BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS AND SCIENCE EDUCATION

EXPLORING FACTORS INFLUENCING INTEGRATION OF EDUCATIONAL TECHNOLOGIES IN ORDINARY LEVEL COMPETENCE-BASED MATHEMATICS LEARNING ACTIVITIES AT ONE RURAL SECONDARY SCHOOL

BY

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APPROVAL FORM

The undersigned certify that they have supervised, read and recommended to Bindura University of Science Education for acceptance a research project entitled; **Exploring factors influencing integration of educational technologies in ordinary level competence based mathematics learning activities at Mwenje-Dumisani Secondary School.**

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ABSTRACT

This study sought to explore factors influencing the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities. Data generation, analysis, and discussion were grounded in an interpretivist paradigm and qualitative approach. The researcher used focus group discussion and interviews in generating data. In this study, thirty-six learners were conveniently selected and five teachers were purposively selected to form the sample for this study. The generated data were analysed according to themes derived from the formulated research questions. Findings of the study revealed educational technologies used in Ordinary Level Competence-Based Mathematics learning activities are smartphones, calculators, and laptops. These educational technologies are used to play games and puzzles, watch videos, searching information, among others. However, the integration of educational technologies at Ordinary Level Competence-Based learning activities encountered the following challenges: political interference, inadequate technologies, and poor network coverage. From the generated, analyzed data and interpreted data, the researcher concluded that the integration of educational technologies in Competence-Based Mathematics learning activities is significantly low due to poor network coverage, and inadequate technologies due to limited availability of funds. The researcher recommends that teachers should use a variety of educational technologies to cater to the learners' different learning styles and there is a need for staff development to teachers on the contemporary strategies that can be used in the integration of educational technologies in Competence-Based learning activities. Furthermore, various stakeholders are encouraged to sponsor these technologies in schools to supplement the existing technologies.

DECLARATION

I, Mususu Nyasha hereby declared that, except for references to other people's work which have been duly acknowledged, this dissertation is the result of my research and has neither in part nor in whole been presented in an education programme.

N. Mususu

Signed: Date: 30-10-24

(Student)

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DEDICATION

This research is dedicated to all my family members and friends who gave me the courage throughout this research project.

Contents

CHAPTER 1 PROBLEM AND ITS SETTING

1.1 Introduction

The integration of educational technologies in mathematics learning activities has become a crucial aspect of teaching and learning in the 21st century. In Zimbabwe, the introduction of the competence-based curriculum at Ordinary Level has created new opportunities for the adoption of educational technologies in mathematics education. However, the effective integration of these technologies remains a challenge for many mathematics teachers.

According to Machingura (2016), the use of educational technologies can enhance teaching and learning experiences in mathematics, but it requires careful planning and implementation. In Zimbabwe, the Ministry of Primary and Secondary Education has emphasized the importance of using technology to improve learning outcomes, particularly in mathematics and science subjects (MoPSE, 2015).Despite these efforts, research has shown that the integration of educational technologies in mathematics learning activities is influenced by a range of factors, including teacher-related, student-related, institutional, and policy-related factors (Mogari, 2014; Chigona & Chigona, 2013). In Zimbabwe, there is a need for research that explores these factors in the context of Ordinary Level Competence-Based Mathematics learning activities.

This study aims to explore the factors influencing the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities in Zimbabwe. The study will investigate the teacher-related, student-related, institutional, and policy-related factors that affect the adoption and effective use of educational technologies in mathematics learning

In this chapter, the problem and its setting are outlined through the following: background of the study, statement of the problem, objectives of the study, significance of the study, delimitations of the study, limitations of the study, definitions of key terms, chapters' layout and chapter summary.

1.2 Background to the study

In colonial education, the education curriculum was grounded in a teacher-centered approach to learning activities, thereby producing products that lacked practical appreciation in their

areas of specialty (Gasva & Moyo, 2017). In this regard, the curriculum was not relevant to society, since it was not serving its needs and aspirations (Mukandi, Pisirai & Chindedza, 2020). It is in this context that since 1980 Zimbabwean education has undergone various reforms is Science Education In-Service Teacher Training, The Zimbabwe Integrated National Teacher Education Course, The Zimbabwe Secondary School Science Project, Education With Production, Better Environmental Science Teaching, Better Schools Program for Zimbabwe and Curriculum Framework (2015 - 2022) with the view to match the societal expectations and ever-changing technological advancement (Dambudzo, 2016).

To solve these problems, the Government of Zimbabwe set up the Nziramasanga Commission to investigate the deficiencies which the current curriculum was experiencing (Gondo & Gondo, 2012). In the findings, it noted that the curriculum being offered in basic and tertiary education was largely academic and did not adequately prepare learners to be functional in different facets of life (Nziramasanga Commission, 1999). It is against this background that the Ministry of Primary and Secondary Education introduced the new curriculum framework (2015 - 2022) with the view to closing the gaps that were identified in the commission's report (Dzimiri & Marimo, 2015). Thus, one of the reforms that were introduced was geared toward the adoption of a learner-centered approach to learning grounded in the Competence-Based Education principles (Ministry of Primary and Secondary Education, 2015). This new approach to education called for the integration of technologies in learning activities (Chinooneka & Mupa, 2015; Isaboke, Wambiri & Mweru, 2021).

The integration of technologies was done in partnership with other players in education such as UNICEF, and network providers (Econet, Telecel, Netone), among others. It is significant to acknowledge that studies by Nherera (2018); Ngwenya (2020); Sithole, Dziwa and Matsvange (2021) focused more on the success and challenges of the implementation of a Competence-Based Curriculum that is the integration of educational technologies in learning activities in urban schools. However, there is a dearth of literature on the integration of educational technologies in Competence-Based learning activities in marginalized secondary schools. It is against this background that this study sought to gain an insight into the factors influencing the integration of educational technologies in Competence-Based learning activities in rural secondary schools.

1.3 Statement of the problem

In Zimbabwe, the Competence-Based Curriculum was introduced to raise the educational profile by modeling learners toward knowledge, skills, and attitudes toward personal and economic imperatives (Machin, et al., 2015; Ngwenya, 2020). This called for the interaction between the learners and their environment with the aid of educational technologies (Chinooneka & Mupa, 2020; Chirume & Ngara, 2018). This was promulgated with the view to promote critical thinking, information handling skills, the level of conceptualization, and problem-solving capacity among learners (Mukandi, Pisirai & Chindedza, 2020). The new Competence-Based Curriculum has put into question the competencies of secondary school teachers, given that it has created new learning areas and instructional approaches (Mufanechiya & Mufanechiya, 2020). It has been noted that teachers have struggled to understand and implement this new curriculum reform which is the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities. It is in this context that this study sought to explore this gap guided by the main research question: What factors influence the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities?

1.4 Research questions

From the above main research question the following sub-questions were formulated:

1. 4.2 what educational technologies are being used in Ordinary Level Competence-Based learning activities.

1.4.2 How are these educational technologies being integrated into Ordinary Level Competence-Based learning activities?

1.4.3 What challenges are faced when integrating educational technologies in Competence-Based learning activities?

1.4.4 What strategies can be implemented to overcome the encountered challenges?

1.5 Significance of the study

The findings of the study will in one way or the other benefit the following:

1.5.1 Policymakers

The Government of Zimbabwe will use the findings of the research when designing the curriculum to incorporate the use of educational technologies in all learning institutions from primary to tertiary levels. This may also impact the design of the assessment as well so that assessment goes hand in hand with the methods of using educational technologies. After being enlightened on the methods of using educational technologies in learning activities, perhaps they will make efforts to improve the availability of various educational technologies in schools.

1.5.2 Mathematics teachers

The teachers within the district will also benefit from the findings of this study in several ways. Workshops may be organized at cluster or district levels to disseminate the information obtained from this study. This will therefore help them improve their teaching methods and in a way, the whole district's performance may improve due to the use of educational technologies. Assessment methods may also be modeled along the line of educational technologies. Some scholars recommend the training of classroom teachers in how to assess learners and believe this training would improve the quality of education. The study will also help teachers on how to effectively use educational technologies in learning all learning areas.

1.5.3 Learners

The learners will benefit from the findings of this study through the use of interesting and motivating methods of learning. Thus if teachers make use of various teaching methods using educational technologies when teaching, then the learners may become motivated and more interested in learning as well as improve their understanding of the content that will be taught.

