address how teachers can adapt their pedagogical approaches to incorporate ICT, rather than just teaching technical skills. For new technologies to be effectively integrated in the classroom, teachers have to be equipped on how to use ICT tools in teaching.

In some cases, the teachers have the knowledge and skills in using ICTs in the teaching-learning process, but the use of ICTs is affected by time factor. Time constraint is another

challenge faced in integrating ICT in the teaching-learning process. Teachers make little use of technologies in the teaching-learning process as they do not have enough time. In Zimbabwe, in most secondary schools, lessons are limited to a time period of 35 to 40 minutes at most. This time limit is not enough for the teacher to use ICT in the classroom. The limited time affects the teachers' ability to complete tasks A study conducted by Gwekwe (2016) in Zvishavane District revealed that a relevant number of teachers identified time constraints as one of the challenges in scheduling enough computer time for classes as a problem in their use of ICT in their teaching and learning. Recent studies show that lack of time is an important factor affecting the use of ICTs in the teaching-learning process as facilitators need time to track down internet information, receive proper training, explore and practice using the technology, deal with technical problems, and prepare lessons.

The high computer-pupil is another hindrance in the successful integration of ICT in the teaching and learning process. Tezci (2011) asserts that they may be challenges of management if the computer-pupil ratio is high and the class sizes are large. This affects ICT integration in the teaching-learning process as it may be difficult to control the learners. With such a scenario, ICTs are prone to abuse especially by those students who may be unsupervised at that particular moment. Instead of doing the assigned tasks, the students can view pornographic materials.

The high computer-pupil ratio also means that not all the students will get a feel on using the computers. The one student sitting close to the computer is the one who will manipulate and do the assigned tasks, while the others are just watching. Thus, the technical skills of the learners not using the computers are not improved. This also can lead to indiscipline on the part of the students not using the computers as they may find other ways of keeping themselves occupied and they end up disrupting the lesson proceedings. The shortage of ICT equipment, tools and resources is another challenge faced in the merging of ICTs in the

teaching-learning process. According to Mndzebele (2013) resources like computers, printers, multimedia projectors, scanners are not available in schools and this hinders the successful integration of ICTs in the teaching and learning of O-Level programmes in secondary schools. After the donations made by the late President of Zimbabwe, most schools had computers, but the computers were very few. In most secondary schools, these computers are only accessible to students doing computer studies while the rest of the students and teacher do not have access to the computers.

In most schools, the computers are located in the computer laboratory as a result, teachers and students must constantly transition from their traditional classrooms to the computer lab to access computers, which can be a significant obstacle to seamlessly integrating ICT into their teaching and learning experiences in the teaching-learning process as so much time is spent in between the movements from the classrooms to the computer laboratory. Hence according to Ghavifekr and Rosdy (2015) only a select group of teachers, specifically those teaching Computer Science, have unrestricted access to the computer laboratory, while others do not. Another challenge encountered in integrating ICTs in the teaching-learning process is that of lack of appropriate infrastructure to house the ICT equipment and facilities. This affects old urban secondary schools and rural schools. Mandoga, Matswetu and Phishi (2013) point out that some rural schools in Zimbabwe do not have proper rooms to keep the computers; the computers are kept at the head's office which is the only safest place in the school. This affects ICT integration in the teaching-learning process as the teacher has to seek permission first from the head to use the computer, and time will be wasted trying to connect the computer in the classroom.

As the ICT facilities are limited, the teachers are forced to share the available resources. Thus, at the end of the day, a teacher may fail to access the ICT material needed during the teaching-learning process, thus there is no ICT integration in the teaching-learning process.

Balanskatet cited in Habibu et al. (2012) The presence of ICT resources does not necessarily ensure effective integration into the teaching and learning process. In addition to inadequate infrastructure and equipment, other challenges such as insufficient high-quality hardware, appropriate educational software, and access to ICT resources hinder successful integration. Moreover, most ICT tools require electricity to function, making unreliable power supply and frequent power fluctuations significant obstacles to using ICTs in the teaching-learning process, leading to disruptions and hindrances to effective learning. The erratic power supply affects practical lessons for students. The heavy load shedding schedules has impacted negatively in the use of ICTs during the teaching-learning process, as the ICTs are only used when electricity is available.

Erratic power supply also affects internet connectivity in secondary schools. Most schools in rural areas are not electrified and some in urban areas are partially electrified. Mingaine (2013) cited in Gwekwe (2016) asserts that access to electricity is a basic requirement needed for successful ICT integration in schools. However, there remains a challenge for such schools to electrify their schools so that ICTs can be integrated in the teaching-learning process. As a result of lack of electricity, computers are just lying idle without being used in the teaching-learning process. Without electricity, both the teachers and students are unable to access the internet. Handling programmes like CISCO learning need constant network stability, hence the need for a constant supply of electricity. The internet enables the teachers and students to access up-to-date information, since the internet through the various search engines is information rich.

Lack of financial resources in schools to purchase ICT equipment that are enough to serve the whole schools is another challenge that has been encountered in integrating ICTs in the teaching-learning process. Finances are needed to keep the hardware and software up-to-date, and this is a costly exercise. Mndzebele (2013) emphasizes that utilizing current and modern

hardware and software resources is crucial for effective technology integration, but unfortunately, this is a luxury that many educational institutions rarely experience or have access to. Lack of administrative support is another challenge faced in integrating ICT in the teaching-learning process. Research studies done found that, teachers felt that there was not enough support from the administrators and they were not being rewarded for integrating ICTs in the teaching learning process. Lack of support from the school administrators according to Ghavifekr and Rosdy (2015) discourages and hinders teachers from using ICTs.

2.6 Conceptual Framework of the Study

This research will focus on the factors related to teachers and schools as the primary influences on the integration of ICT in mathematics teaching. The factors related to teachers include those that directly impact their use of ICT in the classroom, such as their level of ICT knowledge and skills, their attitudes and perceptions about using ICT for teaching, and their prior experiences with ICT integration, among other factors.

School-related factors, which are shaped by the institution's environment, include the support provided by school administrators, access to ICT infrastructure, the school's ICT policy, technical support for maintaining and troubleshooting ICT tools, and the availability of experts and software, all of which impact teachers' ability to integrate ICT in their teaching practices.

Government policies play a crucial role in shaping the adoption of new technologies by teachers and schools, which in turn, influences the extent to which ICT is incorporated into mathematics education, thereby affecting the overall integration of ICT in teaching mathematics

The following figure summaries the conceptual framework for this study.

Conceptual Framework of the study

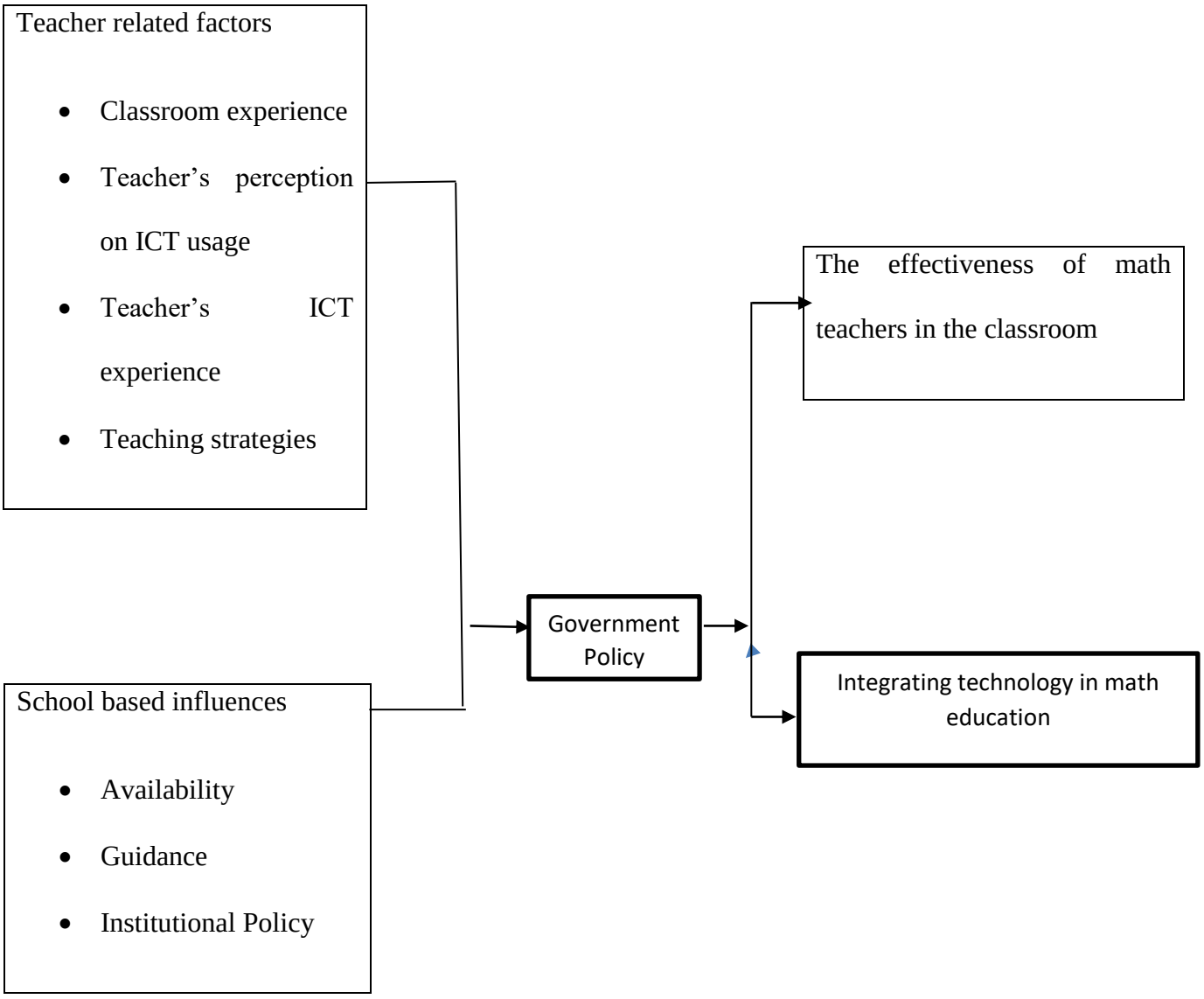

Figure 2: Description

Adoption of ICT in teaching and learning is dependent on both the teacher and school factors.

