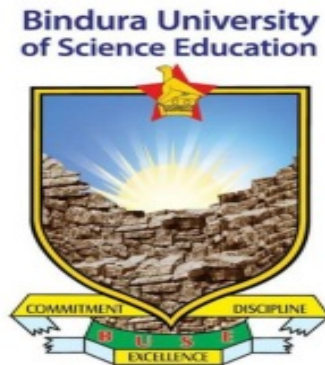


**BINDURA UNIVERSITY OF SCIENCE EDUCATION**

**FACULTY OF SCIENCE EDUCATION**

**BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN  
MATHEMATICS**



**TOPIC AN ASSESSMENT INTO THE CHALLENGES FACED IN  
INCORPORATING ICT IN THE TEACHING AND LEARNING OF  
MATHEMATICS AT O’LEVEL IN SANYATI DISTRICT: CASE STUDY  
OF MUNYARADZI HIGH SCHOOL**

BY

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REG NO. B224606B

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS OF THE BACHELOR OF SCIENCE HONORS DEGREE IN  
MATHEMATICS EDUCATION (HBScEdMt)

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***RELEASE FORM***

**Title of the dissertation: TOPIC AN ASSESSMENT INTO THE CHALLENGES  
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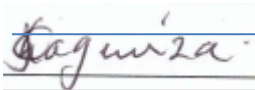
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## DEDICATION

To my dear friends and colleagues I am grateful for all the encouragement and continued support you have given me. Dedicated also to my future mathematics students as we embrace every change in the world education

## ABSTRACT

### **1.1 Abstract:**

This research study aimed to assess the challenges faced by teachers and students in incorporating ICT in the teaching and learning of mathematics at O level at Munyaradzi Primary in Sanyati district. Prior research has indicated that there is limited to almost zero use of technology in the teaching and learning of mathematics.

The study employed a mixed-methods approach, incorporating both quantitative analysis of all participants' responses and qualitative interviews with students, teachers, and school administrators. Factors contributing to the challenges faced by the teachers and students in incorporating ICT made the research interesting.

Based on the findings, the research also identified and evaluated potential interventions to address the identified gaps in technology use in education. Strategies which were considered included teacher training programs, availability of resources as well as teacher and student competency in using technology in mathematics education.

The results of this study were expected to provide important insights to educators, policymakers, and local stakeholders seeking to enhance mathematics learning outcomes and expand educational and career opportunities through the use of ICT. The findings could also help in eradicating the possible challenges faced in the education system as a whole.



## **CHAPTER 1: INTRODUCTION**

### **1.1 Introduction to the study**

Technology has taken the world by storm, everywhere you go there is use of technology and the teaching and learning fraternity has also not been left out. A number of schools in Zimbabwe have had the privilege to have computers and other ICT tools like projectors, printers and so forth donated to their schools by the government and other non-governmental organisations. All this in an effort to enhance the teaching as well as learning from primary school up to university level countrywide both in rural and urban setups. The teaching and learning of mathematics has also not been left behind with topics like geometry among others at O'level have been somewhat become an easier task for both the teachers and learners.

The introduction of new methods of teaching however has its drawbacks bring in the form of challenges of incorporating ICT in the teaching and learning of mathematics at Ordinary Level against the traditional rote learning of this complex subject of numbers in a race against time before the students sit for their final examinations as the year progresses.

### **1.2 Background of the study**

The integration of ICT in classroom is getting more important as it help student in enhancing their collaborative learning skills as well as developing transversal skills that stimulates social skills, problem solving, self-reliance, responsibility and the capacity for reflection and

initiative. All these elements are core values that students need to achieve in an active teaching and learning environment (Ghavifekr 2014).

Not being left behind the Zimbabwean the government has implemented the integration of ICT in learning and teaching process since the early 2000s. This is due to the importance of technology literacy which produce critical thinking workforce to face and involve the country in the global economy (Hamidi, Meshkat, Rezaee, & Jafari, 2011). Accordingly, many schools were upgraded with computer's lab, the internet connection, smart white boards, LCD and other ICT tools and equipment.

Despite all these initiatives, the problem faced was the teachers' skill and aptitude, technical support and stability of the system in order to implement the policy successfully. However, the government is still improving and upgrading the systems to be fully utilising by ICT. As a developing country, exploration of the factors that affecting Zimbabwean teachers' ICT usage in schools can help to increase the integration of ICT in country's teaching and learning process.

The Ministry of Primary and Secondary Education launched a comprehensive review of the education system in the year 2015 ensures possibilities of maximizing the implementation of ICT for self-guided learning in line with the growing global attempts on the deeper needs of educational performance worldwide.

This new era of ICT in education should be developed rapidly to an appropriate extent in order to match the capability of students as well as teachers in educational experience due to the development of new information technology which gets updated day in day out.

### **1.3 Purpose of the study**

The purpose of this study is to assess the challenges faced in the integration of Information and Communication Technology (ICT) in teaching and learning of mathematics. The study aims to explore the profits, challenges, and possibly bring in possible resolutions to these challenges of incorporating ICT tools into mathematics instruction at Ordinary level.

### **1.4 Statement of the problem**

There seem to be challenges faced in the teaching and learning of mathematics at O level in Sanyati District as ICT is incorporated in the teaching and learning processes. As a result of these challenges possible solutions to these have to be found so as to minimise these challenges thereby encouraging effective use of ICT in the teaching and learning of mathematics.

### **1.5 Main research question/Research aim**

- ❖ What are the challenges faced when incorporating ICT in the teaching and learning of mathematics at O level

### **1.6 Sub-questions/Research objectives**

- a) Determine the challenges of using ICT tools in the teaching and learning in the classroom among school teachers

- b) To what extent are the teachers using ICT tools in the teaching and learning of mathematics at O level
  
- c) What are the efforts that have been put in place to curb the challenges faced integrating ICT in the teaching and learning of mathematics

## **1.7 Assumptions**

There is an assumption in this study that in the teaching and learning of mathematics the teachers at Munyaradzi High School in Sanyati District are failing to interegrate ICT in their day to day education activities this in turn is affecting the overall passrate of the school in public examinations

It is also the researcher also assumption that the selected participants are going to provide adequate and relevant information by effectively participating in the study.

Another assumption is there will be ample time to conduct this research with the limited resources available

## **1.8 Significance of the study**

The study of the assessment of the challenges that are faced during the teaching and learning of mathematics while intergrating ICT will have a positive impact on the teachers, learners,

parents, policy makers and other relevant stakeholders on the importance of using ICT. It will make these stakeholders see that despite the challenges that seem to come with the use of technology in the teaching and learning it remains one of the greatest innovations in the education sector so far making the teaching and learning processes somewhat engaging, interesting and much easier.

This research will not only bring out the benefits of using ICT in teaching mathematics at Ordinary level in Zimbabwe but also open eyes of education stakeholders to possible solutions to curb the challenges faced, embracing the use of ICT and then continue to use it for to enhance the nation's passrate at Ordinary level both in the June and November national Examinations.

## **1.9 Delimitations**

The research school has 345 O level students and 4 mathematics teachers and is located in the middle of the vibrant city of Gold, Kadoma. The school has a morning and afternoon sessioning system which made it a task to be able to assess all the children at once and see the progress made as well henceforth.

## **1.10 Limitations**

This research had some limitations, especially the fact that

- it was confined to only one school Munyaradzi in Sanyati District though its one of the biggest in terms of enrolment in Kadoma town. The findings may, therefore, not be a true reflection of what is being experienced in all Sanyati District High schools.
- Lack of adequate resources to acquire accurate findings, some of the ICT tools are outdated and inadequate, with different teaching strategies and exposure this might also not give a true reflection

- Time frame- Between conducting the normal day to day teaching and learning activities and performing the research there was not enough time to come up with a generalized conclusion on the challenges faced during incorporating ICT in teaching and learning mathematics.

### **1.11 Definition of terms**

- Information and communication technologies (ICT) is defined as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, vision/video-conferencing, etc.). UNESCO (2017)
- Oxford English Dictionary (2024) says Mathematics is the science and study of quantity, structure, space and change. Mathematicians seek out patterns, formulate new conjectures and establish truth by rigorous deduction from appropriate chosen axioms and definitions.
- Intergration of ICT in the school according to Encyclopedia (2009) has to do with simple improvements of the traditional instruction but to a radically new pedagogy, shift from the traditional instruction model of knowledge transmitting towards autonomous, active and collaborative learning through students' engagement in ICT –based learning environments and shared learning resources.
- A challenge is defined as a difficulty in a job or undertaking that is stimulating to one engaged in it Hamidi et al (2011). In this study challenges refers to problems and difficulties being faced by teachers in integrating ICT in Mathematics.

## **1.12 Organisation of the study**

This research topic amounts to 5 Chapters

- ❖ First chapter –the introduction which entails the background of the study. The driving force behind conducting this research and pointing out possible expectations, conclusions after the research is done.
  
- ❖ Second Chapter –Literature review- a look at what the latest relevant and related literature says about the research topic at hand
  
- ❖ Third chapter –Methodology used for data collection is laid out as the researcher has made use of taking ethical considerations in mind. It links subsequently Chapter 3 to Chapter 2
  
- ❖ Fourth Chapter- Focuses on data representation and analysis. This part also chips in any consultations and after careful comparison distinguish findings from those results in the literature review Chapter 2
  
- ❖ Final Chapter- This is the summary of the project answering the research questions from the summary of results. It also state any recommendations

## **1.13 Chapter summary**

This introductory chapter outlined the background of the study. The purpose of the study was put forward. The researcher also gave statement of the problem. The main research question or the research aim was laid out subsequently the sub-questions or research objectives'

The assumptions of this qualitative research were then laid out and then the chapter also clarified the significance of the study. Delimitations and the research limitations were explained. Definition of key terms ICT, mathematics and integrating of ICT was elaborated.