1.5.4 Bindura University of Science Education

The findings of this study will help BUSE to design a curriculum that will equip teachers to be computer literate so that they will use educational technology in conducting lessons effectively. The teaching methods should be subject based so that when teachers graduate from the university they will be competent enough to perform their tasks without wavering. Courses like an introduction to educational technologies only provide a drop in the ocean

there is a need for courses that help learners to use different soft wares that will make students competent to teach concepts using educational technologies in their area of specialty.

1.5.5 Researcher

It is hoped that the findings of this study will help the researcher in his future episodes of teaching using educational technologies as he will explore more software that aid teaching and learning of mathematics. The researcher will help other colleagues with using educational technology and train learners on how to use educational technology in learning mathematics. Furthermore, the researcher will be enlightened on the reasons why educational technologies are available in schools yet there are no significant improvements in national examinations and low retention of concepts. The researcher will have insights on how to tackle different challenges that are hindering the integration of educational technologies in teaching and learning mathematics in schools.

1.6 Delimitations of the study

The Ministry of Primary and Secondary Education Masvingo Province has the following education administration districts: Bikita, Chiredzi, Chivi, Gutu, Masvingo, Zaka and Mwenezi. This study was carried out in Chiredzi District which has 18 secondary schools offering basic education from forms 1 - 4 following the dictates of the Ministry of Primary and Secondary Education's Competence-Based Curriculum framework (2015 - 2022). The investigation was carried out at Mwenje-Dumisani Secondary School which has an enrollment of 106 learners, a staff complement of 10, and offers basic education following the demands of the new curriculum framework.

1.7 Limitations of the study

The data generation coincided with a period when the school was capturing CALA marks and moderation. The third term is also characterized by November examination preparation which caused the rescheduling of programs when conducting interviews. However, to bring positive findings to the study there was a rescheduling of the programme. The researcher had to meet the key participants at their convenient times.

1.8 Definition of key terms

In this section the selected terms are defined contextually as follows:

1.8.1 Competence-Based curriculum

A competence-based curriculum is an educational approach that focuses on developing specific skills, knowledge, and attitudes that are essential for students to succeed in their future careers and personal lives.According to Machingura (2016), a competence-based curriculum in mathematics education emphasizes the development of competencies that are relevant to the needs of the economy and society. This approach focuses on developing students' problem-solving skills, critical thinking, and communication skills, which are essential for success in mathematics and other subjects.In line with the use of information and technology, a competence-based curriculum in mathematics education should include competencies such as: - Digital literacy: the ability to use digital tools and technologies to access, process, and communicate mathematical information (Mkwananzi, 2017). Information literacy: the ability to locate, evaluate, and use mathematical information effectively (Munetsi, 2018).Communication skills: the ability to communicate mathematical ideas and solutions effectively using a range of digital tools and technologies (Machingura, 2016).Critical thinking and problem-solving: the ability to think critically and solve mathematical problems using digital tools and technologies (Mkwananzi, 2017).

The implementation of a competence-based curriculum in mathematics education in line with the use of information and technology requires a significant shift in the way education is delivered. Teachers need to be trained to deliver competency-based education, and students need to be assessed on their demonstration of specific competencies (Munetsi, 2018).In Zimbabwe, the Ministry of Primary and Secondary Education has emphasized the importance of using technology to improve learning outcomes in mathematics and other subjects (MoPSE, 2015). The use of digital tools and technologies, such as GeoGebra and Khan Academy, can enhance teaching and learning experiences in mathematics, and help students develop the competencies to success in the 21st century (Machingura, 2016).

A competence-based curriculum in mathematics education in line with the use of information and technology is an educational approach that focuses on developing specific skills, knowledge, and attitudes that are essential for students to succeed in their future careers and personal lives. This approach emphasizes the development of competencies that are relevant to the needs of the economy and society, and requires a significant shift in the way education is delivered.

1.8.2 Educational Technologies

Educational technologies refer to a broad categories that include a wide range of electronic devices and applications that deliver content and support teaching and learning (Ngwenya, 2020). Educational technologies can be used for communication as well as instructional role. Educational technologies support teaching and learning as it provides vast resources to support collaborative learning. The use of computers and the internet to interact with different soft wares and hard wares to deliver content is considered to be educational technology.

1.8.3 Integration

Integration refers to the process of combining different elements to form a cohesive. It is essential for developing teachers who are equipped to navigate the complexities of the digital age and provide quality education to their students. Ngwenya (2020) supports integration as the acts of combining into an integral whole, for example in this context is the application of technologies into teaching and learning to assist, enhances and extend student knowledge.

1.8.4 Ordinary Level Mathematics

It is a science that specializes in delivering concepts in form of numbers, time, and space that is learned in two levels: level 1 is form 1 and 2 then level two is form 3 and 4 inclusively (Zimbabwe School Examinations Council, 2015).

1.9 Chapter layout

Chapter 1 puts the problem and its setting was put into context; chapter 2 outlines the theoretical framework that forms the lens through which the study will be observed. In addition, the gaps to be filled by this study will be identified; chapter 3 outlines the strategy through which data for this study will be generated, analysed, and discussed; chapter 4 explores the generated data through analysis, and discussion with the view to provide answers to sub-questions raised in chapter one and chapter 5 gives an overview of the study conclusion and recommendations.

1.10 Chapter summary

In this chapter, the gap to be filled by the study was identified, through the interrogation of the following: statement of the problem, the significance of the study, delimitation of the

study, and limitations of the study. In addition, key terms were contextually defined. The next chapter focuses on the discussion of relevant literature.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The previous chapter was centered on giving an overview of the problem and its setting. This chapter will be focusing on the identification of gaps to be filled by the study. In this chapter, the researcher will outline the theoretical framework, Competence-Based curriculum as a concept, importance of integrating educational technologies in teaching and learning activities. Challenges faced when integrating educational technologies in Competence-Based teaching and learning will also be discussed.

2.2 THEORETICAL FRAMEWORK

This section centers on theories that contribute to the lens through which the issue under discussion will be interrogated. The following theories will be discussed; constructivist and cognitivist theories. Thus, these theories contribute toward the formation of a lens through which the issue under discussion will be observed.

2.2.1 Constructivism.

Constructivism is a learning theory that suggests that learners construct their own knowledge and understanding through active engagement with their environment and experiences. In the context of Ordinary Level Competence-Based Mathematics learning activities, constructivism can be applied to understand how learners construct their own knowledge and understanding of mathematical concepts.According to Machingura (2019), a Zimbabwean author, constructivism emphasizes the importance of learners' prior knowledge and experiences in shaping their understanding of new concepts. In the context of educational technologies, this means that learners' prior experiences with technology should be taken into account when designing learning activities.

Mkwananzi (2017), another Zimbabwean author, suggests that constructivism emphasizes the importance of social interaction and collaboration in the learning process. In the context of educational technologies, this means that learners should be given the opportunity to collaborate with their peers and teachers through online platforms and tools.Munetsi (2018), a Zimbabwean author, notes that constructivism emphasizes the importance of authentic learning experiences that reflect real-world scenarios. In the context of educational

technologies, this means that learners should be given the opportunity to use technology to solve real-world problems and complete authentic tasks.Chigona and Chigona (2018), Zimbabwean authors, suggest that constructivism emphasizes the importance of teacher facilitation in the learning process. In the context of educational technologies, this means that teachers should play a facilitative role in guiding learners as they explore and interact with mathematical concepts through technology.

2.2.2 Cognitivist

The learners' mind gathers information through perception, judgement, reasoning, and recognition to constantly create and adjust concepts (Fidanboylu, 2014). Thus, the cognitive theory emphasizes information processing of the mind, within the realm of cognition (Kozbelt, 2011; Rubaya & Chademana, 2020). This produces a sense of knowing and understanding within an individual since the mind gathers information through experiencing, sensing, and thinking (Yilmaz, 2011; Cravens & Hallinger, 2013). In this context integrating educational technologies in Competence-Based Mathematics learning assists learners to acquire relevant knowledge, skills and attitudes through problem-solving, judging, and remembering as they interact with these technologies in learning (Ozmon, 2012).