For instance, if a teacher has the necessary skills and knowledge on how to integrate ICT in pedagogical practice then he or she shall be willing to try out this innovation and with time, he/she become confident in using ICT in teaching.

2.7 Chapter summary

The chapter focused on the literature review basing on the theoretical framework and conceptual framework. Review of relevant literature entailed looking at the resourcing of schools in order to support ICT integration in the teaching-learning process, integration of ICTs in the teaching-learning process and challenges encountered in integrating ICTs in the teaching-learning process of O-level programmes at secondary schools. The next chapter will focus on the research methodology that was used in the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design and techniques used to collect and analyse data in the study. The methodology is discussed under the following sub headings: research approach and research design. It further discusses population, sample, sampling techniques, research instruments, and data collection procedures and data analysis of the study.

3.2 Research Approach

Tashakkori and Creswell (2004) define mixed methods research as a holistic approach that integrates both quantitative and qualitative methods in a single study. This approach involves collecting and analyzing data using both numerical and non-numerical methods, combining the findings, and drawing inferences that capitalize on the strengths of both approaches. A mixed methods approach was considered appropriate for the study as the method is adaptable to collective meaningful data from subjects. A mixed methods approach was used with a view that, both quantitative and qualitative approaches, gives the desired outcome as by combining different research approaches, the limitations of one method are compensated by the strengths of another, resulting in a more robust and credible research design (Schumacher, 2014). The goal of collecting diverse data types in this study was to gain a more comprehensive understanding, achieve deeper insights, and establish significant knowledge claims that consider a wide range of perspectives and interests (Greene & Hall, 2010). This mixed approach was appropriate because it allowed for the integration of different theoretical and empirical methods, enhancing the results and providing a form of triangulation, where the findings from one method are validated and clarified by another. The research aims and objectives involve both deductive and inductive elements, making a mixed approach the most suitable choice**.**

3.3 Research Design

A research design is a strategic plan that outlines the procedures for gathering, examining, and interpreting data, as defined by Leedy (2009). It identifies the specific individuals or groups to be studied, the timeframe, setting, and circumstances under which the research will be conducted, providing a clear roadmap for the research process. Thus, a research design provides the direction to uncover the solutions to the research objectives outlined in chapter one. It is a detailed plan, according to which the research is going to be carried out.

This study aims to investigate the availability and utilization of ICT in teaching mathematics at secondary schools. The research design involves a mixed methods approach, starting with the collection of quantitative data, which is then supported by qualitative data, which is then supported by qualitative data to provide a more comprehensive understanding of the results. According to Plano Clark (2011), this convergent parallel design allows for the collection of both types of data to provide a comprehensive understanding of the research problem. The quantitative data provides an overall snapshot, while the qualitative data offers a more in-depth analysis to refine and expand upon the initial findings. The straightforward and uncomplicated nature of design is a second reason. The sequence is shown diagrammatically below:

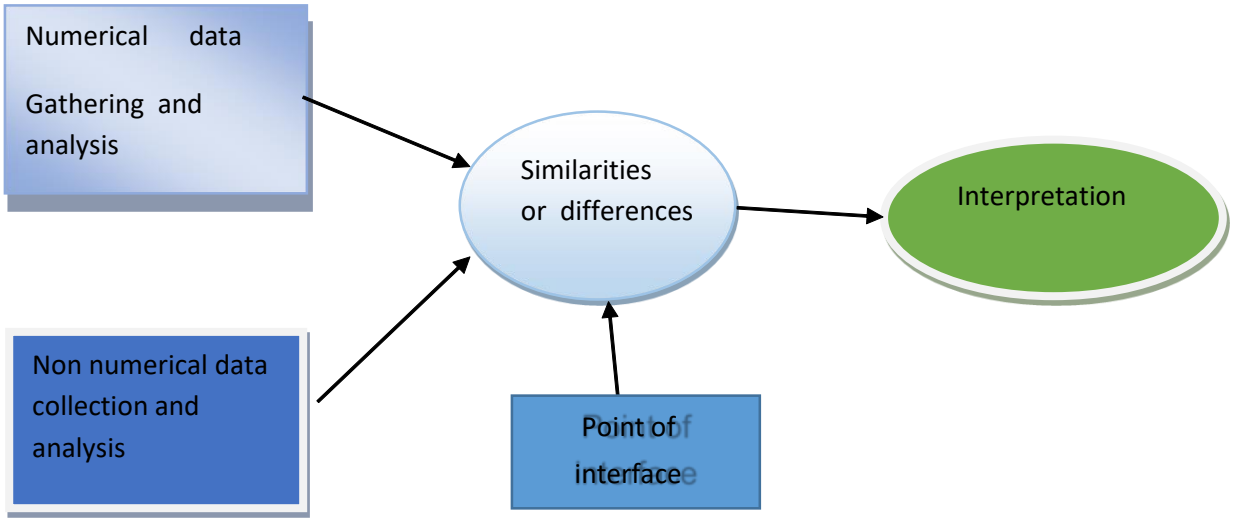

Figure 3 Convergent parallel Design

3.4 Population

According to Udombo (2020), population is a group of individuals with common characteristics with whom the research shall be carried out. The target population refers to the entire group of individuals or cases that are being studied, as defined by the research's objectives and goals (Delamount, 2016). In this study, the aim is to evaluate the access and usage levels of ICT among mathematics teachers in secondary schools in Tsholotsho District. Therefore, it is crucial to identify the specific group of interest. The target population for this research comprises all mathematics teachers in the Tsholotsho district of Matabeleland North Province. Once the target population has been identified, the next step is to determine the appropriate sampling strategy to select the desired participants for the study.

3.5 Sampling and Sampling Procedure

Sampling is a research method that involves picking a few of individuals or cases from a larger population of interest (Leedy, 2010). This approach allows investigators to study a smaller, representative group instead of the entire population (Creswell, 2010). Sampling procedures enable researchers to selectively choose participants, methods, and settings that

align with their research goals (Best & Kahn, 2003). In this mixed-methods study, stratified purposive sampling was employed, combining elements of probability and purposive sampling. This involved dividing the population into subgroups (strata) and intentionally selecting a limited number of cases within each stratum for in-depth analysis (Patton, 2002). This technique is also known as 'selecting samples within samples' (Patton, 2002). Purposive sampling is a non-probability approach that relies on the researcher's judgment to select participants, methods, and settings that best fit the research objectives (Creswell, 2010). Purposive sampling is also known as judgmental, selective or subjective sampling (Bryman, 2010). Purposive sampling shall be chosen because it allows for the selection of participants who are experienced in the research topic. Also it is time-efficient in comparison with other sampling methods. Researchers according to Creswell (2010) use their expert knowledge to select and judge whether a particular sample will be representative for the study.

According to Creswell (2010), purposive sampling is a crucial non-probability sampling technique that enables researchers to selectively identify and recruit key participants who are most relevant to the study. This approach relies on the researcher's expertise and judgment to carefully select sampling units that align with the research objectives, ensuring the most informative and valuable data collection. The research participants consisted of being based on the researcher’s judgment and the objective of the investigation. This is going to be done by identifying teachers that teach mathematics at selected schools. In this study participants shall be chosen using stratified sampling and then purposely sampled schools. Five secondary schools are secondary schools in Tsholotsho district. Twenty teachers on the other hand were selected using purposive sampling that is by virtue of asking permission from authorities and seeking guidance from the administrators on teachers that teach mathematics. After purposively selecting the teachers they shall then be grouped into different strata according to gender and level they taught.

Purposive sampling and stratified sampling were chosen because of their merits. Bernard (2012) posits that purposive sampling is flexible and is more practical than other sampling methods, considering the time, effort, and resources required to recruit participants. The in-built favouritisms of this method shall be considered in this study as promoting efficiency and quality which is crucial in validity, reliability and competence of the informants. Mitchell (2012) suggests that purposive sampling intentionally selects participants or cases with specific traits or features that align with the research focus, yielding more informative and relevant data. This is the reason why teachers and school heads teaching in poor rural schools were chosen for the purpose of this research. Stratified sampling ensures high representative sample of all the strata or layers in the population (Bernard, 2012). This means it ensures that each subgroup within the population receives proper presentation within the sample thus why the sample was stratified.

3.6 Data Collection Instruments and Procedures

According to Maxwell (2005) data collection instruments are a means used to identify information sources and a way of collecting information during a research study. Data collection instruments include interviews, focus group discussions, and expert opinions, direct and participatory observations amongst other data collection instruments. For quantitative aspect closed questionnaires and closed interviews were used whereas the qualitative aspects are covered by the open ended questionnaires and open added interviews

3.6.1 Interviews

An interview according to Rubin and Rubin (2005) is a way of collecting data through face-to-face direct verbal interaction between the interviewer and interviewee. They also define a dialogue as a mutual exchange between two or more people, where one person, typically the interviewer, poses questions to gather information, thoughts, and perspectives from the other

person, the interviewee. An interview is communication that happens between two individuals, where one individual (interviewer) asks questions to the second individual (interviewee) with the hope that the responses given by the interviewee will provide the data needed to answer the research questions.

In the study semi-structured interviews were used as a way of gathering information on the adaption of teachers to ICT in the teaching-learning of mathematical disciplines. As analyst, point out, semi structured interviews is the most used type of interview in qualitative researchers (Alshenqeeti,2014). The researcher shall use semi structured interviews for collecting data in qualitative form. A standardized interview is a widely used research technique in quantitative studies. Since a mixed research method shall be used hence the need to have structured questionnaires that will be analysed quantitative.

The advantage of using semi-structured interviews as a means of collecting data is that rich and detailed information needed to answer the research questions can be obtained. This is done by modifying the interview questions to best fit the needs of the interviewee. This should be done whilst ensuring that the original question does not lose its meaning. In the process of conducting an interview, the interviewees are free to ask for clarifications and rephrasing of questions they might not have well understood and this helps to ensure that data collected is true and actual relates to the questions asked. Denzin and Lincoln (2018) assert that tailoring the questions helps to make the most out of interviews sessions through gaining important data from the participants.

