BINDURA STATE UNIVERSITY

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF MATHEMATICS

EXPLORING CHALLENGES ASSOCIATED WITH USING ONLINE TEACHING PLATFORMS IN MATHEMATICS: POSSIBLE MITIGATION MEASURES.

BY

SHOKO ALISAPHINA

B225365B

A DISSERTATION SUBMITTED TO IN PARTIAL FULFULMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONORS DEGREE IN MATHEMATICS EDUCATION

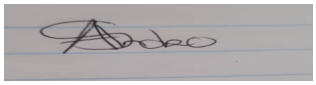
JUNE 2024

RELEASE FORM

Title of the dissertation: Exploring challenges associated with using online teaching platforms in mathematics: possible mitigation measures.

1. **To be completed by the student**

   I certify that this dissertation is in conformity with the preparation guidelines as presented in the Faculty Guide and Instructions for Typing dissertations.

   6 July 2024

   (Signature of student) (Date)

2. **To be completed by the supervisor**

   This dissertation is suitable for submission to the Faculty. This dissertation should be checked for conformity with Faculty guidelines.

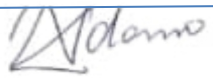
   

   6 July 2024

   (Signature of Supervisor) (Date)

3. **To be completed by the chairperson of the department**

   I certify to the best of my knowledge that the required procedures have been followed and the preparation criteria have been met for this dissertation

   14 October 2024

   (Signature of the chairman) (Date)

APPROVAL FORM

Name of the student: SHOKO ALISAPHINA

Registration Number: B225364B

Dissertation Title: Exploring challenges associated with using online teaching platforms in mathematics: possible mitigation measures.

Degree Title: Bachelor of Science Honors Degree in Mathematics Education.

Year of completion: 2024

Signed…… Date ……/……./……

Permanent Address: Chinembeure Secondary School
PO Box 251
Zvishavane

ACKNOWLEDGEMENTS

I would like to express my appreciation to my supervisor DR Z NDEMO for the support, guidance and dedication which helped me to enable this project to be a success. I am also indebted to my friends at Bindura University of Science Education who supported me so much during this research study. The Head of Chinembeure Secondary School, Ms E Mapute is also acknowledged for creating conducive environment for me to during my studies at the school

\

DEDICATION

The research project is dedicated to my family members who gave me some unconditional love and support throughout the course.

ABSTRACT

The purpose of this research was to explore challenges and solutions on using online teaching platforms to learn Mathematics at ordinary level particularly in Zvishavane district. The COVID-19 Pandemic, which hit various countries, has caused changes in the education sector, such as school closure and the transition from face-to-face learning methods to online learning. The application of online learning is considered a sudden decision, causing teachers as executors of education to take responsibility for the difficulties during online learning implementation. This study discussed the difficulties faced by mathematics teachers and learners in implementing online learning. The method used in this study was both quantitative and qualitative. The sample was made of 8 O level Mathematics teachers where the researcher employed a systematic random sampling technique to come up with the sample. During the study, questionnaires and interviews were used as the research instruments with their merits and demerits being cited briefly. The data collected indicated that that online learning could appear challenging in the first days of its inception, but after a while, both learners and teachers would acclimatize. The researcher also found out that with adequate support, teachers were ready to implement online learning teaching and learning. The researcher therefore made the following recommendations; the study should be carried on many schools to enable gathering of data from a remarkable population that can allow for generalization of findings; schools should offer technical assistance to teachers in terms of ICT gadgets and internet bundles to ease the process of virtual learning; the Zimbabwean government should also be on the ground with tangible assistance when recommending the implementation of online lessons, not heaping much of the burden on schools and the parent community.

Table of Contents

LIST OF TABLES

CHAPTER ONE

1.0 INTRODUCTION

1.1 Introduction

The main aim of this chapter is to unpack all circumstances related to the researcher's study area. These encompass a brief background to the study, statement of the problem, research questions as well as the significance of the study to various stakeholders. Also, to be highlighted in this chapter are limitations, the delimitations as well as the conceptual analysis of the key terms.