2.3 Competence-Based Curriculum as a concept

In this study, competencies entail knowledge, skills, and attitudes that enable learners to interact with their environment (Berg, 2018). It is against this background that a Competence-Based curriculum is seen as a philosophy that advocates for the learners' empowerment through the acquisition of knowledge, skills, and attitudes (UNESCO, 2015). Thus, this interaction with the environment needs to be facilitated by the integration of technologies in learning activities (Gasva, Mutanana & Goronga, 2019). In this context, learners are engaged in measurable tasks using the experiences gained through learner-centered activities (Ministry of Primary and Secondary Education, 2015). It is done through a blended approach to learner assessment that entails formative and summative assessment. It is significant to acknowledge that this new thrust calls for the integration of educational technologies into learning activities where the role of the teacher is to guide and facilitate (Chinooneka & Mupa, 2015; Dambudzo, 2016; Gasva & Moyo, 2017).

2.4 Technologies used in the teaching and learning of mathematics.

2.41 GeoGebra

The use of technology in the teaching and learning of mathematics has become increasingly popular in Zimbabwe. According to Machingura (2019), technology has the potential to enhance the teaching and learning of mathematics by providing interactive and engaging learning experiences. One of the technologies used in the teaching and learning of mathematics in Zimbabwe is GeoGebra. According to Chigona and Chigona (2018), GeoGebra is a free and open-source mathematics software that allows students to explore and interact with mathematical concepts in a dynamic and interactive way. GeoGebra has been used in several Zimbabwean schools to teach mathematics, and has been found to be effective in improving students' understanding and retention of mathematical concepts (Machingura, 2019).

2.4.2 Graphing calculators.

In addition to GeoGebra and Khan Academy, other technologies used in the teaching and learning of mathematics in Zimbabwe include graphing calculators, online learning platforms, and mobile apps. According to Chigona and Chigona (2018), graphing calculators are handheld devices that allow students to graph mathematical functions and explore mathematical concepts in a dynamic and interactive way. Online learning platforms, such as Moodle and Blackboard, provide a platform for teachers to create and share online mathematics courses and resources (Mugweni, 2020).

2.4.3 Use of mobile apps

Mobile apps, such as Mathway and Photomath, provide students with access to interactive mathematics learning resources and tools (Chigona & Chigona, 2018).The use of technology in the teaching and learning of mathematics in Zimbabwe has several benefits. According to Machingura (2019), technology can enhance the teaching and learning of mathematics by providing interactive and engaging learning experiences. Technology can also provide students with access to a wide range of mathematics learning resources and tools, which can help to improve their understanding and retention of mathematical concepts (Mugweni, 2020).

2.5 Integration of technologies in the learning and teaching of mathematics

The integration of technologies in the teaching and learning of mathematics has become a crucial aspect in education systems. According to Machingura (2019), the use of technology in mathematics education can enhance teaching and learning experiences. Machingura argues that technology can provide students with interactive and engaging learning experiences, which can improve their understanding and retention of mathematical concepts. This is supported by Chigona and Chigona (2018), who found that the use of technology in mathematics education can improve students' problem-solving skills and critical thinking.

In Zimbabwe, the use of technology in mathematics education is becoming increasingly popular. Mugweni (2020) found that the majority of mathematics teachers in Zimbabwean secondary schools use technology to support their teaching practices. However, Mugweni also noted that there are several challenges that hinder the effective integration of technology in mathematics education, including inadequate infrastructure and lack of training for teachers.Despite these challenges, there are several examples of successful technology integration in mathematics education in Zimbabwe. For example, the Zimbabwean Ministry

of Primary and Secondary Education has introduced a digital learning platform that provides students with access to interactive mathematics learning materials (MoPSE, 2020). Additionally, several Zimbabwean universities have introduced online mathematics courses that use technology to support student learning (Machingura, 2019).

2.6 Challenges faced when integrating educational technologies into Competence-Based learning activities

Various challenges can hinder the integration of educational technologies into Competence-Based Mathematics learning activities.

2.6.1 Economic factors

The integration of educational technologies in Competence-Based Mathematics learning activities is affected economically in two ways: the cost of purchasing educational technologies and the cost of maintaining them (Nhendere, 2020). Educational technologies are expensive to buy and maintain, especially with marginalized schools worsened by harsh economic environments, Wi-Fi installation will be considered a luxury. However, some schools have benefited from donated computers but it's very common to see a school computer lab full of broken down computers, some repairable and some not (Isaboke, Wambiri & Mweru, 2021; Ngwenya, 2020). It is against this background that the researcher discovered that the integration of educational technologies may be affected by economic factors due to a limited financial base (Hwande & Mpofu, 2017).

2.6.2 Lack of knowledge and skills

The integration of educational technologies in Competence-Based Mathematics learning activities requires the teacher and learner to possess relevant knowledge and skills (Newhouse, 2010). Lack of competence is directly related to teacher confidence in integrating educational technologies into pedagogical practice (Rubaya & Chademana, 2020). The major reason why Mathematics teachers are not integrating educational technologies is the insufficiency of knowledge of educational technologies (Tondeur, 2012). It is against this background that the researcher observed that Mathematics teachers may lack the knowledge and skills to integrate educational technologies into learning activities.

2.5.3 Poor network coverage

Poor network coverage affects the integration of some educational technologies that require the internet (Gasva & Moyo, 2017; Cachapo, 2018). This is mainly caused by the range of base stations and terrain. In a rural setup, base stations are spaced and the network is affected by mountainous scenery. In addition, poor service quality by Network Service Providers such as NetOne, Telecel, and Econet can be attributed to a lack of competition in the country (Sunzuma & Zezekwa, 2016; Nhendere, 2020). The erratic supply of electricity causes weak signals and unstable networks which can be experienced even in urban areas. It is against this background that the researcher noticed that the integration of educational technologies may be mainly affected by poor network coverage.

2.5.4 Policy issues

The Government of Zimbabwe is now having strict measures on any organization or individual who wants to donate any educational technology materials to schools (Rubaya & Chademana, 2020). As a security measure, these organizations must seek authority and permission from the Ministry to indicate their agenda and targeted group (Madondo, 2018).

In most cases, the clearing process is usually cumbersome which discourages those who want to donate educational technologies to schools. Normally in rural areas, the local authorities like village heads and chiefs also check if the organization or individual who wants to donate has clear intentions even though they have been cleared by the ministry.

2.5.5 Resistance to change by teachers

Resisting change is a challenge that can be experienced when integrating educational technologies in Competence-Based Mathematics learning (Murithi & Yoo, 2021). The fear of the unknown among teachers may lead teachers to resist the integration of educational technologies in Competence-Based teaching and learning. The teacher-centered approach is still dominant because of the long syllabus that needs to be covered (Mukandi, Pisirai & Chindedza, 2020). It is in this context that teachers may resist the integration of educational technologies citing different reasons.

2.7 Strategies to overcome technology integration in the teaching and learning of mathematics.

2.7.1 Adequate training and support.

One of the strategies to overcome technology integration in mathematics education is to provide teachers with adequate training and support. According to Chigona and Chigona (2018), teachers need to be trained on how to effectively integrate technology into their teaching practices. This training should include how to use technology to enhance teaching and learning, how to troubleshoot technical problems, and how to evaluate the effectiveness of technology integration. Mugweni (2020) also emphasizes the importance of providing

teachers with ongoing support and mentorship to ensure that they are confident and competent in using technology to teach mathematics.

2.7.2 Addressing the issue of inadequate infrastructure.

Another strategy to overcome technology integration in mathematics education is to address the issue of inadequate infrastructure. According to Machingura (2019), schools need to invest in adequate infrastructure, including computers, laptops, and internet connectivity, to support technology integration. Chigona and Chigona (2018) also suggest that schools can consider partnering with private companies to provide access to technology and internet connectivity.

2.7.3 Use of mobile devices using open-source software and free online resources.

In this regard, schools can also consider using mobile devices to support technology integration in mathematics education. According to Mugweni mobile devices can provide students with access to a wide range of mathematics learning resources and tools, including apps and online games. Machingura (2019) also suggests that schools can consider using open-source software and free online resources to support technology integration in mathematics education.

2.7.4 Parents and community involvement in technology.

Schools can also consider involving parents and the community in technology integration efforts. According to Chigona and Chigona (2018), parents and the community can provide valuable support and resources to help schools integrate technology into mathematics education. Mugweni (2020) also suggests that schools can consider providing parents with training and support to help them understand how to use technology to support their children's mathematics learning.