Rich data and deep understanding of the interviewee's responses were enhanced through the use of interviews. During the interview social cues, such as body language, voice intonation of the interviewee gives the interviewer a lot of supplementary data that add value to the verbal responses given by the interviewee. Rubin and Rubin (2005) postulate that the greatest

advantage of using interviews as a data collection method is the richness of detail obtained from the interviewee. According to Babbie and Mouton (2010) challnges may arise during the interview preparation stage, and this major disadvantage of the interview. Babbie and Mouton (2010) go on to point out that, recruiting respondents for the interview is not only the hard thing, due to the typical unique nature of the interview, but planning where and when to meet can also be difficult. The participants may postpone or terminate the meeting place at the last minute with no option to reschedule. To overcome the identified weaknesses, effort was made to remind the interview participants, about the appointment dates. The interview participants were also asked to diarise the interview date so that they do not forget the interview dates and to communicate early if there are any changes.

3.6.2 Questionnaire

The questionnaire that was used in this research had both open and close ended questions.

Chiromo (2009, p.24) views a questionnaire as, "that form of enquiry which contains a systematically compiled and organised series of questions that are sent to the population samples". A mixed approach was employed, utilizing both closed-ended (structured) and open-ended (unstructured) questions in the questionnaire. As noted by Charumbira (2009), open-ended questions provide a wealth of detailed information and allow respondents to share a broad range of insights and perspectives that may not have been considered by the researcher, offering a more nuanced understanding of the topic. This gives the researcher to draw an insight on participants responds his or her perception and attitude towards assess the levels of use and access to ICT in the teaching and learning of mathematics at secondary schools. Interviews maybe useful as a follow up to questionnaires to test for consistence. An open ended question gives the respondents a chance to express himself or herself hence thus why the researcher opted to use them to gain an insight on teacher adaption to ICT in the

teaching and learning of mathematics at secondary schools. Closed ended question refers to any question for which a researcher participant with options from to choose responses (Creswell, 2012). Closed questionnaires were used to guide the participants.

3.6.3 Focus Group Discussions

A focus group discussion involves the interaction of two or more individuals for the purposes of collecting data, (Then, Rankin & Ali, 2014). In focus groups, questions are posed in a dynamic group environment where participants engage freely with each other. Focus group discussions were used in the study as they assisted to gain in-depth knowledge concerning attitudes, perceptions and opinions of individuals relating to ICT merging in the teaching and learning process. A lot of time and money is saved through the use of focus group discussions as compared to individual interviews. Also a lot of data is gathered within a short period of time as compared to the data collected from individual interviews. Yin (2016) asserts that focus group discussions are less time consuming as compared to one-on-one interviews, as one gets to collect large volumes of data from a given session. As the participants get to answer and discuss the same question at once, more views on a particular issue are gathered.

Since a lot of individuals participate in the focus group discussion, information rich data is gathered. To help reduce bias the participants are given the freedom to ask their own questions within the limits of the topic under discussion. The data gathered from focus group discussions should complements the data obtained from semi-structured interviews. A major weakness of focus group discussions according to Yin (2018) is that of dominance by one or two individuals. To reduce the problem of having the focus groups being dominated by one or two individuals ground rules for the doing the discussions must be outlined. It must be agreed that everyone speaks through the chair. It also must be agreed that a sequence be

followed in answering the posed questions and the same order maintained throughout the discussion. In this way gathering biased data from dominating individuals is greatly reduced. Focus group discussions are conducted with teachers.

3.7 Data Analysis

The data that was collected from interviews was recorded verbatim and then analysed by using segmenting, coding, and also through linking the categories (themes). Whereas the data that was collected from closed questionnaires was analysed using statistical instruments (pie charts, bar graphs and tables).

3.7.1 Segmenting

The recorded data has to be thoroughly analysed so as to make it possible to separate it into clear logical ideas. Segmenting allows for the identification of critical data segments which addressed specific research questions, (Hsieh &Shannon, 2005). The data collected from the interviews and focus groups is categorized into themes that align with the research objectives outlined in chapter one.

3.7.2 Coding

A preparatory data set was created where all the data was logged in a table with the actual question posed, the responses from the various participant groups with specific detailed responses from the coded participants. The full picture of what was coming out per question is then summarised into a theme. These themes was then used in the discussion in chapter 4.

3.7.3 Linking the categories

The categories are analysed and contrasted to identify emerging trends and themes in the data. Thus, thematic analysis is used to analyse data. Thematic analysis entails making sense of unrelated data through noting patterns within the data. Thematic analysis is used as it is

flexible and allows for rich description of data. According to Braun and Clarke (2006), thematic analysis is a technique used to extract and interpret meaningful patterns (themes) from data. This means that its main emphasis is on finding out the patterns which arise within the data that has been collected. Thematic analysis is easy to use and apply when analysing data.

3.7.4 Quantitative analysis

According to Sage (2007), three crucial aspects of research are the 'three Ps': person (researcher's perspective and decisions), process (research design and methods), and presentation (data analysis and interpretation). As noted by Gibich (2007), this encompasses the researcher's choices throughout the study, data quality, and the clear presentation of findings, including theoretical interpretations. The data will be presented in a visually engaging format using tables, graphs, and percentages. Statistical analysis will be conducted using SPSS, and descriptive techniques will be employed to summarize the data, supplemented by extracts and information from the questionnaires

3.8 Ethical Considerations

According to Creswell (2014), researchers from any research tradition encounter various ethical dilemmas throughout the research process, including field research data gathering, data analysis, and the dissemination of research findings in reports. These ethical issues arise regardless of the research approach or methodology used. Ethical clearance was obtained from Bindura University of Science Education (BUSE). Following ethical approval, letters seeking clearance were sent to MOPSE, then to the district and lastly schools.

3.8.1 Informed consent

Before conducting the study, participants' consent was obtained through informed consent procedures. As emphasized by Kour (2014), participants have the autonomy to decide whether to participate in research or not. Informed consent is ensured by seeking permission from individuals before they engage in the study, guaranteeing that they are aware of the research's nature, risks, and benefits. A straightforward and explicit description of the research objectives and potential impact of participation should be prominently highlighted. The participants were given the assurance that they can freely withdraw their service at any time if they felt uncomfortable. The participants were informed both verbally and through letters which they had signed to show that they agree to be a part of the research study. Before participating in the study, individuals were asked to sign consent forms confirming their willingness to take part. The informed consent process was carried out as follows: Prior to the study's commencement, participants were fully briefed on the research's objectives and had the opportunity to ask questions to ensure they understood the purpose and scope of the study.

3.8.2 Anonymity

Data collected for research must be stored securely, treated with confidentiality, and only shared publicly in a way that protects participants' privacy and anonymity, (Mugenda, 2011). Anonymity entails hiding the identity of the individuals. The names of the participants can be replaced with false names in order to maintain anonymity. Participants were allowed to remain anonymous and their names and school affiliations were not requested during the interviews and questionnaire sessions. In the study the real names and address of the participants and school were not revealed.

3.8.3 Confidentiality

As stated by Israel and Hay (2009) confidentiality has to do with how one treats information that has been disclosed to them in a context of mutual trust and with the understanding that information would not be shared to any other persons without their consent. The participants were given the assurance that the information gathered was not going to be revealed or divulged without their permission. In the study the participants were assured that whatever issues had been raised and discussed during the interviews and questionnaires were going to be handled confidentially. Even the questionnaire that were filled online the participants were assured that the only people that had access to their responses were the researcher and supervisor.

3.8.4 Privacy

One of the fundamental principles of informed consent is the guarantee of participants' privacy. As defined by Cresswell (2011), privacy refers to individuals' autonomy to control access to personal information and themselves. In research ethics, privacy is a fundamental right of participants, ensuring that their personal information and identity are protected. To uphold this right, various measures were implemented, including informed consent and the use of anonymous identifiers instead of names, to safeguard participants' privacy.

3.8.5 Prevention of harm

In carrying out research the participants should be protected from personal humiliation, anguish, physical anxiety, disgrace and any other form of harm, (Stevens 2013). To prevent harm, the participants have to be given room to communicate their feelings. If their feelings prior and during the study have changed and they feel they can no longer continue they should feel free to express such feelings without feeling judged. Participants must be informed of their right to refuse participation or withdraw from the research at any point they choose, emphasizing their autonomy and voluntary involvement. This ensures that

individuals participate with full awareness of the potential risks and benefits, and that their involvement is entirely voluntary and informed. No force or coercion must be used in order to obtain data from the participants.

3.8.6 Falsification and fabrication of data

Flynn and Goldsmith (2013) Fabrication refers to the act of creating and recording fictitious data, while falsification involves manipulating or altering research materials, procedures, equipment, or data to misrepresent the findings, including omitting or altering data to distort the results, thereby compromising the accuracy and validity of the research. Information obtained from participants can be stored in password protected folders to prevent misuse. Information sourced from earlier research has to be acknowledged through referencing to avoid academic dishonesty-plagiarism.

3.9 Trustworthiness

Trustworthiness is defined by Smith (2008) as the extent to which the research findings are considered to be believable. Thus, trustworthiness in research encompasses all aspects of the study's design, implementation, and reporting, aiming to ensure that the results accurately reflect the participants experiences and perspectives, making the study reliable and credible when the findings genuinely represent the participants realities and ideas.

The reliability and validity of qualitative content analysis are commonly demonstrated through the use of terms like credibility, dependability, conformability, and transferability, which collectively ensure that the research findings are trustworthy, consistent, and applicable to other contexts

3.9.1 Credibility

The credibility of qualitative research depends on the extent to which the data and analysis are convincing and trustworthy (Israel & Hay, 2009). A variety of strategies are used in the study to ensure credibility mainly triangulation and member checking among others.

Creswell (2014) defines member checking as the process of returning the completed research report to the participants for the review and confirmation. The participants confirm the validity of the research findings by cross checking whether what has been reported is what is actually gathered from the participants. This can be done through conducting follow up interviews with the participants. The participants can also comment on the data that has been collected using the various instruments.

To ensure credibility in the research findings, the participants have to be encouraged to be honest when contributing data. The individuals have to be encouraged to participate on a free-will basis and to be frank from the outset of each session. If there is anything they do not understand during the data gathering process, they are free to seek clarifications. Triangulation, as described by Bowen (2006) involves combining multiple data sources, research methods, and data collection tools to increase validity. Triangulation is important as it is a means of ensuring that the data collected is authentic. Data from the different sources can then be compared and contrasted; in that way rich data can be collected from the participants. Triangulation also helps to reduce the effect of bias by relying on one source of data and one data collection instrument. To improve the richness of the research findings, data is collected using interviews and focus group discussions. Also data is collected from different sources which included the school administrators, teachers, students and SDC members.