The researcher laid out also the organisation of the study concluding it with this first chapter's summary.

## CHAPTER 2

### LITERATURE REVIEW

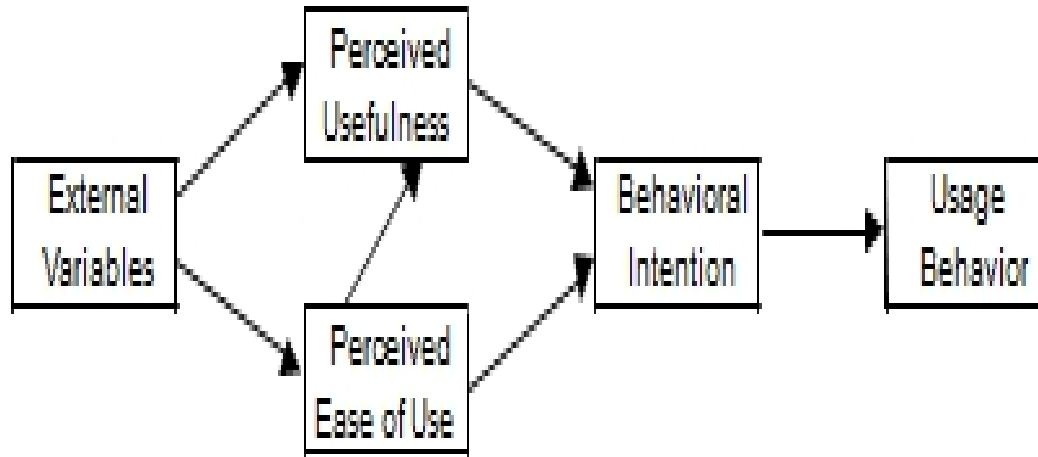


This literature review seeks to assess the challenges of integrating Information and Communication Technology (ICT) in the teaching and learning of mathematics. The main objective of this research project is being to explore the profits, challenges, and possibly bring in possible resolutions to the challenges of incorporating ICT tools into mathematics instruction at Ordinary level. This chapter focuses on reviewing the related literature. This chapter buttresses the researcher's view with prior works on the subject matter in question. This review is critical as it may help uncover gaps in the integration of ICT in Mathematics that may form the basis improvements and future studies. This review helps to put the study into its correct perspective as well as to answer the research questions stated in the previous chapter. The chapter is divided into the following major sub-themes; theoretical framework, the integration of ICT in Mathematics, methods for using ICT resources in teaching Mathematics, opportunities for ICT integration in Mathematics, global situation on the opportunities and benefits of integrating ICT in Mathematics,

### **2.1. Theoretical framework: Technology Acceptance Model**

The study was grounded on Technology Acceptance Model of Venkatesh and Davis (1996) Technology Acceptance Model (TAM) was introduced by Fred Davis in 1986 for his doctorate proposal. TAM is an adaptation of Theory of Reasonable Action, TAM is specifically tailored for modeling users' acceptance of information systems or technologies. In 1989, Davis used TAM to explain computer usage behaviour. The original version of TAM was modified two times. The final version of Technology Acceptance Model was formed by Venkatesh and Davis (1996) after the main finding of both perceived usefulness and perceived ease of use were found to have a direct influence on behaviour intention, thus eliminating the need for the attitude construct.

### 2.1.1. Major Tenets of Technology Acceptance Model of Venkatesh and Davis (1996)



#### Final version of Technology Acceptance Model (TAM) (Venkatesh and Davis, 1996)

Perienen (2019) notes that the technology acceptance model rests upon the fact that the way a person perceives the usefulness (PU) of a technology and its ease of use (PEOU) will determine the way that person makes use of that particular technology. The Perceived usefulness (PU) measures the efficacy identified by the user while perceived ease of use (PEOU) identifies the difficulty level of the technology perceived by the user (Lala, 2020) and these two forms the two major components of TAM. The first proponent of TAM (Davis, 1985) based his model on the assumption that user motivation can be explained by three factors: (1) perceived ease of use, (2) perceived usefulness and (3) attitude toward usage (Perienen, 2019). Perienen (2019) argues that Davis hypothesized that the attitude of a person towards a system was a major factor that influenced whether he/she would use or reject the system. Person's attitude is influenced by two major beliefs: perceived usefulness and perceived ease of use, where perceived ease of use has a direct influence on perceived usefulness (Lala, 2020).

Davis, Bargozi and Warshaw in 1989 later found that behavioural intention was yet another important component of system response and consequently it replaced the attitude construct (Perienen, 2019). They found that perceived usefulness was a major significant determinant of peoples' intention to use computers while perceived ease of use was only a significant secondary determinant (Perienen, 2019).

This theory is quite relevant in this study as it explains teachers' perceptions on the integration of ICT in the teaching of Mathematics. This theory can be used to describe the level of integration of ICT of Mathematics as ICT in schools is determined by the perceived usefulness of computers in the teaching of Mathematics. The theory will help to explain both external and internal factors which determine the integration of ICT in teaching Mathematics to in schools. The integration of ICT in Mathematics is direct result of the perceived usefulness of ICT, teachers' competence and attitude of the users, therefore this theory will lay a discussion base in explaining the manner in which teachers are integrating ICT in Mathematics and challenges which they are facing in accepting the integration of ICT in the teaching of Mathematics.

## **2.2. The Integration of ICT in Mathematics**

Perienen (2019) states that the integration of technology in education dates back to the ancient days of television, where great expectations were formulated to transform the student's learning world. ICT integration in learning areas in most developing countries appears to be a new phenomenon. ICT integration has gained much prominence in developing countries during the last quarter of the 20<sup>th</sup> century (Moyo, 2019). ICT integration implies that the subject teacher incorporates the digital media in imparting knowledge and skills to the learners and as Gakuu and Kidombo (2020) report on effective ICT integration, there is a difference in having

computers in a school and pedagogical integration of ICT in teaching since in most of the schools teaching is done using the chalk and blackboard method (traditional teaching).

The use of ICT in teaching mathematics raises understanding and give better insights into mathematical concepts and the support of ICT to mathematics teachers comes in handy when helping their students design and produce their own knowledge presentations and thereby engage with powerful learning experiences. Therefore application of ICT employs methods that intensify understanding of mathematical concepts through a wide range of technologies could be available to teachers and whose applications could be designed to match user characteristics and the requirements of mathematics curriculum tasks (Leask et al, 2019). the use of ICT to teach mathematics, (Rahman et al. 2019) linked ICT in three ways; using the technology as a data analysis tool, using the technology as a problem-solving or modeling tool and also using it as a tool to integrate mathematics with context.

Gachinu (2019) states that the application of ICT employs methods intensifies understanding of mathematical concepts through a wide range of technologies that could be available to teachers and whose applications could be designed to match user characteristics and the requirements of mathematics curriculum tasks. The new ICTs have other potential benefits as tools for enhancing teaching of mathematics (Gachinu, 2019). ICT tools include those for data capturing, multimedia software for simulation, presentation tools, digital recording equipment and computer projection (Moyo, 2019). Teachers can use ICT tools to increase student productivity particularly with repetitive, low level tasks involving writing and computation.

## **2.3. Methods for Using ICT resources in teaching Mathematics**

### **2.3.1. Reciprocal teaching method**

This is a method of teaching which can be used when teaching Mathematics at junior primary level using ICT tools. The teacher can use a reciprocal teaching method using computer-assisted instruction (CAI) where learners may be engaged in learning a particular skill. Software can be made or used which links what pupils already know and what they do not know. In other words the gap can be bridged using fitting software. Afshari, Bakar, Su Luan, Samah, and Fooi (2019) conclude that students who use computers when learning are more engaged and motivated and produce work that is of greater length and higher quality.

In this give-and-take teaching method, learners may take turns to teach or provide information to the others in those areas which they have grasped. The teacher's role in peer teaching or reciprocal teaching may be that of collecting and providing the computer tools for the group of learners or individual learner depending on the method the teacher chooses.

### **2.3.2. Drill and practice method**

Jackson and Kutnick (2021) propose that individuals perform better than groups when carrying out drill and practice activities. ICT is a powerful tool of presenting or representing information in different ways. This method of drill and practice helps to make pupils learn better by repetitive processes. This can be through different forms like text and pictures or tables and graphs or by enabling changes to be shown dynamically such as in mathematical modelling. Cobb and McClain (2021) have observed that computer tools can help students or teachers manipulate complex data-sets. This then provides a context for effective discussion which in turn can help to develop mathematical understanding. This method can make use of tools like the projector and PowerPoint presentations. Learners get a step by step demonstration of carrying out a mathematical operation and they also practise step by step until they master.

### **2.3.3. Digital story-telling**

ICT tools may be used in the learning of Mathematical language. In this approach students create their own digital stories using text, images, sound and their recorded voices for language learning. Cobb and McClain (2020) define digital storytelling as a form of multimedia that comprises images and segments of video with background music and a voice-over narrative. Story telling is a method which is very effective in teaching of some Mathematical concepts to learners of different age groups. Armstrong (2018) views digital storytelling as simply the application of technology to the —ancientl experience of sharing personal narratives. Technology that students currently have access to, provides them with opportunities to communicate in ways that were not possible in the past. With technology, learners working on digital storytelling can articulate their views creatively in the form of images, video, or sound, and can share their stories with the rest of the world.

This method makes learning of Mathematics livelier because it gives room for learners to include their own personal experience as they will be learning Mathematics concepts.