2.8 Chapter summary

Chapter two underlined the theoretical base on which the study took reference. The chapter also looked at the benefits of educational technologies in learning as well as barriers. The following chapter looks at the research methodology used to provide answers to the formulated research questions

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter was centered on identifying the gaps in the consulted literature that the current study intends to fill. Chapter three focused on the research methodology which was used when the data was collected. The focus will be on the research design (research paradigm and approach), sample and sampling procedure, data generation procedure, data presentation and analysis procedure, research integrity, and chapter summary.

3.2 Research design

Research design is a crucial aspect of the research process, as it provides a blueprint or roadmap for conducting a study. According to Zimbabwean authors, research design refers to the overall plan and structure of a research study, including the methods and procedures used to collect and analyze data (Machingura, 2019).This was supported by Mkwananzi (2017) who defines research design as "a detailed plan outlining how the research questions will be answered, including the methods and procedures to be used in collecting and analyzing data". This definition highlights the importance of having a clear plan and structure for conducting a research study.Munetsi (2018) notes that a good research design should be clear and concise, logical and coherent, feasible and realistic, ethical and responsible, and valid and reliable. A well-designed research study should also take into account the research question or hypothesis, the research objectives, and the research methodology.

In this research, the researcher is going to use survey research design. According to Machingura (2019), a survey research design is a quantitative research approach that involves collecting data from a sample of participants through self-report measures, such as questionnaires or interviews. The goal of a survey research design is to gather information about attitudes, opinions, or behaviors from a sample of participants, and to make inferences about a larger population (Mkwananzi, 2017).

Chigona and Chigona (2018) note that survey research designs are commonly used in educational research, particularly in Zimbabwe, to gather data on students' attitudes, perceptions, and experiences. For example, a survey research design could be used to investigate students' perceptions of the effectiveness of a new mathematics curriculum in

Zimbabwean secondary schools.Munetsi (2018) highlights the advantages of survey research designs, including their ability to provide a snapshot of a large population, their relatively low cost, and their ease of administration.

3.2.1 Research paradigm

A research paradigm is the set of common beliefs shared between researchers about how the issues under investigation should be understood and addressed (Rehman & Alharthi, 2016). Thus, it provides a philosophical guide to the interrogation of the issue under investigation (Kaushik & Walsh, 2019). It is against this background that the researcher chose the interpretivist paradigm in interrogating the issue at the centre of this investigation. This paradigm believes that reality is multi-layered and has multiple interpretations (Poni, 2014). With the individual mattering they give a good reflection of how people are truly feeling often providing an accurate picture and measuring what the researcher set out to measure (Antwi & Hamza, 2015). The researcher used this approach because it sought to explain the subjective reasons and meanings that lie behind every social action (Pascale, 2011). It is in this context that the researcher sought to analyze responses to why teachers may have different views from learners. More so, no interpretation is privileged over another and no interpretation is a definitive one. It is flexible and this allows the researcher to have a deeper insight into the issue under investigation.

3.2.2 Research approach

In this study, a research approach is regarded as a conceptual structure within, which an investigation is conducted as outlined (Leedy & Ormond, 2010). This accorded the study with the plan or structure that guided the data generation, analysis, and discussion (Zohrabi, 2013). This study was grounded in the qualitative approach in its data generation, analysis, and discussion. Thus, it involved data generation and analyzing non-numerical data to understand concepts, opinions, and experiences (Bhandari, 2020) from the participant's perspective. In addition, this qualitative approach assisted the researcher to generate data from personal and social perspectives (Etikan & Bala, 2017). Thus, this approach provided answers concerning the issue under investigation to who, where, what, and how questions (Jawale, 2012). In this regard, it helped the researcher to gain an in-depth insight into the issue under investigation.

3.3 Methods

Karemba (2014) states that research methods are the tools that the researcher uses in data generation. Hence for this study, the researcher was the chief data generation tool aided by document analysis and interview.

3.3.1 Focus Group Discussion.

A focus group discussion (FGD) is a qualitative research method that involves a structured conversation between a small, diverse group of people and a moderator. According to Zimbabwean authors, FGDs are used to gather data on people's attitudes, opinions, and experiences on a specific topic or issue (Machingura, 2019).

Mkwananzi (2017) defines FGDs as "a research method that involves a small, diverse group of people who are brought together to discuss a specific topic or issue, guided by a moderator". This definition highlights the interactive and dynamic nature of FGDs, where participants engage in a discussion to share their thoughts, opinions, and experiences. In this study 2 classes of Ordinary Level with total number of 108 learners. From the 36 participants who were randomly selected to make groups of 6 to encourage more participation among learners as they feel free to share their thoughts and opinions. This was supported by Machingura (2019) who recommends a group size of 6-12 participants for FGDs. This size allows researcher diverse perspectives and opinions while also enabling the researcher to manage the discussion effectively. Learners will be which help to provide target support and peer-to- peer learning and support.

3.3.2 Interview

An interview is a widely research method in various fields, including social sciences, education, and business. According to Zimbabwean authors, an interview is a qualitative research method that involves a face-to-face conversation between a researcher and a participant, aimed at gathering in-depth information about a particular topic or issue (Machingura, 2019).This was supported by Mkwananzi (2017) who defines an interview as "a purposeful conversation between two or more people, where one person, the interviewer, asks questions and the other person, the interviewee, provides answers". This definition

highlights the interactive nature of an interview, where the researcher and the participant engage in a conversation to gather information.

Chigona and Chigona (2018) denote that interviews can be structured, semi-structured, or unstructured, depending on the research question and objectives. Structured interviews involve asking pre-determined questions, while semi-structured interviews involve asking open-ended questions to gather more in-depth information. Unstructured interviews, on the other hand, involve a more flexible and spontaneous conversation.

Munetsi (2018) highlights the advantages of using interviews as a research method, including the ability to gather rich and detailed information, the opportunity to clarify and probe for more information, and the ability to establish a rapport with the participant. However, Munetsi also notes that interviews have limitations, including the potential for interviewer bias, the time-consuming nature of the process, and the need for transcription and analysis.

In this study, 5 purposively selected teachers were interviewed. The interviews with key informants were grounded in the following themes: educational technologies used in teaching and learning, challenges faced in the integration of educational technologies in Competence-Based learning activities, and the strategies to overcome such problems were the backbone of the interview.

3.4 Population

In research, a population refers to the entire group of individuals, items, or data points that a researcher is interested in studying or understanding. The population is the entire scope of the research, and it is the group from which a sample is typically drawn.According to Kerlinger (1973), "a population is the entire collection of individuals, objects, or events that a researcher wishes to investigate" (p. 12).Similarly, Creswell (2014) defines population as "the entire group of individuals or cases that a researcher wants to describe or explain" (p. 145). A population in statistics and other areas of Mathematics is a discrete group of people, animals or anything that can be identified by at least one common characteristic for the purpose of data collection and analysis (Pucnh, 2013). In this regard, a total population of 108 learners at Ordinary Level form 4 class and 12 teachers was under study.

3.5 Sample and sampling procedure

A sample is a fraction of the total population to be used in each study. It is a representation of the whole population (Chigona and Chigona, 2018). This was supporphonesy Mark (2018) who says,"Smaller group of members of a population selected to represent the population". In this study, the researcher targeted all teachers at the selected secondary school as potential key informants for the issue under investigation (Bhattacherjee, 2012). From the potential key informachose12 teachers were purposively selected to participate in data generation. Purposive sampling was chosen for this study based on the assumption that the targeted participants had knowledge on the issue under investigation (Barbaun, 2008; Neuman, 2006). For triangulation purposes, out of 108 learners 36 participants were purposively selected to participate in a focus group discussion. Convenience sampling was adopted in this study since learners were involved in the compilation of CALA profiles, which limited time for interaction. Hence the need for the researcher to conduct focus group discussion with those learners were conveniently done with those who were available. Moreso, out of 12 teachers at Mwenje-Dumisani Secondary School 5 teachers were purposively selected to participate in the research.