3.9.2 Validity and Reliability

While challenges to the accuracy and consistency cannot be entirely eliminated, their impact can be mitigated by prioritizing validity and reliability in research design (Cohen, Manion, and Mortison, 2006). Validity determines whether the study's outcomes can be applied to the entire population. To strengthen construct validity, key terms are precisely defined. Moreover, the research instruments are refined and validated through supervision, ensuring clarity and accuracy, thereby enhancing their validity.

According to Sal kind (2006), reliability is equivalent to qualities like dependability, consistency, stability, trustworthiness, predictability, and faithfulness. Delport and Roestenburg (2011) agree that reliability pertains to the accuracy of measurement, specifically the degree to which test scores are unbiased and precise, with minimal measurement error. Although it is rare to have perfect reliability they are procedures that can increase reliability. In this reliability will be achieved by increasing the number of observations, standardised instructions and maintaining constant scoring procedures.

3.10 Chapter Summary

This chapter thoroughly explained the research methodology and procedures employed to collect and analyze data. It covered the research approach and design, the identification of the target population, the determination of the sample size, and the sampling techniques used. Additionally, the chapter elaborated on the data collection methods, the research instruments employed, and the techniques used to analyze the data. The next chapter, chapter four focuses on data presentation, analysis and discussion.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter presents and analyse data collected using questionnaires and interviews. The purpose of the study was to assess teacher access and use of ICT in teaching mathematics at secondary schools in Tsholotsho, Matebeleland North Province. Tables, pie charts and graphs were used to present quantitative data. Qualitative means were analysed using thematic analysis.

4.2 Qualitative Analysis

This section of the study involves a qualitative analysis to analyse and clarify of the findings. The data was examined using narrative analysis and thematic identification. The goal of this phase was to analyse the qualitative data to achieve the research objectives. As Cohen, Manion, and Morrison (2011) note, there are various methods for analysing and presenting data. The study aimed to identify the physical ICT infrastructure available in Tsholotsho district schools to support ICT integration in mathematics teaching and learning. Additionally, the research explored the strategies schools use to acquire ICT equipment, and the participants' responses are presented below. The responses from the participants are given below:

T1 responded as follows:

. *The school was donated ten computers by the president, but unfortunately, they have remained unused for educational purposes, and the school lacks a dedicated computer lab to facilitate their utilization* In addition, T2 said:

The ICT equipment that the school has was purchased some time back and recently the school head announced that they had managed to buy some laptops for some departments.

T3 responded as follows:

The ICT equipment was purchased by levelling learner's computer levy that was meant to buy computers for the school though the number was insignificant.

T4 admitted being unaware of the processes that are in place at the school in order to source ICT facilities and made suggestions on how this could be done as given below:

I am not aware of how the school sources the ICT equipment. The school could look for donations from the corporate world, NGOs and former students who have made it in life. The school can also embark on projects specifically for raising ICT funds.

T5 just like T4 confessed that they lacked knowledge on the strategies in place in the school in order to source ICT equipment. T5 lamented:

Personally, I am not aware of any strategies that are in place in order to secure ICT resources for the school, but I suggest that the school tasks the SDC to organise fundraising activities in order to get funds to buy these resources. Again, the school can allow the students especially those in higher classes to bring their own gadgets if they have them. The school can lease ICT resources from companies like Q-rent at affordable prices.

On the same issue of sourcing ICT equipment for the school, the question put to the administrators was "what strategies have you put in place in order to source ICT equipment for the school?" The response of the administrators on this issue are as follows:

AD2 indicated:

In order to source ICT equipment, the school has made it its mandate to purchase laptops for each department by having an IT levy charged for each learner. So far we have managed to acquire laptops for six departments.

AD3 added that:

The school has a five-year plan to building a computerised library. The school has liaised with the SDC members that an IT levy be charged for each learner so that more IT resources can be bought. Also we have engaged companies like Econet Wireless and TelOne to increase WIFI coverage in the school and provide affordable data packages.

What emerged from the manner schools provides ICT equipment is that most of the ICT equipment available at the school was donated. Donations came from the government and NGOs. It is also clear that the donations are not enough, for example some schools only received ten computers from the government and never increased the number. As a result, the usage of ICT in teaching mathematics is very limited. A limitation caused by inadequate resources. According to Ganyani (2016), NGOs have also been involved in resourcing secondary schools with ICTs for use in the learning and teaching process. Schools used its own financial resources and it managed to buy ICT equipment's. It also came forth from the participants' responses that strategies that the school can adopt to acquire ICT resources are: engaging the corporate world, liaising with former students, renting of ICT equipment from IT organisations, charging IT levy and the SDC having to organise fundraising activities.

4.2.1 Physical ICT infrastructure Available at school

1. After exploring how schools obtain ICT tools, the research investigated the physical ICT infrastructure and tools available in Tsholotsho district schools to support online learning, with a specific focus on the question: "What ICT tools are available in schools for online learning?" The responses from most teachers were similar to those of Teacher 2 (T2), who stated:

The school has been donated the 15 desktop under the presidential scheme some 15years ago and they have never been used due to lack of power. In 2018 the school was further

donated 10 laptops which have now been allocated to departments for record keeping and report writing.

.

T4 also responded by saying that:

Our school was lucky to receive presidential donations of ten computers from the President. However, these computers are not enough to cater for the entire school.

T8 responded by saying that:

We received tablets, desktop computers from CAMPFED.

The response of the participants indicates that some schools do not have some ICT resources for online learning. However, some of the responses seem to indicate that some schools received ICT gadgets such as tablets and desktop computers that were sourced through donations. Though some schools have these resources, it appears they are not adequate as evidenced by responses given by some participants. The major observation is that the school itself is not putting for online learning because the gadgets seem to be there though they are not enough.

4.3 Challenges of ICT Integration

The research sought to determine challenges faced by teachers in using ICT in the teaching of mathematics. Questions were posed to teachers and they strongly agreed that lack of training was one of the challenges faced by teachers in using ICT in teaching mathematics as shown in Figure 2

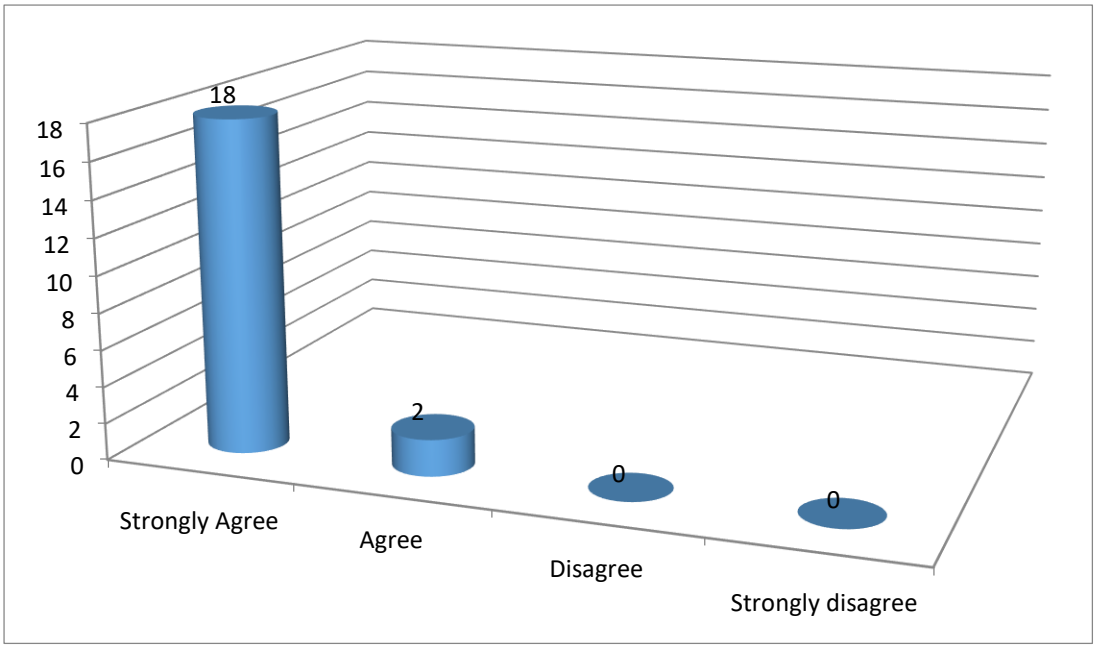

Figure 4: Participants views on poor training as a challenge to ICT integration

Studies have shown that the extent of teachers' exposure to ICT during their training has a profound impact on their acceptance and successful implementation of technology in their teaching (Teo, 2009). Data from figure 2 presents that an overwhelming 90% of the respondent indicated that inadequate training affects successful integration of ICT in mathematics.

Table 1 Determining challenges of poor integration of ICT in mathematics

Table 1: Challenges of poor integration of ICT in mathematics

QUESTION	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	REMARK
There is	0	0	45%	`55%	Agreed

limited time for ICT					
ICT gadgets are inadequate	0	0	5%	95%	Agreed
Lack of internet connectivity	5%	15%	20%	60%	Agreed
Lack of computer labs	25%	20%	10%	45%	Agreed
There is resistance to change	15%	15%	40%	30%	Agreed

The participants agreed that integration was affected by many factors. Participants agreed that time allocated was not enough for proper usage of ICT in the teaching and learning of mathematics therefore more time is required to teach mathematics using ICT. All participants agreed that shortage of ICT gadgets was affecting their readiness to integrate ICT in mathematics. Internet connectivity and attitudes of teachers was discovered as affecting readiness of teachers to use ICT in the teaching-learning of mathematics. Teachers who have negative attitude towards ICT are less likely to be ready to merge ICT in the teaching and learning of mathematics.

4.4 Biographical data of participants

Biographical data is important to get a clear understanding of population in the environment of the research. The Biographical data that was collected included age, gender, qualifications

and teaching experience. The data presented in this part of the chapter from the participants was to establish their biographic data in terms of teaching experience, qualification and age, seen as relevant to issues in the study. The study also sought to establish the gender of the teachers to get balanced views and opinions from both genders. Participants comprised of 7 females and 13 males. The results in Figure 3 show that there were slightly more male teachers than females who teach mathematics in the district. This information is encouraging in that there is a fair representation of female teachers teaching Mathematics. This means that the girl-child would not be left behind as there are plenty of role players. The views of both males and females were obtained regarding their access and use of ICT in learning and teaching process.