### **2.4. Opportunities for ICT Integration in Mathematics**

ICT integration brings substantial change in education acceleration and innovation in various countries, generally those related to the learning process, particularly in mathematics education. Ngeze (2019) pointed out that the use of ICT in teaching and learning has brought new teaching and learning experience to both teachers and students in many countries. ICT integration in mathematics education offers mathematics teachers with integrative teaching methods that persuade students' learning, support their independent learning and active participation in the discovery of mathematics concepts and topics that helps them have deeper understanding of the mathematical ideas (Baya'a and Daher, 2021).

The use of ICT in teaching mathematics can therefore raise understanding and give better insights into mathematical concepts and the support of ICT to mathematics teachers comes in handy when helping their students design and produce their own knowledge presentations and thereby engage with powerful learning experiences. Therefore application of ICT employs methods that intensify understanding of mathematical concepts through a wide range of technologies could be available to teachers and whose applications could be designed to match user characteristics and the requirements of mathematics curriculum tasks (Leask et al, 2019). The use of ICT in teaching and learning mathematics has a positive impact on students' performance and learning achievement (Gerick, and Koop, 2018). The role of ICT in the curriculum is much more than simply a passing trend. Rahman et al. (2020) postulated that the use of technology saved time and gave learners access to powerful new ways to explore mathematics concepts at a depth that had not been possible in the past.

Integrating ICT in learning mathematics was said to have the benefit of motivating students in learning especially in instances where activities were challenging, multidisciplinary and multi-sensorial. It also had the advantage of simplifying abstract concepts to real life situations, foster a sense of inquiry and exploration and allowed students use information acquired to solve new problems besides formulating new ones (GoK, 2020). Such students could be creative and collaborative with other students within the country and around the world in learning through virtual linkage, blogs and electronic bulletins to exchange information with others over the electronic platform, (Kang et al, 2019). This approach had the benefit of making learning concrete rather than abstract whereby learning became more effective because the learners were able to manipulate learning and teaching resources in the modern ICT integrated approach.

The use of ICT can support the new instructional approaches that go hand in hand with the shift towards learner centered learning and make hard-to-implement instructional methods such

as simulation or cooperative learning more feasible. ICT can also play a role in helping a teacher explain abstract concepts. Generally, research shows there are three critical benefits of ICTs, when used in the right way. More effective teaching/learning using ICT can help improve pupil performance and skills, maintain the quality of teaching/learning while cutting down on teaching time and using cheaper aids.

#### **2.4.1. Global Situation on the opportunities and benefits of Integrating ICT**

Bozkurt (2019) states that most countries have integrated ICT in their school curricula ,from Early Childhood Development learners. The integration of ICT in school curricula in all the learning areas has been due to the notion that ICT has become an integral part of people's in all spheres of development (Nkhwalume,2021). A study done Nkhwalume, (2021) indicates that integration of ICT in school curricula has also been influenced by the popularization of postmodernist theory of constructivism, which promotes the use of technology in the teaching and learning processes and support the notion that learners should become active participants in the learning process. Study done by Johnson (2015) in France also reveals the paybacks of the integration ICT to the learners, the benefits include motivating learners to learn, allowing for greater differentiation among learners, promoting both independent work and team work and increasing the teacher's efficiency in lesson preparation and content delivery .It is some of these major opportunities presented by ICT which some teachers and schools are seriously integrating ICT in Mathematics across various learning levels.

A study done Perienen (2019) in Mauritius reveals that the integration of ICT in Mathematics has noticeable advantages as it facilitate active engagement of learners in the learning process and allows smooth and easier teaching of abstract concepts. In agreement Baya'a and Daher (2013:28) states that ICT integration in Mathematics education offers mathematics teachers with integrative teaching methods that motivate students' learning, support their independent



learning and active participation in the discovery of mathematics concepts and topics that helps them have deeper understanding of the mathematical ideas. A study done by Mazinyane (2019) in South Africa in Cape Town reveals that the integration of ICT in Mathematics has the potential of enhancing learners' performance in the subject. He (Mazinyane, 2019) indicates that learners who were taught using various ICT tools performed far much better to those who were taught using the traditional method. Chivhaka (2017) argues that the integration of ICT has reduced the workload of the teacher as ICT has the ability to explain easily abstract concepts to learners and it has made teachers to become highly competent in teaching Mathematics. Her (Chivaka,2017) five year case study of primary teachers in Zambia, indicates that the constant integration of ICT in Mathematics has managed to enhance teachers competency and sharpened teachers' delivery skills.

### **2.4.3. Challenges of Integrating ICT in Mathematics**

Some schools and teachers across the globe are facing a plethora of challenges in integrating ICT in Mathematics. Jackson (2017) acknowledges the existence of various challenges which teachers and learners are experiencing in integrating ICT in Mathematics. These challenges include limited ICT skills on both, teachers and learners, lack of ICT supporting infrastructure and resources, lack of adequate support from stakeholders and lack of clear-cut ICT integration policies in schools (Jackson, 2017).

#### **2.4.3.1. Low computer Literacy**

A study done by García, Weiss, and Engdahl (2020) in USA, indicate that some teachers and learners are not highly computer literate and some limited use of ICT tools for learning and teaching purposes. This therefore hinders the effective integration of ICT in Mathematics as most teachers resort in using traditional methods. It can be noted that effective integration of

ICT in Mathematics depends on the ICT competency level of teachers and learners. A study done in Canada by Jackson (2018) identifies the following set of challenges being experienced by teachers in integrating ICT in Mathematics, these include the working environment, resource system, activity structure, and curriculum script. The working environment which is too strict does not enhance teachers' creativity and innovation in using various ICT tools and software in teaching Mathematics, this is typically true with regard to some private schools (Jackson, 2018).

García ,Weiss, and Engdahl (2020) note that the “digital divide” in countries such as USA is hindering effective integration of ICT in many learning areas. They also further noted that some children do not have access to the devices or internet services needed to operate online and there is a double digital divide that arises from the fact that low-income children and Black and Hispanic children are more likely to lack this access.

#### **2.4.3.2. Limited ICT Infrastructure**

Challenges of integrating ICT in Mathematics are more pronounced in developing countries than in developed countries (García, Weiss, and Engdahl, 2020). A study done by Nkhwalume, (2021) in Botswana and other SADC countries identifies the major factors which are hindering effective integration of ICT in Mathematics, these challenges include lack of or limited access to computers, Some countries in Africa has low tele-density, this cripples the use of internet which is core in the effective integration of ICT in Mathematics (Madzivanyika, 2019). The relevance of the internet is that Mathematics teachers can use blogs, wiki and collaborations for remedial work or extension work during the holidays, therefore without the internet this cannot be effectively done (Madzivanyika, 2019). Countries which have low tele-density include Malawi, Somalia, Kenya and Lesotho and these also have limited use of virtual learning and teaching (Madzivanyika, 2019).

Also in some developing countries especially in Sub-Saharan countries do not have adequate ICT laboratories in schools (Chirwa, 2020). Lack of laboratories entails that it becomes difficult for teachers to effectively demonstrate various concepts in a conducive environment. Laboratories are useful as these provide a suitable and safe environment for storing and using ICT tools (Chirwa, 2020). García, Weiss, and Engdahl, (2020) attribute this to high digital divide, whereby schools in developed countries due to their technological access are able to a greater to integrate ICT as compared to schools in developing countries which are largely crippled technologically, integrate ICT in the curricular to a lesser extent.

#### **2.4.3.2. Inadequate Contact Time**

In some schools across the globe, teachers have limited time to resort to the effective use of ICT when teaching Mathematics Inadequate contact time for teaching Mathematics and Lack of administrative support. These challenges are not only unique in Botswana. Study done by Perienen (2019) in Mauritius also concurs with the findings of Nkhwalume, (2021) as he identifies technological challenge, limited teaching time and lack of stakeholder support as the major challenges the integration of ICT in Mathematics.

Other factors which are playing a pivotal role in hindering effective integration of ICT in Mathematics include, low computer literacy and competence among teachers and learners, unavailability of supporting infrastructure for ICT and lack of motivation and poor remuneration (Tshuma,2021).

#### **2.4.3.3. The Zimbabwean Situation**

As a developing nation, Zimbabwe needs to be part of this new dispensation which entails integrating new ICT processes into the education system. There is little doubt that Zimbabwe's education sector is missing out on the benefits of ICTs. As the country lags behind in the

adoption, use and innovation in ICT, many pupils are losing out on better education and well-paying ICT jobs (Kachembere, 2019). The vision of the country's National ICT policy, was to establish a knowledge-based society with ubiquitous connectivity by 2020, and one of the desired policy outcome is Facilitate the deployment and exploitation of ICTs in the educational system from primary school upwards. Work with the relevant Ministries to include ICT training and education in schools (GoZ, 2019). The Policy objective is to attain universal access to ICT services in the country by 2018 that translates to a 100% Internet penetration, 80% Internet geographical coverage and affordable services relative to the country's economy and SADC benchmarks (GoZ, 2019).

However despite having a lucrative ICT policy, which targeted universal access to ICT by 2020, more than 65% of the Zimbabwean population are school going children, and most of these people do not have access to technologies with some using their parent's gadget which have limited access to , (Sithole, 2021). There is a technological or digital divide that exist between parents and students seeing technology intergrating with education. The digital divide in Zimbabwe is putting a whole generation of students at a disadvantage. The general youth trail behind the rest of the world in technology, (Ganyani, 2022). The students are lagging in the adoption and use of technology through interactions with computers because there are few trained teachers in the technology areas (Konyana and Konyana, 2021), who are also disadvantaged by the same gap.