3.6 Data generation procedure

On the data generation procedure, the researcher obtained an introductory letter from the Bindura University of Science Education, Faculty of Education which is inserted in appendix 1. The researcher outlined the objectives of the study to the school head, who later included it among the activities being done at the school. The researcher requested all the relevant policy documents that guided the integration of educational technologies in Competence-Based learning activities. Thereafter the researcher organized a meeting with the potential participants to highlight their role in the study as well as sought their consent. The participants were selected purposively and the researcher personally conducted interviews with selected teachers. As a way of triangulating, data generated from the key informants, learners were selected to participate in a focus group discussion. Before interviews were conducted issues to do with research ethics were considered to be of paramount importance.

3.7 Data analysis procedure

Stevens (2021) defines data analysis as the process of collecting, modeling, and analyzing raw data to extract meaningful insights that support decision-making. This section analyses the data generated through document analysis, focus group discussion, and personal interviews. In this study data analysis was seen as a process that systematically interrogates the sourced experiences, views, and opinions about the issue under study (Schilling, 2006). In addition, it involved data generation, and sorting of raw data to extract meaningful insights that support the basis of an argument (Stevens, 2021). Thus, through this, the researcher was well-positioned to carry out an iterative and recursive type of data generation and analysis (Hatch, 2002; Stoffels, 2004). In this study data sourced through the application of the selected methods was analyzed according to emerging themes (Babbie, 2010). The themes that guided the data presentation, analysis, and discussion were derived from the research questions in chapter 1.

Furthermore, the themes were identified after carefully going through the participants' responses to each question to come up with broad themes. In this way, the researcher sort to identify and describe patterns and trends from the participants' perspective, with the aim of understanding and interpreting them (Creswell, 2014). This called for the reduction of the accumulated data to a manageable size that enabled the researcher to identify the themes from each participant's contribution and this fed into the broader themes. It is from these broader themes that the researcher managed to derive answers to the formulated research questions in chapter 1. In addition, this called for the researcher to present data on each theme in form of short quotations from the participants followed by an analysis of the contribution. It is against this background that data was generated and analyzed in line with the main thrust of the study (Calzon, 2021).

3.8 Research integrity

In this study research integrity was grounded on the trustworthiness of the study and ethical considerations that are discussed in detail below:

3.8.1 Trustworthiness of the study

According to Rule and John (2011), trustworthiness in a study is achieved by giving attention to the study's transferability, credibility, dependability, and conformability. Thus, this study ensures the trustworthiness of its findings by providing a multidimensional comprehension of the issues relating to the integration of educational technologies in secondary schools. In addition, the researcher triangulated document analysis, personal interviews, and focus groups discussion, with the view to extract valuable information on the factors influencing the integration of educational technologies in Competence-Based teaching and learning at the selected school and to minimize the issue of bias. Thus, trustworthiness was rooted in considering whether or not the findings answered all research questions by reflecting on the credibility of the original data shared by the participants (Madondo, 2018). For this reason, trustworthiness was assumed to be achieved through a thorough triangulation of narrations and interpretations of data from multiple sources of evidence (Wilson, 2015). In this setting, triangulation emphasized the need to trim down the influence of bias in data analysis and elucidation (Gunawan, 2015). This brought to light convergence within data, which makes it possible to robustly look at a study from perspectives centered on the integrity of the findings (Oliver, 2012).

3.8.2 Ethical considerations

The researcher always had the responsibility to conduct the investigations and report findings without harming the research participants (Zindi, 2018). Ethical consideration is defined as the accumulation of values and principles that address questions of what knowledge, skills, and attitudes to be acquired relevant to life needs (Omoro & NATO, 2014). Thus, the participants were informed their names will not be published, they will remain anonymous. The respondents were also assured of the confidentiality of their responses and that their responses were going to be used by the researcher to complete the study. They were also permitted to withdraw from the study whenever they feel like, they were free.

Ethics are systems of moral values that are concerned with the degree to which research procedures adhere to professional, legal, and social obligations (Saunders & Thornhill, 2012). Participants were approached with an introductory letter from the Bindura University of Science Education. Information in the letter was about the researcher and the department in case the participants had queries or wanted to verify the identity of the researcher. In this research, the researcher shall seek authority and permission from school authorities and the

respondents. The participants' voluntary freedom to participate or withdraw from the exercise was clarified. All study participants were treated with respect, fairness, and dignity. Anonymity, confidentiality, and privacy of study participants were explained to the participants that their data is not going to be used against them.

3.9 Chapter summary

The chapter focuses on the methodology that was centered on the following: research paradigm, research approach, methods, sampling procedure, data generation procedure, data analysis procedure, research integrity, and chapter summary. In the next chapter generated data will be analysed and discussed according to the identified themes.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

The previous chapter outlined the strategy for data generation, analysis, and discussion. The current chapter focuses on the analysis and discussion of the generated data. The findings are presented narratively according to the emerging themes.

4.2 Characteristics of the participants

Analysis of generated data was performed using the thematic approach in which data was categorized according to sub-questions. This section focuses on the demographic characteristics of the participants, that is, the Ordinary Level Mathematics learners, and teachers.

Attribute(s)		(n)	%
Sex	Females	18	50
	Males	18	50
Age Range (years)	13 – 15	25	69,4
	16 – 18	9	25
	Above 18	2	5,6
Level of Education	Form 4A	18	50
	Form 4 B	18	50

Table 4.1: Demographic characteristics of the learners (n=36)

Firstly, it was noted that the purposively selected 36 participants were 18 males and 18 females with ages ranging from 13 - 18 years, and doing Ordinary Level Mathematics at Dumisani-Mwenje secondary school. Further, it was noted that these participants were

enrolled according to the demands of the Education Act (Ministry of Education, Sport and Culture and UNICEF, 2000). There was a balanced number of females and males. Form 4A constituted 50% whilst form 4B constituted 50%. This enabled the researcher to interrogate the generated data to understand with clarity the extent to which the integration of educational technologies in Competence-Based Mathematics learning activities from learners' experiences. With the view to triangulate the data generated from the participants, 5 teachers were purposively included in this study.

Table 4.2: Demographic characteristics of the selected teachers (n=5)

Attribute(s)		**(n)**	
Sex	Females	3	0
	Males	2	0
Professional qualification(s)	Certificate in Education	0	
	Diploma in Education	4	0
	Degree in Education	1	0
Teaching experience (years) Teaching experience (years)	3 – 8	3	0
	9 – 14	1	0
	15 – 20	1	0
	21 – 25	0	

	Above 25	0	

A close look at the staff that was included in the research shows that there were 40% males and 60% females, the researcher also noted that Diploma holders constituted 80% whilst those with Bachelor's degree were 20%. In addition, the selected teachers are of varying teaching experiences ranging from 3 - 20 years which shows that there is vast experience. Looking closely 3-8 years of teaching experience had 60%, 9-14 years had 20% and teaching experience of 15-20 years constituted 20%. This is advantageous to the learners because they will get the necessary knowledge to understand pedagogy. Among of those 4 who are diploma holders, two of them are currently doing their degrees from different tertiary institutions. This made the researcher assume that they are a credible and dependable source of data for the issue under discussion.

4.3 Educational technologies used in Ordinary Level Competence-Based Mathematics learning activities

In this section data generated from the participants is analyzed, and discussed with the view to provide an answer to research question 1 in chapter one. In line with the theme derived from the question technologies used when teaching mathematics the participants responses are as follows:

Teacher 1said; *I use GeoGebra to do free online mathematics. This software allows teachers to create interactive math models, simulations, and exercises.*

Teacher 2 said; *I use vidmate. This is an online learning App platform that you use to download video lessons, practice exercises, and quizzes for mathematics, including Competence-Based Mathematics.*

Teacher 3 said *that; I use Mathway. This is an online math problem solver allows students to enter math problems and see step-by-step solutions.*

Teacher 4 said*; I use Desmos a free online graphing calculator that allows teachers to create interactive math lessons, examples, and exercises.*

Teacher 5 said; *I use QR Code Generacou.It allows teacher to create QR codes that link to online math resources, such as video lessons, interactive exercises, and math games.*

In support of this, focus group discussion 1 *revealed that they use the scientific calculator as our first choice to solve mathematical problems.*

In addition, focus group discussion 2 said that, *sometimes we use a projector during lessons which the teacher bought at school does not have one.*

Focus group 3 said that, *our teachers use the phone to share documents and videos encouraging us that when we go home we will study on our own.*

Focus Group Discussion 4 said that, during lessons delivery our teachers will be using laptops to display information rather than putting it on the chalkboard

Focus group discussion 5 said that, *they also use tablets to perform calculations and draw graphs during mathematics lessons.*

Focus group discussion 6 said that, *they use mathematics applications like GeoGebra when doing homework.*

The researcher observed that educational technologies being used most in Competence-Based Mathematics learning are mobile phones, laptops, and calculators. One of the participants wished the school had projectors that can be used in learning activities. This further revealed that a projector is a form of educational technology that can be integrated into Competence-Based Mathematics learning to promote mind mapping activities and visualizations (Cachapo, 2018). In addition, calculators proved to be common among learners but only teachers had laptops may be due to cost and availability (Rubaya & Chademana, 2020). Thus, Competence-Based Mathematics learning activities advocate for a learner-centered approach with the aid of technologies (Ministry of Primary and Secondary Education, 2015).