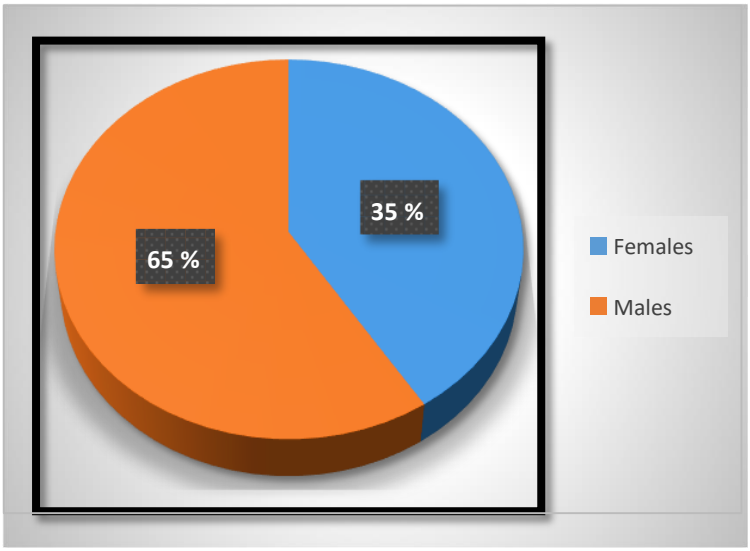

Figure 5: Gender representation of teachers

Figure 5 shows that there was an unequal representation of teachers by gender. This is because gender imbalances still exist in the teaching of mathematics with the subject male dominated. However, information gathered is encouraging especially with 35% of the participants being females. Waal (2006) has also highlighted the importance of female role models in mathematics, who can challenge and overcome gender biases that often favour men

in maths-related fields. In this study, representation of males and females was very important to have a balanced view and opinions from both genders.

4.4.2 Age of participants

The study sought to establish the age of teachers. The participants ages are shown in Figure 4 below:

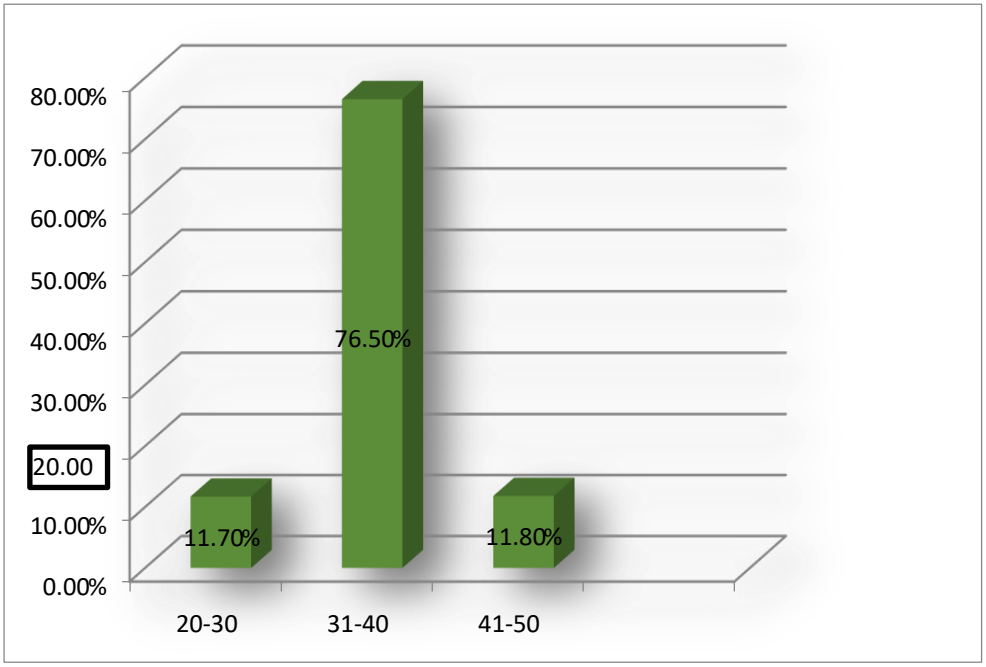

Figure 6: Age of teacher participants

Information from figure 6 indicated that a large proportion of the teachers were aged between 31-40. Again, whilst only 11.7% fell within the ages of 20-30, and 11.8% fell in 41-50. The participants' population mostly fell within the age range which is said to be techno-savvy in educational debates as 'digital natives' and 'net generations' (Presky, 2001). This implies that the majority of today's teachers are part of the digitally native generation. As a result, if the required technology infrastructure is provided, they will be more inclined to integrate technology into their teaching practices and student learning.

11.8% of the teachers are in the age range of 41-50 years. This is the age group which has vast knowledge on the traditional approach to teaching and is somehow sceptical about integrating ICTs in the teaching-learning process. Muchiri (2008) asserts that younger teachers are more open to use ICT than older teachers. Since more teachers fall below 40 years the future is bright in the digital world because if this group is exposed to ICT it can easily master hence integration can be achieved at a higher level.

4.4.3 Teacher qualifications

Table 2: Teacher qualifications

Qualification	Number of teachers	Percentage
Certificate in Education	0	0%
Diploma in Education	12	60%
Bachelor of Education	5	25%
Master of Science Education	3	15%
Total	20	100%

The qualification of teachers presented in table 2 indicates that five of the teachers are holders of a bachelor's degree, twelve educators are holders of Diploma of Education majoring in mathematics and three is a master's holder. The data shown in the table revealed that the teachers are all qualified and all hold relevant educational qualifications which put them in a position to be able to integrate ICTs in the teaching learning process. The teachers have received pedagogical training and are knowledgeable on the different teaching strategies

that can be used in the classroom so to produce good results. The teachers are expected to embrace new technology and adapt to use ICT in the teaching-learning of mathematics.

4.4.4 Teacher Experience

The study further sought to establish the distribution of teachers by their years of experience in the teaching field. Table 3 summarises the data obtained.

Table 3: Teaching experience of teachers

Teaching Experience (years)	Number of Teachers	Percentage
Below 5	3	15%
5-10	14	70%
11-15	2	10%
Above 15	1	5%
Total	20	100%

The data obtained revealed that the majority of the teachers have vast experience in teaching with fourteen teachers falling in the range of 5-10 years' experience, three below 5 years' experience, two with an experience of 11-15 and one has an experience of more than 15 years. As one gains more experience the more they understand the subject and ways of improving on lesson delivery so as to produce good results. Teaching experience of a teacher is of significance as it influences how ones responds to new technologies. The teachers with more than 15 years' experience are those that underwent training before ICT was made compulsory in the training colleges and may not be familiar with use of ICT in the teaching

and learning process. Contrary, those with experience below 5years learnt in the new format where ICT is being enhanced in teaching.

4.4.5 Teachers with ICT Certificate

The research also sought to establish whether participants had any ICT training certificates. The results are represented in the graph below

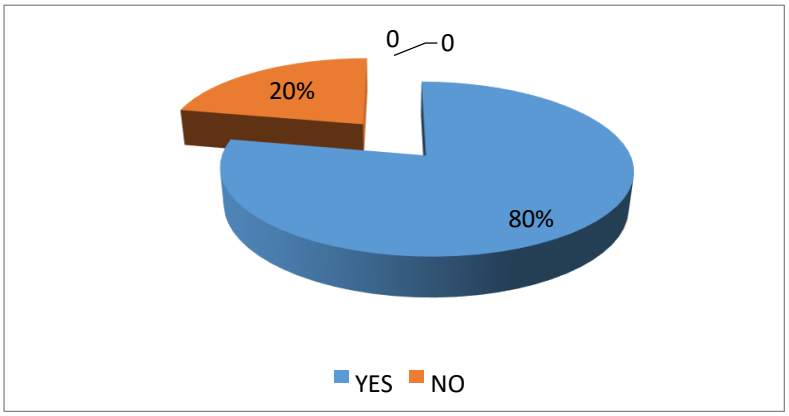

Figure 7: Teachers with ICT Training Certificates

Data obtained showed that most teachers teaching mathematics do not have an ICT training certificate. This has an effect of not being comfortable with teaching mathematics using ICT skills. It is very important for teachers to have an ICT qualification so that they are able to use ICT tools in the teaching mathematics.

4.4.6 ICT Training at tertiary institution

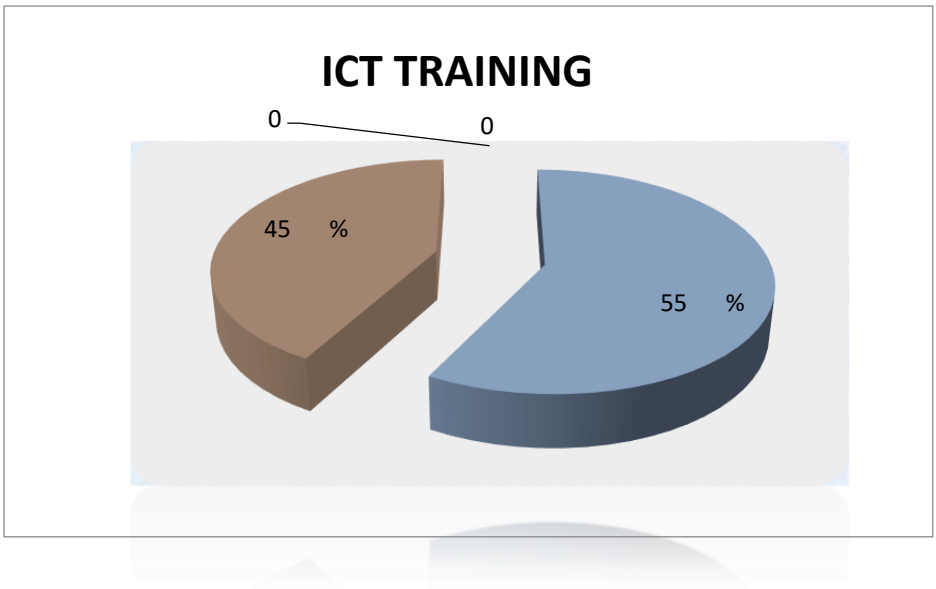

Figure 8: ICT training at tertiary institutions

Data obtained showed that 55% of the participants did not receive ICT training or do an ICT course at college. This was due to the fact that some of the participants learnt before the digital era where much emphasis was on the traditional ways of teaching mathematics that involved using the textbook as the best way of teaching mathematics. The teachers that were trained before the digital era are reluctant to use ICT in teaching mathematics because of lack of knowledge.