Zimbabwe like other developing countries has various challenges limiting effective integration of ICT in the teaching and learning of Mathematics. Musingafi and Chaden'anga (2018) states in Zimbabwe, many factors are thwarting effective integration of ICT in Mathematics, these include lack of resources, discouragement by leadership, bad attitude, lack of training and expertise, poor teaching and leadership environment, and work overload. Conversely, resource insufficiency leads to curriculum suffering still birth (Esau and Mpofu, 2019). In that same

annotation, inadequate funding and human resources in terms of number and skills exacerbate curriculum implementation failure (Cheung and Wong, 2019). A study done by Ndlela (2022) reveals that inadequate funding in Sanyati district is rampant in most schools due to low payment of levies, this has worked unfortunately against the procurement of ICT equipment for integration in the updated curriculum.

Most schools in Zimbabwe need to be the focus of technology enterprise. In order to bridge this digital divide, the government through various stakeholders, as well as local and international organizations, has partnered with Computers for Zimbabwean Schools (CZwS) to provide computers to schools in both urban and rural areas, (Sithole, 2022). The government did not only provide schools with affordable computers, but training support and connectivity as well, (Sithole, 2022). The aim is to make teachers use computers and Internet based learning programs to enhance student achievement. Students will learn to use computers and thus, be in a better position to compete with their urban counterparts (Sithole, 2022).

Another problem is the phobia of computers and that leads to the resistance of the use of computers at schools (Tshabalala and Ncube, 2019). Some teachers in Zimbabwe they have a fear of integrating ICT in the teaching process, this fear is largely a result of low incompetence in computers (Sithole, 2022). This computer phobia by teachers is making teachers to be reluctant to learn and appreciate the importance of integration of ICT in Mathematics (Dennis, 2019).

Ncube,(2018) states that students do not get enough support and encouragement from teachers and administrators. Most schools in the education sector are manned by unqualified young teachers who are commonly known as untrained teachers in Zimbabwe. These untrained teachers may lack the skills and necessary training for them to teach computer usage. Some

students as well as teachers in the schools are nervous about using a computer for use in schools and most avoid using it for fear of failing, (Sithole, 2022). A whole generation rarely has access to internet because it is expensive to reach certain sites and some even access to the computers. Teachers in Zimbabwe have not been trained in ICT, and hence have poor practical skills in ICT usage. The majority of them cannot even use the basic software in computers for the delivery of their lessons (Bukaliya and Mubika, 2019)

It is through this realization that some schools in Sanayati district in Zimbabwe are striving to seize this opportunity to exploit the benefits of ICT for the purpose of teaching and learning Mathematics. However, poverty and low technological development in most Sanyati District schools, Munyaradzi high included seem to be working against effective integration of ICT in the teaching of Mathematics.

The increase in responsibility due to introduction and integration of ICT in new curriculum also causes an increase in managerial tasks, feeling of isolation, rising stress levels, and a decrease in professional satisfaction. Wallin and Reimer, (2018) alluded that while scholars and educational stakeholders believe that schools should serve the local community interests conflicts still exists over the purpose of schooling. Many schools, according to Dennis (2019), serve a vital role in recreating communities in highly mobile, industrialized society. Wallin and Reimer cited in Frankson (2019) note that that most schools are often plagued with educational problems such as (a) isolation from specialized services; (b) limited accessibility to quality staff, development and university services; (c) teacher shortages; and (d) decreasing enrolment in public schools with the emergence of many private schools and colleges which leads to decreased funding.

Madzanire and Meier,(2020) note that the majority of urban school learners indicated that they had access to computers at home but there is limited internet access. The researchers concluded

that this gap is evidence that there is a huge digital divide between learners and parents with the latter seeing technology as a way for children from running away from chores at home and play games. (Tshabalala and Ncube, 2019). The authors' position is that the more learners are exposed to technology through computers, the more they become skilled at using them.

## **2.5. Efforts placed by governments to enhance effective Integration of ICT in Mathematics**

Mathematics is regarded as one of the vital subjects across the globe. Governments have come up with strategies which support the effective teaching of Mathematics through the integration of ICT. One such strategy is that governments have come developed policies that promote ICT integration in learning areas including Mathematics (Green, 2019).

### **2.5.1. Developing Clear-cut Policies for Integration of ICT in Mathematics**

Various governments across the globe have developed various formidable ICT policies which support the integration of ICT in subjects such as Mathematics. One such policy is that Finland, Finland, national educational policy, makes it a prerequisite for educational institutions to adopt and integrate ICT in all the learning areas (Fiske,2020) and the policy also the country's ICT policy encourages educationists to use ICT tools and to promote digital learning (Fiske, 2020). Sweden has a direct policy which supports the integration of ICT in Mathematics. According to Dereck (2021), Sweden National Science Education policy, stresses that in all Science subjects including Mathematics, teachers should ensure that they use ICT in the teaching and learning process. Commenting on this Sweden policy, Hugo ICT integration brings significant change in education acceleration and innovation in various countries, generally those related to the learning process, particularly in mathematics education (2021) states that, this policy has witnessed significant integration of ICT in Mathematics and has contributed to high child participation in the learning process.

The government of Zimbabwe, has National ICT policy which support the integration of ICT in schools (Ndoro, 2020). The updated curriculum which was introduced in 2015 also supports the integration of ICT (Mudzengi, 2018). However the country does not have specific policy which supports effective integration of ICT in specific learning areas such as Mathematics. There are no ministerial circulars and policies which directly promote the integration of ICT in Mathematics.

### **2.5.2. Re-training of Teachers for ICT Integration**

Some governments have been training teachers so that they can ICT skills which are a vital prerequisite for effective ICT integration in various learning areas such as Mathematics. Such countries include South Africa, Zambia, Portugal and Spain. For example in 2016, Spain carried out teacher refresher courses on ICT integration, these refresher courses largely targeted Science and Mathematics teachers. In 2017, Zambia also trained teachers on how to integrate ICT on STEM subjects (Chiombe, 2019). It can be noted that the re-training programmes has paid much dividends in those countries. A survey done by Trevor in Zambia and South Africa reveals that due to intensive training the majority of the teachers are now able to use sophisticated ICT tools in teaching , and this has remarkable enhanced learners understanding of Mathematics.

### **2.5.3. Providing Schools with ICT Resources**

Some governments in partnership with private companies have been providing various ICT resources across the globe. In USA, the government increased learners and teachers access to internet facilities in various parts of the state, including to disadvantaged and marginalized communities (Webster, 2021). Such arrangement has made teachers to be able to fully utilize ICT for learning purpose and this has largely promoted virtual learning in USA (Webster, 2021). A study done Roberts (2017) reveals that the Ghanaian government in collaboration



with some local telecommunication companies has been working tirelessly enhancing internet connectivity for schools and in providing computers.

The Zimbabwean government also has been doing its level best in providing schools with ICT resources. As from 2004 the government has been providing some schools with free computers and the government working together with local companies has been providing internet connectivity to schools. These government initiatives have not helped much as most schools which have limited access to internet connectivity and do not have the source of power for running these computers in case there is no electricity which is almost a day to day adventure in the town schools with the rampant loadshedding.

## **2.6. The Research Gap**

The literature reviewed above give a general over view of the challenges being experienced by teachers in integrating ICT in Mathematics and also there is no study which has been done specifically focusing on the topic at Ordinary Level. The studies also done does not consider the facts that there is now new crop of teachers which are technologically competent and who are also using their own resources in integrating ICT in Mathematics as demanded by the updated curriculum. Therefore this study will attempt to fill the gap left by previous done studies as it will pay particular attention to Munyaradzi High School in Sanyati District

## **2.7. Summary**

This chapter focused on reviewing related literature. In this study Technology Acceptance Model of Venkatesh and Davis (1996) was discussed as the theoretical framework of the study. Opportunities of ICT integration in Mathematics was discussed in detail. The chapter an international, regional and national perspective on the challenges being experienced by teachers in integrating ICT in Mathematics. Also various strategies employed by government

in enhancing ICT integration in learning areas was examined. The next chapter will be centred on research methodology.

## **CHAPTER THREE: RESEACH METHODOLOGY**

### **3.1 INTRODUCTION**

This chapter mainly centres on the methods and technique to be employed by the researcher in an effort to gather data for the study. This would incorporate a description of the target

population, the research layout and sampling techniques. To be examined are the suitable procedures of data collection, representation and the data validation techniques.

### **3.2 RESEARCH DESIGN**

The research will use the action research design combining both qualitative and quantitative methods of data collection. This design format involves initial expository analysis and the development of an action strategy focusing on finding solutions to the challenges faced by teachers in integrating ICT in the teaching and learning of mathematics. For purposes of this study, the researcher will use three data collection tools. These will include questionnaires, interviews and direct observations. The questionnaire includes both closed and open-ended probing questions. Throughout the study these tools will complement each other in gathering relevant information. Furthermore, this mixed method design brings in validity and reliability for both the quantitative and qualitative data collected.

### **3.3 POPULATION**

This study was carried out at Munyaradzi High School in Sanyati District in Mashonaland West Province on a population of (50) fifty form 4 pupils and 5 mathematics teachers including the school head who is Mathematics teaching specialist. Amongst the fifty students interviewed, 26 were females and the rest were male. The inclusion of both sexes served to address gender equity. All the three classes from which the population was selected, were not streamed and the age range included late teen years of 16-19 year olds.

### **3.4 SAMPLING PROCEDURE**

The researcher used the random sampling procedure to come out with the required target population. The researcher used small manila cards on which he wrote the names of all Form four classes. The names used are 4A, 4B and 4C, on which he put in a chalk box and thoroughly mixed. Another teacher picked the small cards without replacement, one by one. The first class picked inevitably qualified for the study. The random sampling procedure was preferred by the researcher as each of the classes from which the sample was obtained has an equal chance of being selected giving everyone equal opportunity to be selected. In addition to that, it is cost effective and an easy method to carry out.