4.4 Integration of educational technologies at Ordinary Level Competence-Based Mathematics learning activities.

The researcher in this section centers the analysis and discussion on how educational technologies are being integrated into Competence-Based Mathematics learning activities giving their influence on content mastering with the view to provide answers to research question 2 in chapter 1.

In this context Teacher 1 highlighted that*; I can use educational technologies like video lessons to deliver instruction at home, and then use class time for hands-on activities, group work, and problem-solving.*

Teacher 2 said that*; I can use educational technologies like GeoGebra, Desmos, or Mathway to create interactive math lessons that allow students to explore and visualize mathematical concepts.*

Teacher 3 said that*; I can use educational technologies like virtual manipulatives (e.g., pattern blocks, geometry shapes) to provide students with hands-on experiences that promote mathematical understanding.*

Teacher 4 said that; *I can use educational technologies like online quizzes, tests, or games to assess student understanding and provide immediate feedback.*

Teachers 5 said that; *I can use educational technologies like online collaboration tools (e.g., Google Docs, Padlet) to facilitate group work and collaborative problem-solving activities that promote mathematical communication and critical thinking.*

It was noted from the findings that laptops and smartphones were the most used technologies in teacher-learner interactions. Furthermore, these technologies are used to explore graphing software which facilitates simplifying abstract concepts to enhance understanding. This is supported by Mukandi, Pisirai, and Chindedza (2020) who postulated that the integration of technologies in learning activities brings about simplicity in the delivery of content. This was in agreement with interviewee 2 who also posited that the use of educational technologies in learning activities promotes a deeper understanding of Mathematics concepts and processes. This concurs with Homero (2015) who highlighted that learners should interact with technologies that in turn enhance critical thinking and problem-solving skills.

In support of the above citations focus group discussion 1, *said one of their teachers always gives them some notes as soft copies. They also share videos and pictures of topics that we intend to learn.*

In addition, focus group discussion 2 said that*; they play videos on mobile phone or laptop which helps them to learn many lessons at the same time.*

Focus Group Discussion 3 said that, *when learning topics such as geometrical we usually use videos. We have noticed that it retain more information when we learn using videos than when we learn the traditional way.*

Focus Group Discussion 4 said that, *their teacher encourage us to play games and puzzles on their phones so that they can learn Mathematical concepts unaware as they enjoy the challenge. It helped a lot when learners dealing with number patterns*

Focus Group Discussion 5 said *they enjoy learning when a video is used, it makes us understand better. We need no much explanation when we watch the videos.*

Focus Group Discussion 6 said that, *they participate on groups through platforms like whatsapp.*

According to Hightower (2011) teachers are expected to come up with various strategies to motivate learners and inculcate in them a positive attitude towards science and related subjects to enhance knowledge transmission. The researcher noticed that educational technologies used in Competence-Based Mathematics learning activities differ in the topics to be taught, aims and objectives. Thus, teachers may prefer to use three-dimensional videos and amination that have high chances of clearly demonstrating the concept being taught (Musarurwa, 2011). In this regard, it was noted from the findings that games and puzzles were also being used in Mathematics learning activities to enhance critical thinking among learners. Thus, through these technologies learners can comprehend number patterns. Furthermore, learners become competent in searching for information which builds an intellectual base (Murithi & Yoo, 2021).

4.5 Challenges faced when integrating educational technologies in Ordinary Level Competence-Based Mathematics learning activities

In this section, findings are anticipated to indicate challenges encountered by rural secondary learners and teachers in integrating Competence-Based teaching and learning activities. In an interview teacher 1 said that, at this school there is no electricity, at times it's a struggle for my phone to get fully charged when it's cloudy because my solar kit is small. I use my laptop and phone to share and deliver information to students. Only a few students have smartphones.

In addition, focus group discussion 1 said that learning with the aid of a phone is interesting but the challenge we are facing right now is the unavailability of power. Our phone can go up to two days without power.

The unavailability of a reliable power source is making it difficult for educational technologies to be integrated into Competence-Based learning activities. This was supported by Makunde (2020) who says, many schools have limited or no internet connectivity, which can make it difficult for teachers to access online tools and resources to support them. It was not noted that only a few students possess compatible devices which makes it difficult for the whole class to use so to counter the challenge learners have to share as a group which does not guarantee the expected results. The same challenge that is faced by teachers of not having a reliable power source is also faced by students. The teacher may want to share information with students and their gadgets may have run out of power. Smartphones are expensive it's not every family can afford to buy them for their children as supported by the response below,

Focus group discussion 2 said that, *their parents can't afford to buy me a phone. When our teachers want to share information with us our mother gives us phone sometimes it will be difficult for us to use it at home because she will be using her phone for other purposes.*

Furthermore, focus group discussion 3 said that, *our parents do not want us to own a phone they say I will be naughty calling boyfriends and friends late at night*.

From the findings, the researcher noted that some parents deny buying their children some phones assuming that they may misuse them. It is a common problem among teenagers that they end up using their phones for most social purposes instead of academic purposes (Chinyoka, 2019). This will hinder learners from their privilege to learn using educational technologies. Furthermore, the unavailability of Wi-Fi at the school is a big challenge to Competence-Based Mathematics learning activities. On this issue, teacher 2 said that, there is no Wi-Fi at this school so I buy data using my funds and nowadays data is very expensive. When we ask the admin to buy us data they refuse saying maybe it's for our gains. Not only this, the network is very poor these days only WhatsApp will be functional all other browsers will not have access to the internet.

In addition, focus group discussion 4 said that, *they walk about 2.5km at a point where there is a strong internet connection. Sometimes we go there and nothing materializes there which is very disappointing.*

Challenges rose from the findings echo Nhendere (2020) who found out that the state of educational technologies infrastructure needs urgent attention if education in Zimbabwe is to reap meaningful results from the use of educational technologies. Poor infrastructure is making internet access difficult and impossible in most parts of the country. In addition, poor service quality by Network Service Providers such as Zol, Africom, NetOne, Telecel, and Econet can be attributed to a lack of competition in the country (Sunzuma & Zezekwa, 2016). In addition, the researcher noted that teachers are using their funds to buy data since the school is failing to buy for them due to the unavailability of funds and other reasons. This affects learning coupled with weak signals experienced in this area. Furthermore, one of the students cited that he walks long distances in search of a strong signal to access the internet.

In the interviews conducted teachers 3 said that, *when I want to teach graphical concepts using a graphic calculator and GeoGebra it consumes a lot of time because there is only one graphic calculator for the whole class and only a few students have smartphones*.

Focus Group Discussion 5 said that; *some of us are not being familiarize with technogy so it is difficult for us to geometry using laptop, so at the end of the lesson objectives cannot be achieved.*

In addition, teacher 4 said that; *there is too much political interference in this area. There is a guy who wanted to donate laptops to the school. He was blocked by the community citing he want to campaign so he opted to donate them to our neighboring school.*

This was supported by Focus Group Discussion 6 *who said that shortage of ICT technology resources at our school find us difficult for some of us to gain skills since one learner will be demonstrating for the whole group.*

In an interview teacher 5 said; *she doesn't have sufficient knowledge to effectively integrate technology in teaching.*

This was supported by Chinyoka (2019) who said, some teachers lack technical skills to effectively integrate technology into their teaching, which can hinder successful implementation of competence based curriculum in mathematics

From the above findings, it can be noted that teachers are appreciating the integration of educational technologies in Competence-Based learning activities however; they are citing that the technologies are few which in turn takes more time when facilitating the lesson. Makunde (2020) supports the statement saying, many schools especially in rural areas lack access to tablets and other digital devices. Furthermore, the researcher noted that from the findings that the community was privileged to have someone who wanted to donate educational technologies to the school since they were not enough for learners however, the donation was blocked because of political reasons.