4.4.7 Teachers ability in designing instructional material

The research sought to establish teacher's ability to design instructional materials and the following results were:

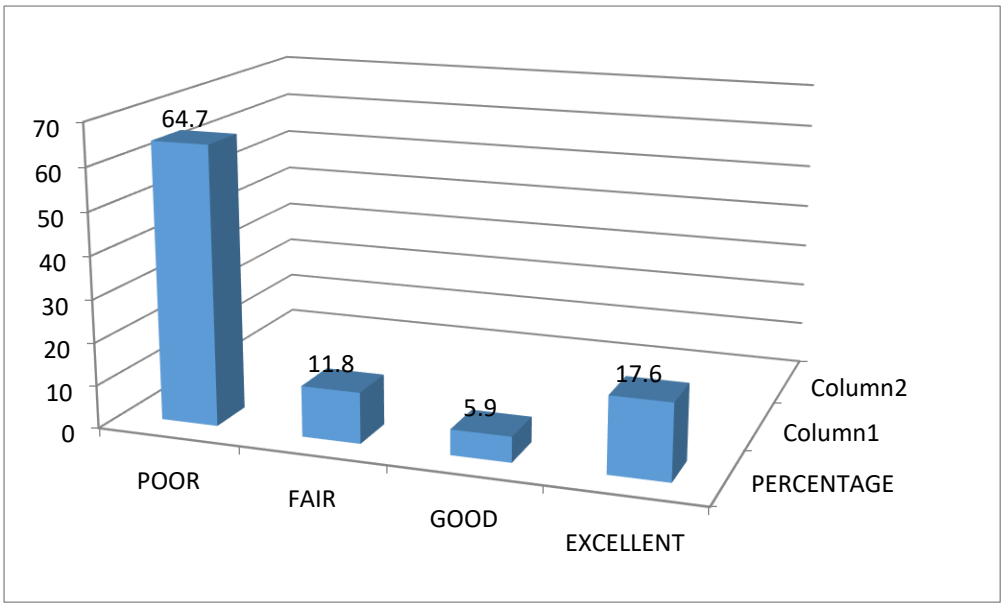

Figure 9: Ability to design instructional material

Figure 7 reveals that most participants cannot design instructional materials with 64.7% indicating that they could not design instructional materials using ICT. A webpage if designed well help students to understand basic concepts (Boutne, 2008). If one is able to design webpages for instructional materials it means it can be easy for one to use ICT in the teaching of mathematics. Since 64.7% of the participants are poor in designing instructional material this is an indication that most teachers are not comfortable with ICT gadgets thus not ready to use ICT in the teaching of mathematics.

4.4.8 Level of ICT Competence in Classroom Practice

The research sought to determine teacher's competence in the classroom and the following results were obtained:

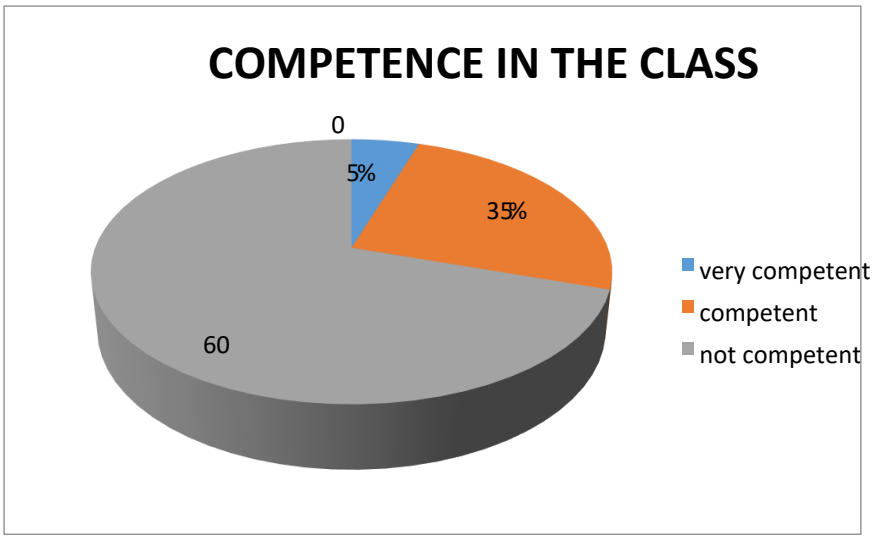

Figure 10: Level of teacher competence in the classroom

Figure 10 shows the teachers self-assessed ability to use technology in the classroom. While many teachers have access to technology (as shown in table 10), 60% of them admit they need improvement in using it effectively for teaching. On the other hand, 35% consider themselves proficient and 5% highly proficient. This highlights that merely having access to technology does not necessarily having access to technology does not necessarily means teachers are skilled in using it. This supports the view that having access to ICT is not a guarantee of competency. However, having ICT competence helps a teacher to integrate ICT in mathematics because he or she will not struggle in using mathematical software such as maple, GeoGebra, Microsoft mathematics and java.

This calls for support and training for the teachers.

4.4.9 Determining ICT integration

The research sought to determine whether ICT integration in mathematics was easy or difficult.

Table 4 Determining the integration of ICT in mathematics

	EASY	DIFFICULT
ICT INTEGRATION IN MATHEMATICS	**6**	**14**
PERCENTAGE (%)	**30%**	**70%**

Table 4 above shows that most of the teachers regarded teaching mathematics using ICT as very difficult. This is the reason why most mathematics teachers are not incorporating technology into their math teaching practices. For teachers to embrace technology then they need to have the rightful attitude. It is evident from the results that there is a strong perception that integrating ICT in teaching mathematics is difficult. This is an issue as it militates against adoption of ICT.

4.4.10 Chapter summary

This chapter presented analysed data and discussed the findings of the study based on assess the levels of use and access ICT in the teaching of Mathematics by teachers in Tsholotsho district. Presentation, analysis of data was done in line with objectives given in Chapter one. The following chapter will explore on the summary of the major findings, recommendations and summary of the study

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

This study aimed to assess the teachers' adaption to information and communication technology in Secondary school mathematics in Tsholotsho, Matebeleland North Province. This chapter presents a summary of the findings, conclusions and recommendations.

5.2 Summary of findings

5.2.1 Teachers' level of access and use to integrate ICT in the teaching and learning of Mathematics.

The study examined the access and usage of ICT tools among mathematics teachers in Tsholotsho district's secondary schools. The results showed that while most teachers have basic ICT skills, they need additional training on using ICT tools for mathematics teaching. The teachers reported limited knowledge of mathematics-specific ICT tools and emphasized the lack of adequate physical ICT infrastructure in their schools, which poses a significant barrier to ICT integration in mathematics education.

5.2.2 Teacher knowledge and ICT skills in the teaching and learning of Mathematics

The study also revealed that teachers lacked the necessary pedagogical skills to effectively integrate ICT into mathematics teaching, with most participants acknowledging that using ICT in mathematics instruction was challenging due to inadequate training in ICT-based teaching methods during their college education. Furthermore, the time allocated for mathematics lessons was deemed insufficient, failing to accommodate the modern teaching approaches that incorporate ICT.

5.2.3 Teachers' challenges towards the use of ICT in the teaching of mathematics

The research uncovered numerous challenges that teachers encounter when attempting to integrate ICT into mathematics teaching and learning. The study found that schools face significant obstacles that hinder effective ICT integration, including inadequate ICT resources and infrastructure, such as computer labs, and financial constraints. Specifically, the shortage of ICT resources meant that, on average, 50 students had to share a single computer, a significant barrier to successful ICT integration in mathematics teaching. Furthermore, some schools in the district lacked electricity, making it impossible for even those with the necessary expertise to utilize ICT in mathematics teaching, highlighting the need for urgent attention to address these challenges and facilitate effective technology adoption.

5.2.4 Resourcing of schools to facilitate ICT integration in the teaching-learning process

The study's results showed that the majority of ICT resources (such as tablets, laptops, and desktops) in schools were obtained through donations from government and non-governmental organizations (NGOs). However, the study also revealed that the available ICT resources were insufficient, hindering the effective integration of ICT in mathematics teaching. The research identified potential strategies for schools to acquire ICT equipment, including partnering with the corporate sector, seeking support from alumni, renting equipment from IT companies, imposing a one-time IT levy on students, and organizing fundraising events through the School Development Committee (SDC).

5.2.5 Benefits of ICT integration in Mathematics

The findings indicated that there was need to match what was happening in the education sector with the demands of industry, so that the students who come out from their schooling are relevant to the needs of the industry. The study also revealed that the study of ICT

integration in education helps stakeholders to gain better understanding of the benefits of integrating ICTs in the teaching-learning process versus the traditional approach

5.3 Conclusions

The study's findings, based on the data analysis, led to the following conclusions aligned with the research objectives: While teachers have high levels of access and usage of ICT in teaching mathematics, most lack sufficient knowledge and skills in ICT. Additionally, the age and work experience of teachers' impact their ICT proficiency in teaching mathematics, with older, more experienced teachers tend to be less competent in ICT. Furthermore, the level of education attained by teachers influences their effectiveness in using ICT for mathematics teaching**.**

5.4 Recommendations

On the basis of the findings made in this study, the following recommendations were drawn:

1. School administrators, in collaboration with the School Development Committee (SDC), must ensure that the school has sufficient ICT resources to support the integration of technology in teaching and learning. Additionally, there is a need for increased support from both the government and private sector to provide secondary schools with the necessary ICT equipment and facilities, as well as to maintain and upgrade them.

2. Teachers need exposure to mathematics software and regular professional development through workshops to stay up-to-date with the latest tools and technologies, enhancing their teaching skills and student learning outcomes.

3. The Ministry of Primary and Secondary Education (MOPSE) should oversee and supervise the execution of the ICT policy in schools, ensuring its effective implementation and adherence to guidelines.

4. The Ministry, in partnership with private sector entities, should offer subsidized ICT resources, including materials and equipment, to schools and students, making technology more accessible and affordable for educational purposes.

5. There is need to address the electricity issue in schools if the implementation of ICT is to be successful.

6. The Ministry, in partnership with private sector entities, should undertake a joint investment to establish internet connectivity in all schools, ensuring universal access to online resources and digital opportunities for educational enhancement.

7. Education stakeholders, including school administrators, parents, policymakers, and others, must collaborate to develop effective strategies that promote the seamless integration of ICTs into teaching and learning, tackling the existing obstacles that hinder the successful adoption of technology in education.