### **3.5 RESEARCH INSTRUMENTS**

To obtain data for this study, the researcher used questionnaires, oral face-face interviews and direct observations.

#### **3.5.1 QUESTIONNAIRES**

Yin (2017) defines a questionnaire as “a form prepared and distributed to source responses to certain questions by filling in on the form.” Questionnaires have numerous advantages as instruments of research. They are economical in terms of time, cost and time involved in constructing them, as well as in distributing them. Yin (2017) also adds that with self-administered questionnaires, a lot of information can be gathered from a large number of people within a short period of time.

Furthermore, Leedy (2019) acknowledges that with questionnaires, information can be collected from people who are thousands of miles away, and whom the researcher may never see. Again, unlike interviews, questionnaires are easy to plan, construct and administer, and since the names of the respondents do not appear on them, there is a high chance for

respondents to freely express themselves. Leedy also posits that questionnaires tend to eye blinker the respondent on those aspects the researcher requires.

Nonetheless, with questionnaires, there is no room to probe for elaboration when respondents give inadequate, sensitive or those intriguing answers. They are also wholly unsuitable to the illiterate, and there are chances that some of the respondents may withhold information by either retaining the questionnaires or by destroying them.

The questionnaires used on this study were meant for teachers, and they solicited for views on how group discussion can effectively contribute in the teaching and learning of Mathematics at 'O' level. Some of the questions on the questionnaire called for yes or no responses, while others requested broader explanations.

### **3.5.3 INTERVIEWS**

The researcher realized that the level of pupils he worked with, are young to respond to questionnaires, so on top of merely observing them he also conducted face to face oral interviews on them. Yin (2017), claims that oral interviews are another good form of collecting information of people's perceptions on a particular subject.

Yin cites a major merit of oral interviews as that of enabling the researcher to collect data on some sensitive topics which people tend to fear to express their views and feelings in public. This implies that with high levels of confidentiality promised and agreed upon by both parties engaged in an interview, a strong bond can be formed between the two. Again, the findings to be obtained from the interviewees are not influenced by others in the group and the interviewer is capable of noting down both verbal and non-verbal responses of the subject.

Moreover, Popper (2014) admits that when oral face-face interviews are employed, cases of misunderstanding each other due to ambiguous statements are clarified, and the incomplete

answers which may need elaboration may be followed up easily. Also, interviewees cannot lie about their age and sex, and the wording of questions can be adjusted to suit the level of the respondents.

However, like any other instruments of research, interviews have their shortcomings. Punch (2015) contends that, they are time consuming, and the process of entering the data manually is laborious, which may result in interviewers altering some of the respondents' responses. Again, they are costly in terms of time and amount of manpower required to conduct them. If the interviewer is inexperienced and lacks planning techniques, the results produced maybe inconsistent with what is expected.

### **3.6 Data Collection Procedure**

To collect the data for this study, the researcher used questionnaires for learners, oral interviews with the teachers as well as direct observation on pupils and teachers. The items of the interviews and questionnaires will be either open-ended or closed. Two days were used to give teachers to fill in their responses, while a week to conduct oral interviews and observe the pupils and teachers was taken.

All the three instruments of research used were mainly aiming to gather information on the challenges faced while intergrating ICT in the teaching and learning of Mathematics at 'O' level. The observations carried out on the teachers and pupils were helpful to assess the challenges and come up with possible solution to these challenges.

### **3.7 DATA PRESENTATION**

The data gathered from teachers' responses to questionnaires, pupils' responses to interviews and the researcher's observations were presented by the use of statistical graphs like frequency tables, bar graphs, pie charts as well as stem and leaf diagrams. The statistical graphs above

have the advantages that, they compact the given data, without altering it and they allowed the researcher to make direct comparisons of their findings.

### **3.8 DATA ANALYSIS**

The tabulated data was analysed basing on the other findings from earlier researchers. Thus, the results or outcomes were analysed with reference to the literature review section in Chapter two. The analysis chiefly involved the teacher's perceptions to interactive methodologies as reflected by their responses on questionnaires and the pupils' answers to interview question. Also analysed were the pupils' physical behaviours during group discussions taken by the researcher when direct observations were made.

### **3.9 CHAPTER SUMMARY**

This chapter conclusively was based on research methods that were adopted by the researcher in conducting the research. These were organized under respective sub headings which include the introduction, research design, target population, sample and sampling procedures, data collection instruments, research instruments, data collection procedures, data presentation and data analysis.

The introduction gave an overview of the whole chapter under the headings being discussed in the whole chapter. The target population consisted of 540 pupils and 19 teachers, Purposive sampling and simple random sampling were used wherein 50 Ordinary Level pupils were sampled together with 5 Mathematics teachers including the school head. Data collection instruments included questionnaires, interview and observations.

On data collection procedure, the researcher used the letter from the university to ask for permission to do research at Munyaradzi High School from the head, administered questionnaires and carried out interviews with the participants. The data collected was then presented using tables and graphs, coded and analysed using descriptive statistics. The next chapter dealt with data analysis and interpretation.



## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

#### 4.0. Introduction

This chapter is centred on presenting, analysing and discussing the research findings on the study that sought to assess the challenges of integrating ICT in the teaching and learning O' level Mathematics at Munyaradzi High in Sanyati District. Findings of the study in this chapter are based on the data gathered from; interviews and questionnaires administered to school administrators as well as school mathematics teachers. Further findings were found from observing the students during the teaching and learning of Mathematics. For this study results from participants were analysed question by question and then presented in a narrative form under each main theme using appropriate literal quotes where necessary to illustrate the findings. Results are organized to specific themes and sub-themes within the context of literature reviewed and theoretical framework discussed in chapter two which address the research objectives.

#### 4.1. Participants' Response Rate

**Table 4.1 Participants Response Rate**

<b>Participants</b>	<b>Targeted size</b>	<b>Sample</b>	<b>Frequency</b>	<b>Response Rate</b>
School Administrators/teachers	5	5		85%
Students	50	25		85%

<b>Total</b>	<b>55</b>	<b>30</b>	<b>85%</b>
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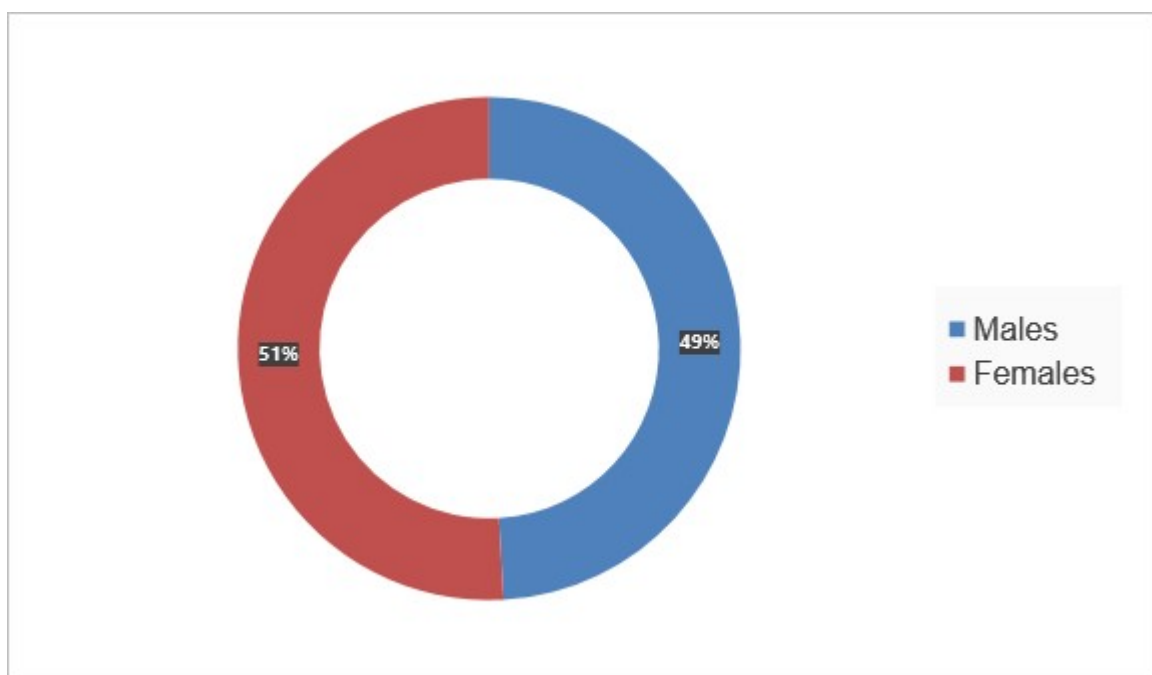
The table above shows participants' response rate. School administrators'-teachers' participation rate stood at 85% and that of the students was 85%. The overall participation rate was 83%. According to Mugenda and Mugenda (2014), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent; therefore, this response rate of 85% was adequate and excellent for analysis.

#### 4.2 Demographic data for participants

The demographic data of study participants who constituted 85% is summarized below. The data included participants' age, gender, professional qualification and employment status. Demographic analysis deals with the interdisciplinary of human populations which deals with social characteristics of the population and their development through time (Schulze, 2002). Demographic data may include analysis of the population on the basis of age and sex.

##### 4.2.1. Gender Distribution of the Participants

N=55



**Fig 4.1. Gender distribution of the Participants**

The pie-chart above shows the gender distribution of the participants. Males constituted 49% of the study participants and 51% were females. Therefore females constituted the major part of the study participants though figures almost balanced.