4.6 Strategies that can be implemented to overcome the encountered challenges

Based on the findings from the participants this section provides answers to the demands of research question 4 in chapter 1. The responses of the participants on the strategies that can be implemented were presented as follows, teacher 1 said that the government should provide ICT gadgets to teachers and students, not the teacher to use his or her money to buy and use them in public institutions.

In addition, focus group discussion 1 reviewed that; *the school should provide educational technologies to teachers and learners, electrify the school, and internet installation should be a priority.*

The above responses show clearly that teachers have gone the extra mile in purchasing educational technologies for Competence-Based learning activities using their funds. However, under normal circumstances, the school should provide educational technologies to teachers and learners. It is in this context that the Ministry of Primary and Secondary Education in collaboration with other stakeholders should provide educational technologies to marginalized schools. Furthermore, the responses show what other scholars have said that individual efforts will not reap sustainable results in so far as benefiting from the use of educational technologies is concerned as such the government has a crucial role to play in

coordinating efforts for the whole country to benefit from an improved educational technologies availability (Ogbomo, 2011).

In addition to this, teacher 2 said that; *for teachers to be effective there is a need for teacher capacity development through workshops where they are trained to use technologies for learning purposes.*

From the findings, the researcher noted that training is an important component of curriculum implementation since it capacitates teachers on how to use educational technologies in Competence-Based Mathematics learning activities (Newhouse, 2010). In addition, the researcher noted that the teaching experience and qualifications of teachers have an impact on the use of educational technologies in Competence-Based Mathematics learning. Teachers with a teaching experience of ten years and above may face challenges due to changes in pedagogical issues so there is a need for training and workshops to keep abreast with the Competence-Based Curriculum (Cachapo, 2018).

In support of the above findings, focus group discussion 2 said that; *the school should buy tablets and calculators for us because at the moment our parents are not able to buy them.*

In addition to the idea above focus group discussion 3 said that; *the school authorities should introduce a computer levy that should be paid by every child towards buying laptops and smartphones.*

Furthermore, in an interview teacher 3 said that; *the community needs to be educated so that they know the importance of educational technologies so that whenever someone wants to donate they will accept so that the learners and the entire community benefit.*

Focus Group Discussion 4 said that; *as learners we should learn to share resources with other group members to promote collaboration and reducing technical issues. In addition to that as learners we should seek help from peers and teachers when encountering problems.*

Moreover, teacher 4 in an interview said that*; he should seek technical support from school administrators, IT personnel to troubleshoot technical issues.*

Focus Group Discussion 5 said that*; as learners we should develop troubleshooting and problem-solving skills so that we can identify and resolve technical issues such as reconnections and technical issues.*

In an interview teacher 5 said that; *as teachers they should collaborate with colleagues who have experience with technology integration to share best practices resources and ideas.* Focus Group Discussion 6 said that; *as learners we should develop patience and persistent when working with technology recognizing that technical issues can arise and they can be overcome with time and effort.*

From the above findings, learners feel that the school should provide them with educational technologies for them to use citing that their parents or guardians are not able to buy them because they are expensive. In addition, the researcher noted that the school authorities should introduce a levy on purchasing of educational technologies. The idea should be first communicated and agreed upon with parents to map the way forward. Communication is the key to successful learners and parent involvement in school activities (Smudde & Cortright, 2011; Zindi & Ruparanganda, 2013). Nhendere (2020) encouraged the government to seriously consider investing in educational technology infrastructure or put in place consistent policies that would encourage private sector or non-governmental organizations to invest in the national information and communications technology infrastructure.

4.7 Chapter summary

Chapter four analyzed, and discussed data generated through document analysis and personal interviews. In addition, the researcher attempted to provide answers to the research questions raised in chapter 1. The next chapter will provide a summary of the study, general conclusion, and recommendations

CHAPTER 5: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter, data was analyzed and discussed. This current chapter focuses on the following: summary of the project, conclusion, recommendations, areas for further study, and chapter summary.

5.2 Summary of the project

In chapter 1, the researcher looked at the problem and its context where the focus was on the background of the study, statement of the problem, the research questions, and research objectives, assumption of the study and significance of the study, limitations of the study, and delimitation of the study as well as definition of dkey terms. Chapter 2 outlines the theoretical framework through which the gaps in the consulted literature were interrogated. Chapter 3 highlighted the strategy for data generation, presentation, analysis, and interpretation. Furthermore, in chapter 4, the researcher looked at the data presentation, data analysis, and discussion. The findings of the research were presented and analyzed as follows:

1. What educational technologies are being used in Ordinary level competence - based learning activities.

One of the most significant educational technologies being used in Ordinary level competence-based learning activities is Information and Computer Technology (ICT). Mhlanga (2018) argues that ICT has the potential to facilitate the teaching of BTD and promote practical competencies. ICT enables learners to access a wide range of digital resources, including tutorials, videos, and simulations, which can enhance their understanding of BTD concepts.

E-learning platforms are also being used in Ordinary level competence-based learning activities. Machingambi, (2020) denotes that e-learning platforms, such as Moodle and Blackboard, are being used to support learner-centered and adaptive learning approaches. These platforms enable learners to access learning materials, participate in online discussions, and submit assignments, which helps to promote flexibility and autonomy in learning.Digital tools are also being used in Ordinary level competence-based learning activities. Chikwature (2019) argues that digital tools, such as project management software and collaboration tools can facilitate project-based learning, case studies, and other innovative teaching methods. These tools enable learners to work collaboratively, share ideas, and receive feedback, which helps to develop their communication and teamwork.

2. How are these educational technologies, are being intergrated into Ordinary level competence - based.

Educational technologies are being integrated into Ordinary level competence-based learning activities are through the use of Information and Computer Technology (ICT). Mhlanga (2018) argues that ICT is being used to facilitate the teaching of BTD and promote practical competencies. Teachers are using ICT to create digital resources, such as videos, tutorials, and simulations that learners can access online. This enables learners to work at their own pace, access learning materials anytime and anywhere, and develop their digital literacy skills.

E-learning platforms are also being used to integrate educational technologies into Ordinary level competence-based learning activities. Machingambi, (2020) denotes that e-learning platforms, such as Moodle and Blackboard, are being used to support learner-centered and adaptive learning approaches. Teachers are using e-learning platforms to create online

courses, discussions, and assessments that enable learners to work collaboratively, share ideas, and receive feedback.

Digital tools are also being used to integrate educational technologies into Ordinary level competence-based learning activities. Chikwature (2019) argues that digital tools, such as project management software and collaboration tools are being used to facilitate project-based learning, case studies, and other innovative teaching methods. Teachers are using digital tools to enable learners to work collaboratively, share ideas, and receive feedback, which helps to develop their communication, teamwork, and problem-solving skills.In addition, educational technologies are being integrated into Ordinary level competence-based learning activities through the use of mobile devices. Mupinga (2019) notes that mobile devices, such as smartphones and tablets, are being used to enable learners to access learning materials, participate in online discussions, and submit assignments. This enables learners to work flexibly, access learning materials anytime and anywhere.

3. What challenges are faced when intergrating educational technologies in competence-based activities.

One of the significant challenges faced when integrating educational technologies is the lack of infrastructure and resources. Machingambi (2020) denotes that many schools in Zimbabwe lack the necessary infrastructure, such as computers, internet connectivity, and electricity, to support the use of educational technologies. This makes it difficult for teachers to integrate technology into their teaching and learning activities. Another challenge faced when integrating educational technologies is the lack of technical support and training for teachers. Mlambo (2019) argues that many teachers in Zimbabwe lack the necessary technical skills and training to effectively integrate educational technologies into their teaching and learning

activities. This can lead to frustration and disappointment among teachers, which can negatively impact the learning experience.

The high cost of educational technologies is another challenge faced when integrating these technologies into teaching and learning. Chikwature (2019) denotes that many educational technologies, such as software and hardware, are expensive and may not be affordable for many schools in Zimbabwe. This can limit the availability of educational technologies and make it difficult for teachers to integrate them into their teaching and learning activities. The lack of digital literacy among learners is also a challenge faced when integrating educational technologies into teaching and learning. Mupinga (2019) argues that many learners in Zimbabwe lack the necessary digital literacy skills to effectively use educational technologies. This can make it difficult for learners to access and use educational technologies, which can limit their learning experience.