8. The study recommends that administrators and parent ministry should train and staff develop teachers in the use of ICT. The training of teachers should not be left in the hands of individual schools hence the need to engage the assistance of the corporate world.

9. Teacher training institutions, including colleges and universities, should prioritize the integration of ICT training into their teacher education programs,

ensuring that future teachers are adequately equipped with the skills and knowledge necessary to effectively incorporate technology into their teaching practices.

10. The dissertation should serve as a practical guide to the policy-makers and the Principals in the Colleges of Education about how to increase the use of the new technologies in teaching and learning within the Zimbabwean education system. In the medium term, it is envisaged that this dissertation will lead to a more widespread use of ICT in teacher education. In the long term, as teachers are better trained to teach with these new technologies, they will also make better and more widespread use of them in the classroom, which will help equip students in Zimbabwe with the necessary skills to survive and thrive in the fast developing global economy and information society.

Finally, the researcher would like to recommend for a further research to be conducted on teacher adaption to use ICT tools in the teaching and learning of Mathematics with a larger population.

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Sage.

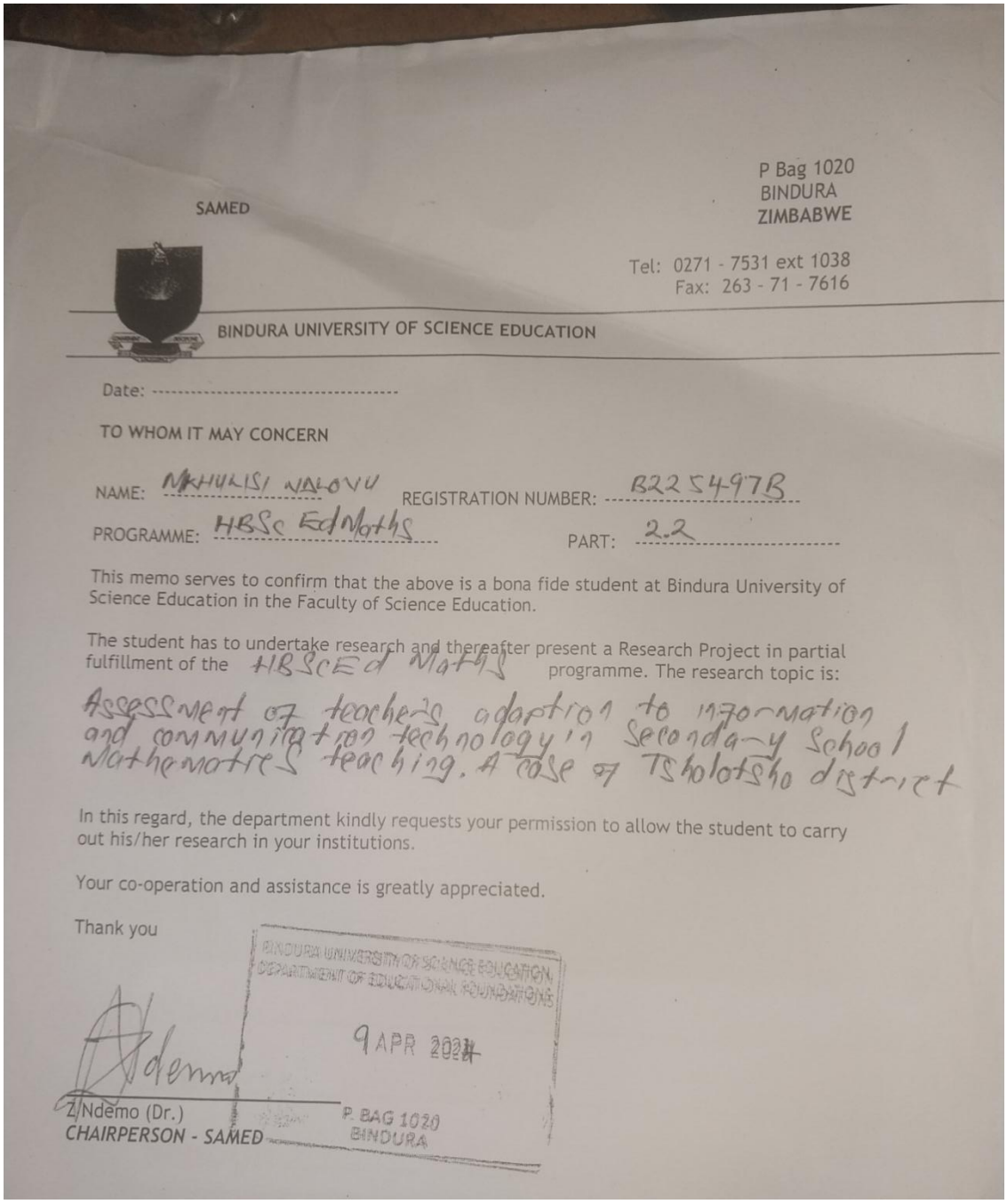
Zimbabwe National Information and Communication Technology Policy Framework.

December 2005. Government of Zimbabwe.

Zimbabwe National Information and Communication Technology Policy Framework

2016-2020. August 2016. Government of Zimbabwe

Appendix A: Introductory letter from Buse



SAMED

P Bag 1020
BINDURA
ZIMBABWE

Tel: 0271 - 7531 ext 1038
Fax: 263 - 71 - 7616

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: ----------

TO WHOM IT MAY CONCERN

NAME: NKHULISI NALOVU REGISTRATION NUMBER: B225497B

PROGRAMME: HBSc Ed/Maths PART: 2.2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the HBSCEd Maths programme. The research topic is:

Assessment of teacher's adaption to information and communication technology in Secondary School Mathematics teaching. A case of Tsholotsho district

In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

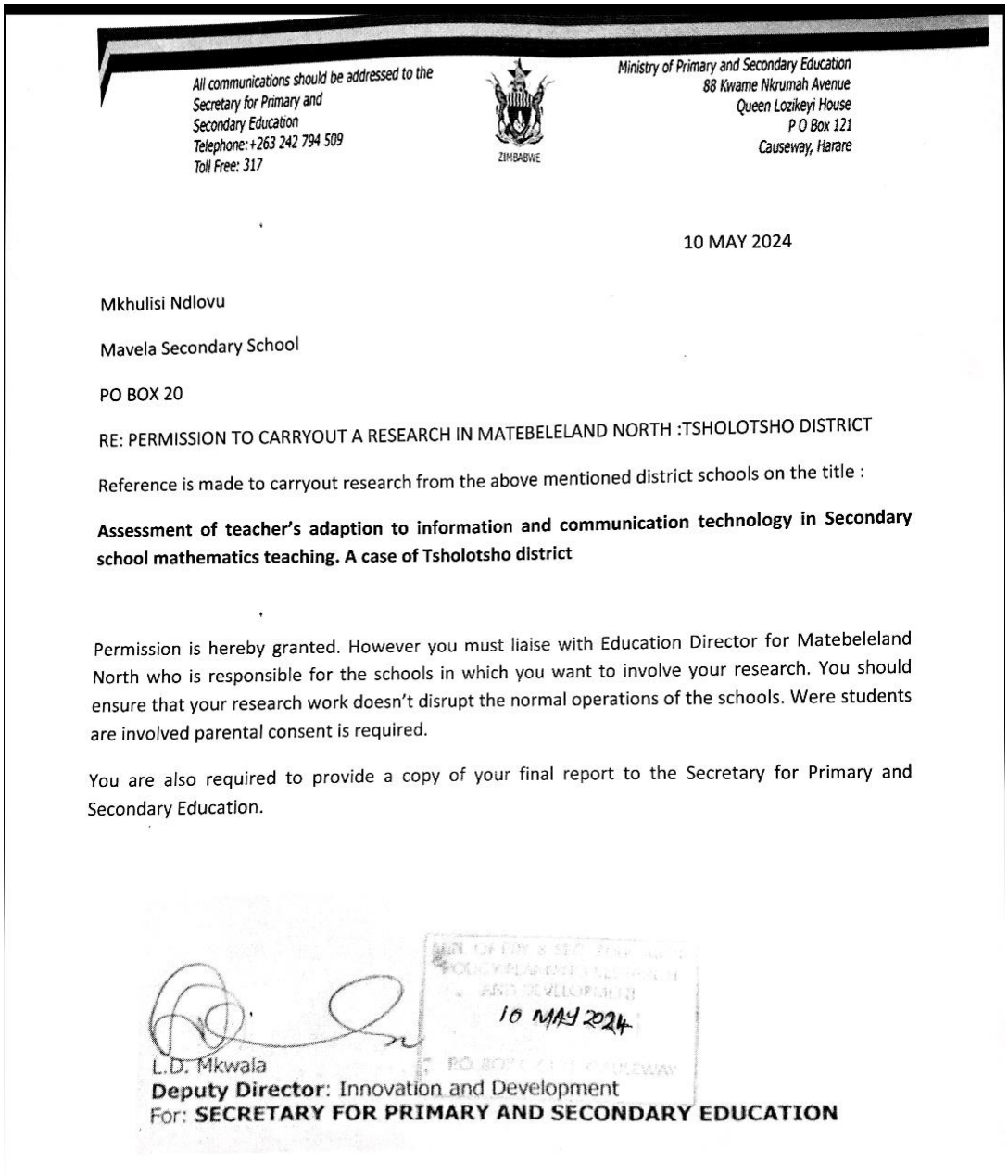
Your co-operation and assistance is greatly appreciated.