**4.2.2. Level of Education and Professional Qualifications**

**Table 4.2. Professional Qualifications of the participants**

N= 5

Education Diplomas		BEd		Med	
No	%	No	%	No	%
3	60	1	20	1	20

Table 4.2 above shows professional qualifications of the participants. Sixty percent of the participants revealed that they had Diplomas, while 20% had Bachelor of Education degrees. The same percentage had Masters in Education degree. The majority of the participants were holders of education diplomas only a few had post graduate qualifications.

**4.2.3. Mathematics Teaching Experience**

**Table 4.3. Teachers’ Teaching Experience in Mathematics**

N=5

0 -5 years		06 -10		11-15		16 years and above	
Frequency	%	frequency		frequency	%	frequency	%
1	20%	0	0%	3	60%	1	20%

The table above outlines Mathematics teaching experience of the participants. Twenty percent of the teachers’ participants noted that they had between zero and five years Mathematics teaching experience, 60% noted that they had between 11 and 15 years’ experience and 20% pointed out that they had 16 years and above experience. Most of the teachers had more than 10 years’ experience in teaching Mathematics.

It can be noted that the schools has seasoned teachers who have been teaching the subject mathematics for a long period. Green (2017) reveals that the teachers who have been in the teaching service for a long period are likely not to embrace new teaching methodologies and are likely to resist the integration of technology in the teaching and learning processes .However, Jasmina, Marta and Federico (2018) are of the sentiment that teaching experience can make teachers to effectively embrace and test other teaching methods. This implies that through experience educators could come with effective teaching methods for students to acquire knowledge and skills such as the integration of ICT in teaching and learning Mathematics.

### **4.3. Research findings and discussion**

#### **4.3. 1. Resources being used by teachers in integrating ICT in the teaching and learning of Mathematics**

**Table 4.4. ICT Resources for ICT integration in Mathematics**

ICT Tools	Used		Not used		not sure
	Frequency	%	Freq	%	
Mathematical software	02	08%	23	92%	
Computers	10	20%	20	80%	
laptops	03	12%	22	88%	
Audio and video devices	01	28%	13	52%	
Smartphones and tablets	5	100%			

The above table shows types of ICT resources being used by Mathematics teachers in schools. On Mathematical software, eight percent of the participants indicated that they use it whilst 92% revealed that they do not use it. Twenty percent of the participants noted that they use computers when teaching Mathematics and 80% of the participants indicated that they do not use them. On laptops, 12% revealed that they use them when teaching Mathematics whilst 88% stated they do not use them. On audio and visual devices, 28% outlined that they use them, 52% revealed that they do not use laptops and 20% noted that they were not sure. On smartphones and tablets, all participants revealed that they use them.

School administrators through interviews noted that teachers use various forms of ICT tools, however these are the most common ICT tool is a smartphone,. They also revealed that laptops, computers and Mathematical software are rarely used.

It can be noted that there is limited use of ICT tools in teaching Mathematics. This is largely due to lack of various ICT tools in schools. The common tools being used tend to be private gadgets being owned by teachers. Such arrangement undermines the effective integration of ICT in Mathematics. Also limited use of different ICT tools is due to lack of competency in the use of these tools. Also it can be noted that the use of some ICT tools is determined by the availability of supporting infrastructure such as electricity and internet connectivity. The school has computers which were donated by the government, however these are not in use due to lack of electricity. This has greatly weakened the effective integration of ICT in Mathematics.

#### **4.3.1. Challenges faced by teachers in integrating ICT in Mathematics**

##### **4.3.1.1. Lack of Adequate ICT Resources**

#### **Fig 4.2. Adequateness of ICT Resources**

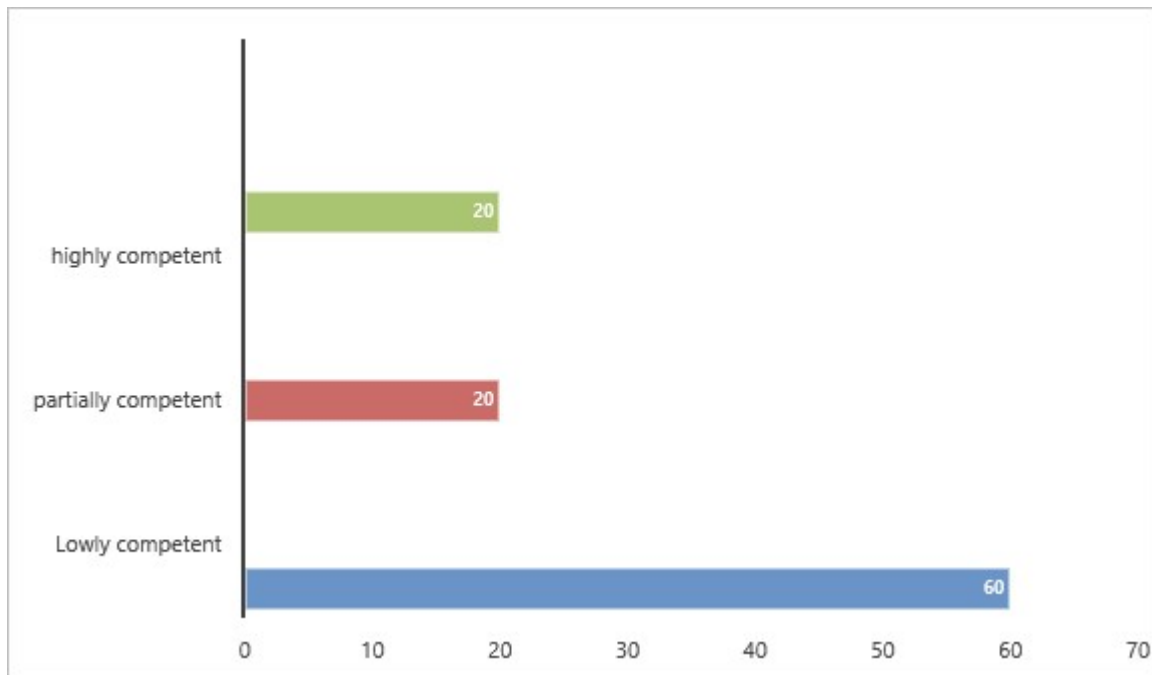
School administrators during interviews revealed that schools do not have enough ICT resources. One of the administrators stated that *“teachers are facing challenges in integrating ICT in various subjects such as Mathematics as schools do not have funds to purchase ICT resources.”* Another one in concur revealed that, *“in most schools, relevant and adequate ICT resources are quite few.”*

It can be noted that one major reason for most teachers to fail to effectively integrate ICT in Mathematics is that they do not have basic ICT resources which are a prerequisite for ICT integration in any learning area besides Mathematics. In agreement Sithole, (2012) states that most schools in Sub-Saharan Africa do not have adequate and latest ICT resources, therefore

it is not surprising that teachers are not integrating ICT in the learning and teaching processes .It can be noted that limited or non –existent of ICT resources is major a major stumbling block for the integration of ICT in Mathematics, as this cannot be done without proper ICT resources. Lack of adequate ICT resources affects the frequency of integration of ICT in Mathematics, it makes teachers to rarely use ICT tools or devices in their teaching, and such arrangement retards the sharpening of ICT competency and efficiency of teachers. Moyo (2017) also argues that the adequateness of ICT tools cheers teachers to often use these tools when teaching and this has the potential of enhancing the skills and aptitude of the teachers.

#### **4.3.1.2. Lack of ICT Competency for Integration**

(N=5)



**Fig 4.3. Teachers’ Levels of Competency of Integrating ICT in Mathematics**

The above bar graph shows the level of teachers’ competency in the integration of ICT in Mathematics. Twenty percent of the participants indicated that they are highly competent, another 20% revealed that they are partially competent and 60% noted that they are lowly competent. Most of the participants who constituted more than half of the participants stressed that they were lowly competent.

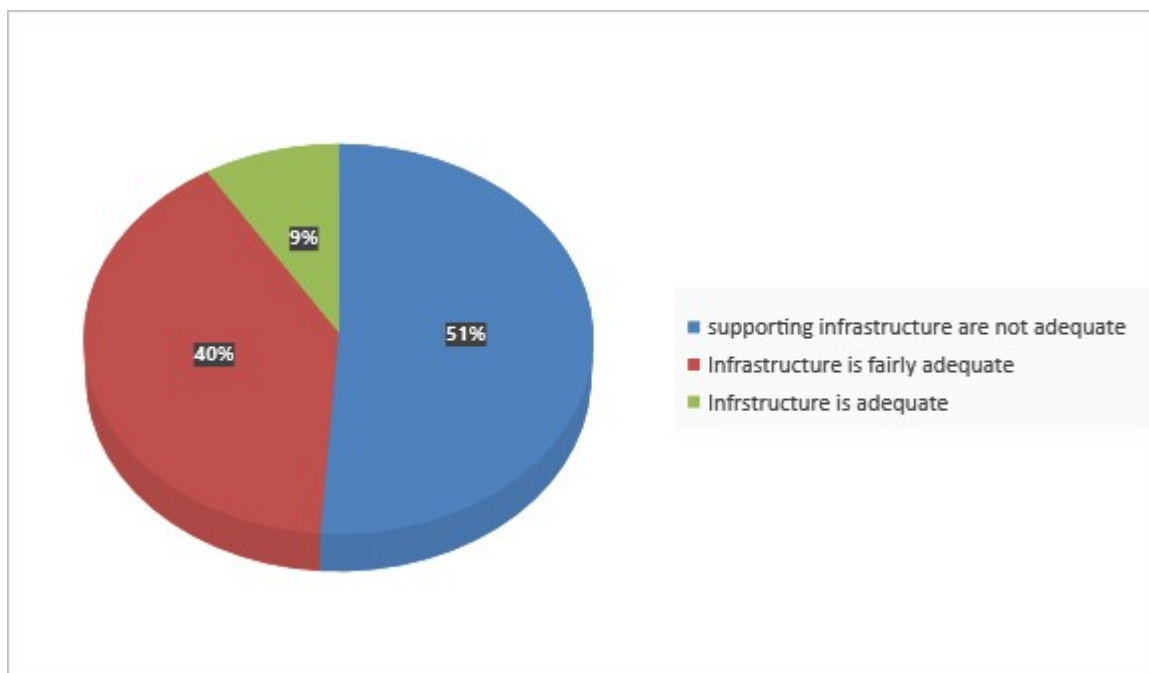
During interviews schools administrators also showed the general levels of teachers’ competency in ICT. Their responses indicated that teachers have varied levels of competency. Administrator of school B, stated that “ *the majority of Mathematics teachers especially those who have 12 years and above work experience are not all that competent in ICT, only few recent graduates seems to be competent.*” The administrator of school A revealed that, “ *most of my teachers especially ladies are not competent in using ICT in teaching Mathematics.*”