4. What strategies can be implemented to overcome encountered challenges?

One of the strategies that can be implemented to overcome challenges encountered when using educational technologies is to provide teachers with ongoing training and support. Machingambi (2020) notes that teachers need to be equipped with the necessary technical skills and knowledge to effectively integrate educational technologies into their teaching and learning activities. This can be achieved through workshops, seminars, and online courses that focus on the use of educational technologies in teaching and learning. Another strategy that can be implemented is to invest in infrastructure and resources. Mlambo (2019) argues that schools need to have the necessary infrastructure, such as computers, internet connectivity, and electricity, to support the use of educational technologies. This can be achieved through government funding, donor support, and community involvement.

To overcome the challenge of high cost of educational technologies, schools can explore open-source and free educational technologies. Chikwature (2019) notes that there are many open-source and free educational technologies, such as Moodle and Open Office, that can be used in teaching and learning. This can help to reduce the cost of educational technologies and make them more accessible to schools.

5.3 Conclusion

From the generated, analyzed data and interpreted data, the researcher reached the conclusion that the limited use of educational technologies in Ordinary Level Competence-Based Mathematics learning activities at the selected secondary school was due to multiple factors such as inadequate infrastructure, economic factors, and poor network coverage among others. This is so despite the implementation of the Competence-Based curriculum, which calls for the integration of educational technologies in Ordinary Level Mathematics learning activities.

5.4 Recommendations

The researcher proposes the following recommendations to improve the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities:

Teachers are encouraged to use of variety educational technologies to cater to the learners' different learning styles.

Teachers need to be staff developed on the contemporary strategies that can be used in the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities.

5.5 Areas for further research

As the study was only limited to one school in the Ministry of Primary and Secondary Education Chiredzi District, it will be necessary to carry out a wider study to other provinces in Zimbabwe.

5.6 Chapter Summary

In this chapter, the research study was summarized, the conclusion was articulated, recommendations were made and the area for the study was identified.

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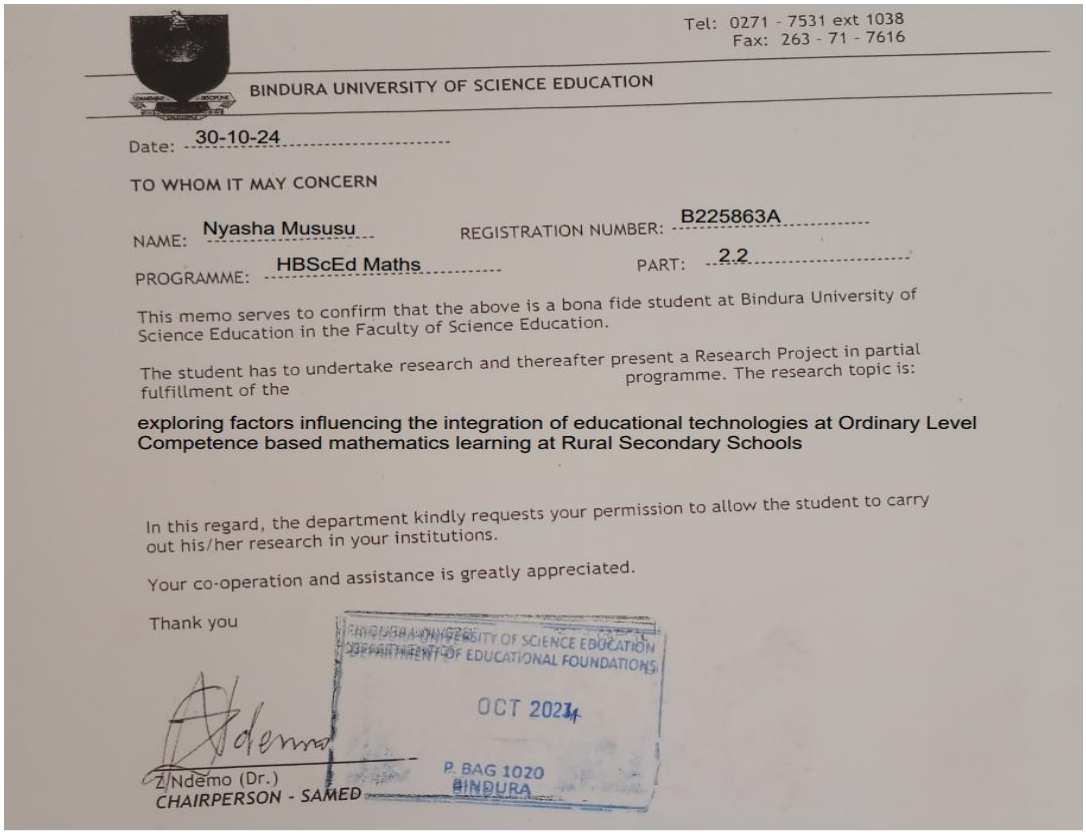
APPENDICES

APPENDIX 1: RESEARCH PERMISSION LETTER



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

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 30-10-24

TO WHOM IT MAY CONCERN

NAME: Nyasha Mususu REGISTRATION NUMBER: B225863A

PROGRAMME: HBScEd 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 programme. The research topic is:

exploring factors influencing the integration of educational technologies at Ordinary Level Competence based mathematics learning at Rural Secondary Schools

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
OCT 2024
P. BAG 1020
BINDURA

Z Ndemo (Dr.)
CHAIRPERSON - SAMED

APPENDIX 2: FOCUS GROUP DISCUSSION GUIDE FOR LEARNERS

Introduction: Welcome and thank you for coming forward to take part in this discussion. You have been requested to play a part as your point of view is important. This discussion is designed to gain insight into your current thoughts and feelings about your experiences in integrating educational technologies in Ordinary Level Competence-Based Mathematics learning activities at the selected secondary school.

Ground rules

1. Only one participant speaks at a time (there may be a temptation to jump in when someone is talking but please wait until they have finished)
2. There are no wrong or right answers
3. You do not have to speak in any particular order
4. When you do have something to say, please indicate by lifting your hand slightly
5. You do not have to agree with the views of other participants in the group

OK, let's begin

Introductory Question

I will give you a couple of minutes to think about factors influencing the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities.

Guiding Questions

1) What educational technologies do you use in Ordinary Level Competence-Based Mathematics learning activities?
2) How are your teachers using these technologies in Ordinary Level Competence-Based learning activities?
3) What challenges do you face when using these educational technologies in Ordinary Level Competence-Based Mathematics learning activities?
4) What solutions can be applied to overcome the encountered challenges?

Concluding question

Of all the issues we have discussed here, what would you say are the most important ones?

Conclusion

Thank you for taking part. This has been a very fruitful conversation. Your sentiments will be appreciated in this study. We wish once again to let you know that any remarks featured in this study will remain anonymous

APPENDIX 3: INTERVIEW GUIDE FOR TEACHERS

Thank you for agreeing to be interviewed. This study focuses particularly on factors influencing the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities, I believe you can make a significant contribution to gaining insight into the issue under investigation. I am going to ask you some questions which you are free to elaborate on, in ways you consider fit. In case you do not feel like answering the question, you are at liberty to say so. I would like to let you know from the start that your personal and school details will not be included in the final report.

1) Briefly tell me something about yourself (with specific reference to professional qualifications, and teaching experience in general).
2) For how long have you been facilitating Ordinary Level Competence-Based Mathematics learning activities?
3) Which technology-based tools are used in Ordinary Level Competence-Based Mathematics?
4) Do you use educational technologies in Ordinary Level Competence-Based Mathematics learning activities?
5) What are the benefits of using educational technologies in Ordinary Level Competence-Based learning activities?
6) Have you been trained to integrate educational technologies in Ordinary Level Competence-Based learning activities? (If yes did it improve the way you used to deliver lessons? If not what have you done to integrate educational technologies into teaching and learning?)
7) What challenges are you facing when integrating educational technologies in Ordinary Level Competence-Based Mathematics learning activities?
8) In your own opinion what should be done to counter challenges that are influencing the integration of educational technologies in Ordinary Level Competence-Based Mathematics learning activities?

Thank you for participating in this interview