1.2 Background to the study

Since time immemorial, the teaching and learning of Mathematics was done using traditional teaching and learning methods like: the lecture, the story telling, question and answer, and the problem-solving approach (Kasambira, 2017); among others. With the pass of time and technological advances, other teaching and learning approaches like simulations, video films and debates (Tripod, 2010) were incorporated. The new methodologies are mostly child centered, with the main intention being to involve the learners as much as possible during teaching and learning. The use of the internet and ICT tools in teaching and learning of Mathematics has been practiced since independence but the coming of the COVID-19 pandemic brought acceleration of the use of online teaching and learning techniques. Online learning is defined by Manning (2019) as an interactive process in two main divisions; as broadcasted or as interaction between two or more people. Broadcasted online learning comes in the form of radio or televised announcements, while the interactive online learning deals with communication between two or more people, for example on platforms like Facebook, WhatsApp, Twitters or emails. For all forms of ONLINE LEARNING, internet connection is a pre-requisite as well as possession of an appropriate gadget. For example, it is impossible to receive information of broadcasted online learning when you do not have gadgets like radios, laptops or smart phones. Similarly, to interact on online learning, one needs to have appropriate devices that can access the internet. The use of online learning to facilitate the teaching and learning of Mathematics is not much documented, since the subject has been taught using conventional teaching and learning methods. A study

carried by Mikis (2012) on the effectiveness of the use of ICT in teaching and learning indicates that technology brings about numerous opportunities to facilitate the process. On the other hand, Tripod (2010) submits that there are also glaring drawbacks that are associated with use of online learning as a teaching and learning approach in Mathematics. A lot of stakeholders are involved in the teaching and learning of Mathematics using online learning. The parent community, teachers, learners and the school administrators should play collaborative roles in ensuring that the use of online learning to facilitate teaching and learning materializes. A study carried by Mikis (2020) in Austria-Hungary established that the use of online learning in teaching and learning of Mathematics may lead to dissemination of unverified information if not monitored closely. The researcher has noted that in developing countries where resources are in short supply, the use of online learning is progressing sluggishly and the rate of implementing it is not forthcoming owing to countless issues. In another finding by Thomas (2020), online learning as a form of teaching requires a tactical approach in which educators and learners interact meaningfully with the former adequately planning the content to be given to learners. Being a new approach, the researcher believes that a lot is yet to be realized about the relevance of online learning in the teaching and learning of Mathematics, hence the desire to carry out this study.

1.3 The statement of the problem

The onset of the COVID-19 pandemic rattled the education sectors of many countries, compelling the majority of countries to adopt non-contact forms of teaching and learning as envisaged by protocols of the COVID-19. The developed world, apart from ensuring strict safety measures introduced virtual learning platforms that saw learners receiving online lessons in the comfort of their homes. In the developing countries like Zimbabwe, the COVID-19 era caught them unaware and consequently saw schools being closed indefinitely and half-baked learners sat for examinations. Teachers in different faculties, Mathematics included devised many initiatives to reach out to their learners amidst the lockdowns perpetuated by the prevalence of COVID-19 cases and deaths. Some Mathematics teachers adopted online lessons via online learning platforms such as WhatsApp and other learning platforms like Google classroom, but the extent to which these methods reap the intended instructional benefits hampered by numerous shortcomings. It is against this background that the researcher is compelled to

investigate the challenges and solutions on using online teaching platforms in the teaching and learning of Mathematics at Ordinary level in four selected schools in Zvishavane district. -

1.4 Research Questions

1.4.1 What are teachers' conceptions of online learning?

1.4.2. What are the barriers to online teaching and learning implementation?

1.5 The objectives of the study

1.5.1 To examine barriers teachers view as significant to e-learning.

1.5.2. To provide possible mitigation measures to challenges to online learning.

1.6 Significance of the study

Study is done as part fulfilment of the requirements Bachelor of Science Education Honours-Degree in Mathematics at-Bindura-University. The research study help motivate the researcher to relate the research theories learnt into practice, therefore coming up with mature related programs required at the workplace. Through this study, school administrators are going to be acquainted with the numerous roles they should play to make the teaching and learning of Mathematics to Ordinary Level learners successful, among these: provision of adequate data bundles, procuring ICT gadgets and offering remuneration packages for teachers. The curriculum developers may also benefit from this study, as they shall make use of the recommendations to be suggested by the researcher to include contemporary methodologies (e.g. online learning) when designing syllabi for Ordinary Level Mathematics.

1.7 Delimitations of the study

The study was carried out in Zvishavane District found in Midlands Province. It was carried out on four secondary schools in Mazvihwa cluster. Also the study focused on Mathematics and not other subjects. The study focused on the barriers and possible solutions on using online teaching platforms with O level learners.

1.8 Limitations of the study

According to the researcher, the study was limited in terms of the participants and sample size. These limitations existed because of the timing of the shift of mode instructions in schools (Yarkoni, 2019). There were few students managed to access online learning when the research was conducted. Thus, the findings of the study may not be widely applicable beyond this population. Despite these limitations, this research provides challenges and solutions faced in an online learning environment. The realities discovered in this research cannot be denied and deserves the attention of mathematics teachers.