It can be noted that teachers are failing to effectively integrate ICT in Mathematics as they have limited ICT skills and knowledge. This finding concurs with the finding made by García,



Weiss, and Engdahl (2020) in USA, these indicate that some teachers are not highly computer literate, this limit their use of ICT tools when teaching. Low competency do not encourage often integration of ICT in Mathematics and it makes the teachers to view integration as time consuming. Low competency in ICT indicates that teachers did not receive adequate training in ICT. This is typically true with regard to most Sub-Saharan countries, where the majority of teachers have received little training in ICT. In agreement Madzivanyika (2019) stresses that developing countries are struggling to promote universal competency and literacy in ICT, the worst situation is that most teachers have not received formal training in ICT in most of these developing countries, this evidenced by low computer literacy by the majority of the teachers. Low competency also entails that teachers struggle to integrate ICT in Mathematics and this makes them to usually resort to traditional methods of teaching.

#### 4.3.1.3. Lack of adequate ICT supporting Infrastructure for Effective Integration



**Fig 4.4. Availability of ICT supporting Infrastructure**

The above pie-chart outlines teachers' response on the availability of ICT supporting infrastructure. Fifty percent of the participants stated that schools does not have ICT supporting

infrastructure, 28% revealed that these infrastructure are partially available and 20% noted that supporting infrastructure are highly available. Very few participants who constituted less than half revealed that ICT infrastructure are highly available and the majority stated that ICT supporting infrastructure are not available.

During interviews the teachers echoed that the schools few computers cannot cater for the huge number of students which makes intergration a difficult task.” The administrator revealed that, *“my school has electricity and but does not have a standard computer laboratory with solar backup in case there is no electricity which is almost the norm and internet connectivity is poor.”*

This finding reflects that lack of supporting ICT infrastructure coupled with other challenges is undermining the integration of ICT in Mathematics. It is difficult to use ICT in teaching where there is unreliable source of power and where there is no suitable room to use the ICT tools. Due to nil or limited internet connectivity teachers find it difficult to download various Mathematics teaching software. This arrangement make some teachers to shun the integration of ICT when teaching Mathematics as the exercise is cumbersome and the lack of these vital resources demotivates teachers. A study done by Nkhwalume, (2013) in Botswana and other SADC countries identifies the major factors which are hindering effective integration of ICT in Mathematics, these challenges include lack of or limited access to computers, Some countries in Africa has low tele-density, this cripples the use of internet which is core in the effective integration of ICT in Mathematics (Madzivanyika, 2019).

#### 4.3.1.4. Limited preparation and teaching Time

**Table 4.5. The Adequateness of preparation and Teaching Time**

(N=25)

Time is highly adequate		Time is fairly adequate		Time is not adequate		Not sure	
Frequency	%	frequency	%	Frequency	%	Freq	%
5	20%	6	24%	10	40%	1	4%

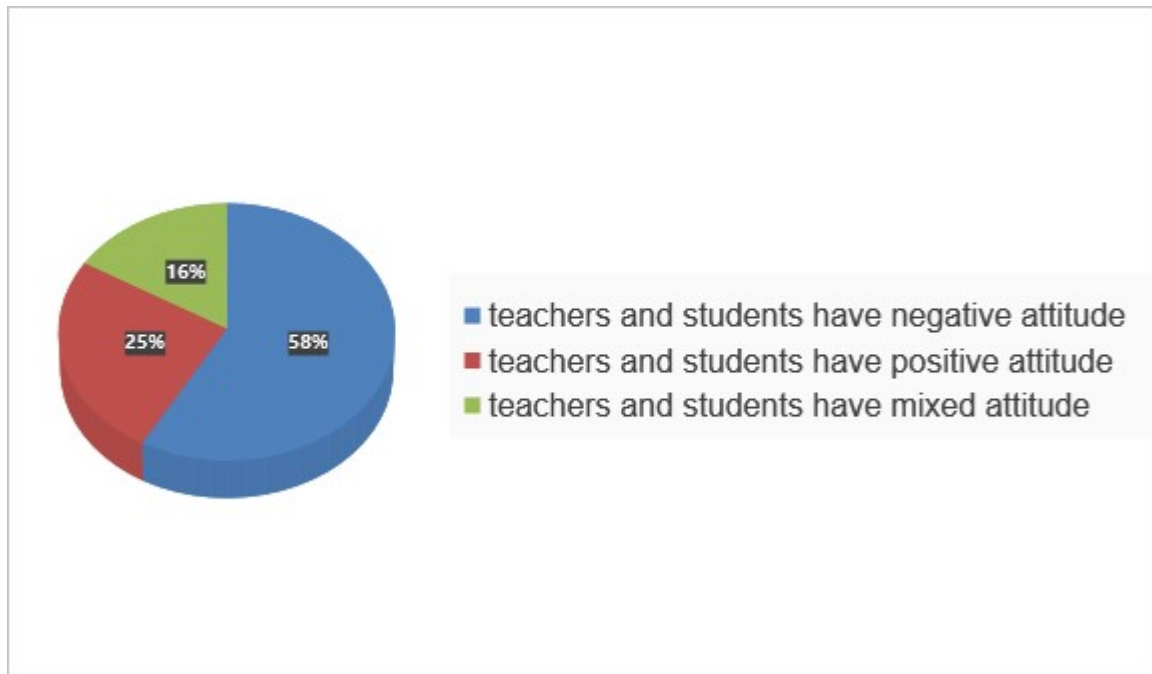
The table above shows teachers' response on the adequateness of time for preparation and teaching using ICT. Twenty percent of the participants noted that time is highly adequate, 24% indicated that the preparation and teaching time is fairly adequate and 40% indicated that it is not adequate and four percent of the participants pointed out that they were not sure. The majority of the participants were of the perception that time for preparing and teaching Mathematics through ICT is not enough. Only a limited number regarded time to be adequate.

Administrators during interviews indicated that preparation and teaching time using ICT is generally inadequate. Administrator of school D noted that *“it is difficult for teachers to adequately prepare and teach using ICT due to lack of enough time because of the nature of*

*the updated curriculum which has many subjects need to be taught.” Another administrator of school A pointed out that “power challenges and limited resources make teachers to take a lot of time to prepare and teach using ICT.” Head of school B stated that “preparation stage is time consuming given the fact that most teachers are low competent, these require much time to prepare their devices and teaching materials.”*

This finding indicates that teachers are facing time challenge. Due to numerous challenges which they are facing including lack of resources and low level of computer competency makes teachers to fail to effectively use stipulated time as indicated on their timetables. This entails that teachers’ end up using other time which is not meant for Mathematics as the stipulated time becomes inadequate. In concurrence Perienen (2019) argues that in most schools which do not have adequate resources find it difficult to integrate ICT in Mathematics within the stipulated time as the preparation stage consumes much of the time due to the use of obsolete machines which can malfunction in the middle of the lesson. In Zimbabwe, in areas which have unreliable power challenges makes it difficult for teachers to teach their learners using ICT within the limits of the timetable and has forced some teachers to resort to the use of weekends and late afternoon times (TShuma, 2019). It can be noted that time challenges faced by teachers makes some of them not to integrate ICT in Mathematics.

#### 4.3.1.5. Negative attitude towards ICT integration



**Fig 4.5. Teachers' attitude towards ICT integration in Mathematics**

Figure 4.5 above shows the attitude of teachers towards the integration of ICT in Mathematics. 16 % of the participants revealed that teachers have mixed attitude towards ICT integration in Mathematics, 26% of the participants stated that teachers have positive attitude and 58% pointed out that teachers have negative attitude towards ICT integration in Mathematics. The majority of the participants indicated that teachers have negative attitude towards ICT integration.

During interviews, schools administrators also highlighted teachers' perceptions on the integration of ICT in Mathematics. Administrators indicated that most of the teachers especially the elderly teachers have negative attitude towards integration whilst younger teachers have positive attitude. One of the administrators noted that *“teachers have negative perceptions and attitudes towards ICT integration as these are cyber phobic and resist the*

*application of technology in education.” Another one noted that, “teachers generally have a negative attitude towards the integration of ICT in Mathematics.”*

Teachers’ negative attitude hinders effective integration of ICT. Negative attitude makes teachers to lowly use ICT even if the ICT resources are available. This negative attitude is usually a result of other challenges associated with the use of ICT such as low ICT competency. Also negative attitude of teachers entails that teachers will rarely integrate ICT when teaching Mathematics. Jackson (2017) states that teachers who low competency and those who do not have adequate resources tend to have negative attitude towards the use of ICT when teaching. In elaboration (Madzivanyika (2019) points out that recent graduates who are usually young are more likely to develop positive attitude as these teachers are more experimental and eager to apply new technologies in education as compared to elderly teachers who have little exposure to ICT in education.