Thank you

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
9 APR 2021
P BAG 1020
BINDURA

Z. Ndemo (Dr.)
CHAIRPERSON - SAMED

Appendix B: Letter from the Ministry of Primary and Secondary Education granting



All communications should be addressed to the
Secretary for Primary and
Secondary Education
Telephone: +263 242 794 509
Toll Free: 317

ZIMBABWE

Ministry of Primary and Secondary Education
88 Kwame Nkrumah Avenue
Queen Lozikeyi House
P O Box 121
Causeway, Harare

10 MAY 2024

Mkhulisi Ndlovu

Mavela Secondary School

PO BOX 20

RE: PERMISSION TO CARRYOUT A RESEARCH IN MATEBELELAND NORTH :TSHOLOTSHO DISTRICT

Reference is made to carryout research from the above mentioned district schools on the title :

Assessment of teacher's adaption to information and communication technology in Secondary school mathematics teaching. A case of Tsholotsho district

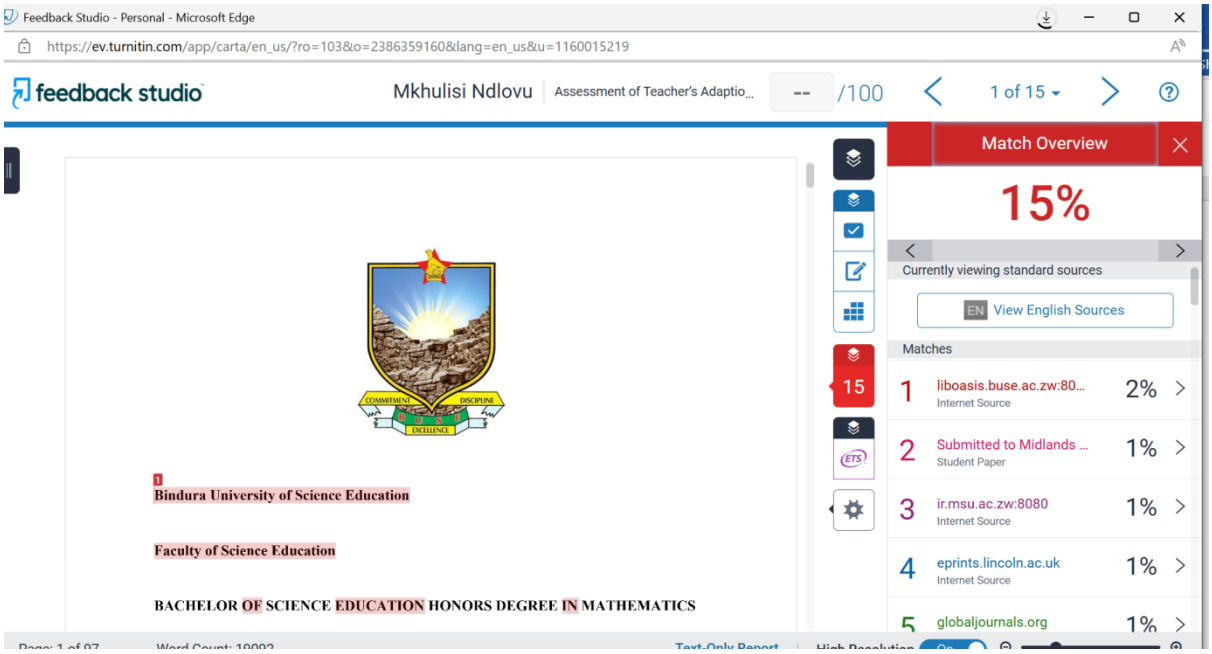
Permission is hereby granted. However you must liaise with Education Director for Matebeleland North who is responsible for the schools in which you want to involve your research. You should ensure that your research work doesn't disrupt the normal operations of the schools. Were students are involved parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education.

10 MAY 2024

L.D. Mkwala
Deputy Director: Innovation and Development
For: **SECRETARY FOR PRIMARY AND SECONDARY EDUCATION**

Anti-plagiarism Report



Appendix C: Informed Consent Agreement form

I hereby agree to participate in research regarding…….

In giving my consent I state that:

- I understand the purpose of the study and what I will be asked to do.
- I understand that I am participating freely and without being forced in any way to do so.
- I understand that this is a research project whose purpose is not necessarily to benefit me personally.
- I have been informed about the nature of the research and the nature of my involvement.
- The researcher has answered any questions that I had about the study and I am happy with the responses.
- I understand that I can withdraw from the interview at any time and that this decision will not in any way affect me negatively.
- I understand that I may refuse to answer any questions I do not wish to answer.
- I understand that personal information about me that is collected over the course of this interview will be stored securely and will only be used for purposes that I have agreed to.

- I understand that information about me will only be told to the researcher's supervisor, and that my identity will not be referred to.
- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.
- I consent to:
- Audio-recording Yes…….No…….
- Permanent archiving Yes…….No…….

Signature of participant: ……..

Date: ……

Appendix D: Interview guide for teachers

Interview guide for Teachers

Thank you for agreeing to participate in this interview. My name is Mkhulisi Ndlovu and l am studying at Bindura University of Science Education ,student in Mathematics.The interview will be confidential and all contributions will be anonymous.

1. What is your highest level of ICT training?
2. Did you receive ICT training at college?
3. Do you use ICT in the teaching of mathematics? lf not what could be done so that teachers use ICT?
4. Do you have adequate infrastructure to enable you to effectively use ICTs in teaching and learning?
5. What infrastructure do you think is critical for enabling effective use of ICTs in teaching and learning of Mathematics?
6. How is your access to the internet?
7. Do you have adequate ICT tools for your class?
8. How frequently do you use ICTs tools in teaching and learning?

9. Which mathematical soft wares have you ever used in teaching of mathematics?

10. Are you happy with the operational condition of your ICT tools?

Thank you for your participation

Appendix E: Questionaire for teachers SURVEY

This is a research on assessment of teacher's adaption to ICT in the teaching of mathematics at secondary schools. Your valuable contribution will assist in understanding it so that proper planning can be done with the education sector. Your privacy and identity will be protected at all times including in all publication resulting from this study. The only people who will have access to the completed questionnaire will be the researcher, Mr M Ndlovu and the supervisor, Dr L Mukavhi Your participation in this study is voluntarily and you may withdraw your consent to participate at any time. You will not be penalised should you decide not to participate or withdraw from this study. If you have any question or concern about this study or face any problem, please contact my supervisor.

1. What is your gender?

Male ☐

Female ☐

2. What is your age?

20-30 ☐ 31-40 ☐ 41-50 ☐ 51-60 ☐

60+ ☐

3. What is your highest qualification?

Certificate in Education.....

Diploma in Education.....

Degree.....

Masters.....

4. Teaching Experience in years? 20-30

0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐

5. Do you have any qualification in ICT?

YES ☐ NO ☐

6. Did you receive ICT training at college?

YES ☐ NO ☐

SECTION B: TEACHER ICT KNOWLEDGE

Items to measure ICT skills

7. How do you describe your computer skill?

Poor..... Fair.....

Good.....Excellent.....

8. Rate your ability of teaching mathematics using ICT?

Poor..... Fair.....

Good.....Excellent.....

9. Do you need further training in ICT? Yes [ ] No [ ]

SECTION C CHALLENGES OF ICT INTEGRATION

10. Rate the extent to which you agree with the following statements using a tick

Strongly Disagree(SD) Disagree (D) Agree(A) Strongly Agree(SA)

STATEMENT	SD	D	A	SA
There is adequate training on ICT at colleges				
There is adequate ICT infrastructure at the school				
The school has relevant ICT equipment and gadgets				
There is limited time for ICT integration				
There is limited accessibility to ICT gadgets				
Lack of electricity				
There is resistance to change				
There is poor of internet connectivity in the school				
There is fear in the use of ICTs among teachers				
Teachers level of knowledge on the use of ICT				
The use of ICT in the teaching and learning improves learners understanding of mathematics concepts				
The use of ICT in the teaching and learning improves learners interest in mathematics				

The use of ICT in mathematics reduces mathematics anxiety				
The use of ICT in Mathematics removes mathematics phobia				

Appendix F: Data set

Questions	Teachers	Administrators	Themes

	students especially those in higher classes to bring their own gadgets if they have them. The school can lease ICT resources from companies like Q-rent at affordable prices.	have engaged companies like Econet Wireless and Telone to increase WIFI coverage in the school and provide affordable data packages. AD: We have managed to engage stakeholders especially former students and they have been of greater help .So far we managed to source 15 desktop computers	
QUESTION	Teachers	Administrators	Themes

		AD1: The school has computers that we received as a donation from the president. We also have access to the internet. AD2:The school has computers that	Most responses from the participants indicate that schools have ICT resources but the challenge is that the computers at schools are not enough for the whole school hence making it difficult for teachers to
		were donated by the government and these are the computers that are used for integrating mathematics	integrate it with mathematics.
Section B	Teachers	Administrators	Themes

Question 2: What are the benefits of integrating ICTs in the teachinglearning process?	T2: There are many benefits of using ICTs. The use of ICTs encourages learners to read widely on their own, makes them to be eager and be inquisitive, broadens their mind-set and allows learners to read at their own pace. Another benefit is that it allows room for deeper understanding as it appeals to both visual and hearing especially when videos from	AD1: There are a number of benefits of integrating ICT in the teaching learning process. Scheming and recording of marks becomes easy, access to information is very fast and efficient as pupils can discover information on their own through the use of the internet. However, ICT is prone to abuse by both teachers and learners. They can open pornographic sites and instead of surfing the net to find relevant material they can search for content not related to the	From the responses given by the participants the benefits of integrating ICTs in the teaching-learning process include accessing of up-to-date information very fast, generating interest of the students , catering for individual learner needs by making it possible for them to pace their own learning, appeals to different senses of the learner(visual , auditory). The responses also revealed that ICTs are prone to abuse from both the teachers and students.

	YouTube are		

	used thus students can maximise their potential. T4: One of the benefits of using ICTs is that abstract concepts are simplified. Practical experiments which we cannot conducted in science laboratory due to shortage of apparatus can be downloaded via YouTube and the learners get to see what actually	subject being taught. Students can download music videos. AD2: The benefits of integrating ICTs in the teachinglearning process include accessing of up to date information from the internet, gaining a pool of information using mobile applications like online dictionary, softcopy textbooks and internet articles. The benefit of using ICTs is that it allows for collaboration amongst students, the students get to share the information they have with their peers.	

	happens. Another benefit is that it reduces student's dependency on the teacher as the student can study and research on their own this	Also the learners get information not only from teachers but from different	

	instils a sense of ownership and responsibility leading to improved learning outcomes. T12: Both the teacher and student are exposed to vast quantities of knowledge through the use of the internet. ICT provides a platform for students to interact with live examples. Lastly it is a vivid and interesting way of learning as it appeals to both visual and auditory	sources thus reducing heavy reliance on the teacher. ICTs are interactive and appealing to students if packaged well and this arouses student's interest in the subject. Lastly the use of ICTs allows for learning outside the four walls as the learners can research and makes it easy to share resources with their teacher and peers at the comfort of their homes. SD2: If successfully integrated in the teaching-learning ICTs are very beneficial. The use of ICTs makes it easy to	

	senses of the learner.	deliver lessons through use of presentation software and	

		projectors. It also makes it easy to share information (via social media platforms) between learners and between the learner teacher. and	