**4.4.3. Strategies that can be adopted by schools in order to increase teachers’ effectiveness in integrating ICT in Mathematics teaching at O Level**

**Table 4.6. Strategies that can be adopted by schools in order to enhance teachers’ effectiveness in integrating ICT in Mathematics**

**Strategies**

ICT workshops and in-service trainings for teachers	4 respondents
Providing adequate ICT resources to teachers and students	39 respondents
Supporting virtual learning from grass roots that is from form one	12 respondents

The table 4.6 above shows the response of all participants on efforts being done by schools to promote the integration of ICT in Mathematics. Participants identified some of the efforts done, these included providing ICT training for Mathematics teachers, providing teachers with ICT resources and supporting virtual learning. These strategies have been implemented in Zimbabwe. In As from 2011 the government has been supporting teachers with further education programmes at universities and colleges for Mathematics teachers. These programmes also have been exposing teachers to new teaching methodologies relevant for the 21<sup>st</sup> century.

Government in collaboration with private entities such as Econet are promoting virtual learning. This type of learning highly integrates ICT in teaching Mathematics as this learning system depends on ICT technology. This strategy has been very useful in various where it has been implemented, in those countries there is a significant improvement of integration of ICT in Mathematics. . In USA, the government increased learners and teachers access to internet facilities in various parts of the state, including to disadvantaged and marginalized communities

(Webster, 2021). Such arrangement has made teachers to be able to fully utilize ICT for learning purpose and this has largely promoted virtual learning in USA (Webster, 2021). A study done Roberts (2017) in Ghana reveals that the Ghanaian government and private entities are helping schools to integrate ICT in various learning areas such as Mathematics in collaboration with some local telecommunication companies have been working tirelessly enhancing internet connectivity for schools and in providing computers.

The teacher training programme has paid some dividends especially in urban areas where trained teachers are now resorting to the integration of ICT in Mathematics (Nyoni,2018).Zambia has been doing the same, Chiombe, (2019) states that Zambia is training teachers on how to integrate ICT on STEM subjects. However in most Zimbabwean schools this strategy is being implemented to a lesser extent as few numbers of teachers have been re-trained since 2012. Also it appears the majority of the beneficiaries of this training are urban teachers, mostly from the humanities sector who have accessed these training programmes. Also financial challenges being experienced by the Zimbabwean government has witnessed the scaling down of these sponsored re-training programmes.

#### **4.5. Summary**

The major focus of this chapter was to present, analyse and discuss the gathered data. Participants' response rate was high. Data was presented in form of tables, graphs, charts and text. The major findings of this study were; (a) the major ICT tools which are used by teachers include audio and visual devices and smartphones, (b) teachers are experiencing various challenges in integrating ICT in Mathematics, the challenges include, lack of ICT resources, lack of ICT supporting infrastructure, low competency in ICT and teachers' negative attitude towards ICT integration and (c) schools in the cluster are implementing are implementing various strategies in order to enhance teachers' effectiveness in integrating ICT in Mathematics



such strategies include providing ICT training for Mathematics teachers, providing teachers with ICT resources and supporting virtual learning. The next chapter focuses on summary, conclusions and recommendations.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

Chapter five summarizes the major findings of the study based on the research questions. Coerces and limitations of the study are summarised together with the conclusions made based on the findings of the researcher. Recommendations are proposed and possible opportunities for future research are also mentioned in this concluding chapter.

#### **5.2. Summary**

This research study was meant to assess the challenges faced by teachers in integrating ICT in Mathematics at O’level at Munyaradzi High School in Sanyati District. This research study’s objectives were to discuss ways in which teachers are integrating ICT in Mathematics at O’Level, to assess the challenges being faced in integrating ICT in Mathematics at O’Level and to evaluate strategies that are adopted by teachers in order to integrate ICT in Mathematics at Ordinary Level. Whilst carrying out the research study the researcher encountered various limitations which included lack of financial resources and adequate time. However these difficulties were by passed by utilising time during weekends and adjusting the budget to accommodate the research project fully.

The researcher used mixed research approach and descriptive survey method. The study sample size was 55. The study participants were selected using purposive and convenience sampling

techniques. Data was gathered using questionnaires and interviews. Various research ethical issues in this study were considered. To satisfy the requirement of consent the researcher informed participants about their participation, the requirements of the study and the importance so as to get their consent before data was collected. A pilot study was carried out to assess the instruments' credibility and trustworthiness.

Data was presented in form of tables, graphs, charts and text. The major findings of this study were that;

(i) The major ICT tools if not the only tools which are used by teachers include audio and visual devices and smartphones.

(ii) Teachers are experiencing various challenges in integrating ICT in Mathematics, the challenges include, lack of ICT resources, lack of ICT supporting infrastructure, low competency in ICT as well as teachers' negative outlook towards ICT integration.

(iii) Mathematics teachers at Munyaradzi High school are employing various approaches in order to enhance teachers' effectiveness in integrating ICT in teaching Mathematics at O'Level such strategies include providing ICT training for Mathematics teachers, providing teachers with adequate ICT resources and supporting virtual learning.

### **5.3. Conclusions**

From the findings of the study it can be concluded that mathematics teachers in at Munyaradzi High School are poorly integrating of ICT in teaching and learning of Mathematics because of a number challenges. Low integration of ICT in Mathematics is directly linked to lack of ICT resources, lack of supporting ICT infrastructure and low ICT competency on the part of teachers. Teachers at Munyaradzi High School are aware of the benefits and opportunities of integrating ICT in Mathematics, however these opportunities are not realised as long the

challenges are not addressed. The teachers are exposed to few ICT resources at the workplace which they rarely use to teach Mathematics because of their inadequacy. Most of these few if not all ICT resources that were being used are personal ICT gadgets. Therefore administrators of schools are not effectively supporting the integration of ICT in Mathematics. Munyaradzi High School has adopted some strategies meant to enhance teachers' effectiveness in integrating ICT in Mathematics. However, the effort is too little and these have not yielded much result due to lack of adequate resources required to implement the adopted strategies.

#### **5.4. Recommendations**

In consideration of the information obtained through literature review and findings of this research drawn above, the following recommendations are presented as possible ways to improve the implementation of the integration of ICT in Mathematics.

- Teachers especially the experienced and mature are not highly competent in ICT, therefore they need to be re-trained through ICT short courses for educators so that they can be in a position to be able to integrate ICT in teaching and learning of Mathematics.
- Government and various stakeholders should provide all schools with adequate ICT resources and supporting infrastructure so that teachers can be able to use them in the teaching and learning of Mathematics.
- Teachers should change their negative attitude towards ICT integration in Mathematics and they should develop self confidence in the use of modern technology in the teaching process.
- The government should ensure that all efforts being done to support the use of ICT in education are cascaded down so that all teachers and schools benefit.

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BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 06/06/24

TO WHOM IT MAY CONCERN

NAME: CHIBVO LEONETTA F REGISTRATION NUMBER: B224606B  
PROGRAMME: HBScEdmt PART: 22

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 HBScEdMathematics programme. The research topic is:

An assessment into the challenges faced in incorporating ICT in the teaching and learning of Mathematics at O'level in Sanyati District: Case study of Mungwaradzi High School

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

Z. Ndemo (Dr.)  
CHAIRPERSON - SAMED

BINDURA UNIVERSITY OF SCIENCE EDUCATION  
DEPARTMENT OF EDUCATION FOUNDATIONS  
9 APR 2024  
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All communications should be addressed to  
"The Provincial Education Director"  
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Ref :C/246/1/MW

Ministry of Primary & Secondary Education  
Mashonaland West Province  
P.O Box 328  
Chinhoyi

09/04/24

The District Schools Inspector  
SANYATI District

**AUTHORITY TO CARRY OUT EDUCATIONAL RESEARCH: SCHOOLS IN**  
SANYATI DISTRICT: MR/MRS/MS: CHISO LEONETTA  
EC.NO/IDNO. 09949572 STATION WESTVIEW PRIMARY  
DISTRICT SANYATI INSTITUTION BURS  
REG.NO. B7246068 PROGRAMME H.R.S.C.F.A MATHE

TOPIC: AN ANALYSIS OF LEARNER MATHEMATICAL ERRORS IN SOLVING QUADRATIC EQUATIONS IN ICADOMA URBAN SEC SCHOOLS  
The above named student has been granted authority by the Provincial Education Director to carry out a research in SANYATI District. The student has been advised to visit your office before entering the schools.

Research Topic AN ASSESSMENT INTO THE CHALLENGES FACED IN INCORPORATING ICT IN THE TEACHING AND LEARNING OF MATHEMATICS AT O LEVEL IN SANYATI DISTRICT: CASE STUDY OF MUNYARAZOI HIGH  
Period of research 09/04/24 to 30/06/24  
Targeted school/s MUNYARAZOI HIGH  
Method of research QUESTIONNAIRE, INTERVIEWS AND OBSERVATIONS

Please ensure that the learning and teaching programmes at the targeted schools are not interrupted in any way; the student strictly adheres to the activities and topics specified in his/her letter of request and that the research should be conducted according to the given time frame.

The District Schools Inspector is requested to liaise with the researcher on the specific schools where the research will be conducted and advise the Provincial Office of the chosen schools. Furthermore, the District Schools Inspector should ensure that a copy of the research findings is submitted to the Provincial Education Director once the research is completed.

FOR: ACTING PROVINCIAL EDUCATION DIRECTOR  
MASHONALAND WEST PROVINCE

MIN. OF PRY. & SEC. EDUCATION  
MASHONALAND WEST PROVINCE  
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MINISTRY OF PRIMARY & SECONDARY EDUCATION  
MASHONALAND WEST PROVINCE  
SANYATI DISTRICT  
JUN 2024  
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11-06-2024