1.9 Definition of Terms

Challenges – a condition that makes it difficult to perform a particular task. In this study, challenges will refer to hindrances associated with the use of online learning in the teaching and learning of Mathematics during Covid-19.(Buckle,J.L, 2008)

Mathematics– the study of past events, particularly in human affairs.

Ordinary Level – the level of education in the Zimbabwean education system spanning from form three to form four (Hilderbrand 1990).

Secondary school – a learning institution in Zimbabwe that enrolls learners from Form 1 to Form 6 level (Hilderbrand 1990).

Learners – learners attending secondary school

Teaching and learning – Morrison (1998) defines learning as a permanent change in behavior which is a result of practice and experience. Therefore teaching and learning is the kind of things teachers do in an effort to help learners acquire particular subject matter

E learning –the use of technology, primarily the internet, to deliver educational content and facilitate learning outside of the traditional classroom settings.

1.10 SUMMARY

The researcher was motivated to research about the challenges and solutions of teaching and learning mathematics online in secondary education. The chapter gives an outline of the questions which will be answered towards the objectives and the end of research study. The

chapter paves way for the following chapter. The next chapter dealt with related literature review.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

Information and communications technology (ICT) advancement in the twenty-first century has influenced society, particularly education, not just in Zimbabwe but also globally. The promotion of distance learning via ICT in educational institutions changes the entire pedagogical component. Online learning has become increasingly accessible due to a variety of socioeconomic and educational factors, which has compelled many institutions to adopt virtual learning techniques. A few of them include increased stakeholder collaboration and cooperation, better information access, pedagogical advancements using visual aids, virtual environments, and simulations, cheaper online learning where teachers can reach many students virtually, synchronous learning, and improved ICT infrastructure (Shahzad et al., 2020). Based on factors including time flexibility, cost effectiveness, ability to adapt to certain domains, reusability, and ability to be adjusted, both teachers and students can choose the best app for their needs (Gustavsson et al., 2020).

However, schools that desire to incorporate ICT infrastructure into their educational systems face considerable difficulties due to a lack of time and funding. The purpose of this component of the research is to review previous studies about the implementation of online learning in schools in order to lay the groundwork for a discussion of the issues raised during interviews with study participants. To demonstrate the necessity and applicability of the current study, other implementation-related theories will also be taken into account.

2.1 Online teaching and learning.

Online teaching and learning refers to the use of digital technologies and internet to deliver educational content, facilitate instructional interactions and support the acquisition of knowledge and skills in a virtual environment. It involves the usage of various online platforms, tools, and resources to conduct educational activities such as lectures, discussions, assignments, assessments and collaborative projects. It has become increasingly popular in recent years especially with the advancement of technology and a widespread availability of internet access. It offers several advantages including flexibility in terms of time and location, access to widw range of educational resources among students and facilitators, (Moore, M,G& Kearsley, G 2011).

According to Dhawan (2020), online learning is the capability for students to use devices that are connected to a network, providing them the opportunity to learn whenever, from wherever, and using whatever technique they choose. In another study, Singh and Thurman (2019) defined online learning as "learning experiences in synchronous or asynchronous contexts using different devices" (e.g., mobile phones, laptops, etc.). In these environments, students are free to learn and engage with teachers and other students wherever they choose (independently).

According to Stewart et al. (2021) in their study of open educational resources and open content, a thorough online learning for both the synchronous and asynchronous communication modes ensures that the adopted method is suitable for all learners. Chatting strategies like messaging and bulletin boards increase synchronous teacher-learner and learner-learner communication. On the other hand, using less time-sensitive channels like emails to conduct asynchronous communication improves it. A school must be able to get over access-related obstacles like electricity, internet connectivity, and redundant infrastructure in order to come up with the best strategy (Laskaris et al., 2017).

2.1.1 The Extent to Which Online Learning Is Applicable In Teaching and Learning

2.1.1.1 Learning through WhatsApp Groups

Online learning encompasses learning through the use of internet services and social platforms such as WhatsApp groups. A study by Duraku and Hoxha (2020) indicates that due to the emergence of the COVID-19 pandemic, online learning platforms such as WhatsApp have become common ways through which teachers can reach out their learners. In Zimbabwe, the use of WhatsApp has been mainly for social ol communication but with the need to adopt online learning, the WhatsApp facility has now been instrumental for facilitating the teaching and learning process. According to Zanamwe, Rupere and Kufandirimbwa (2013), teachers in Zimbabwe have considered WhatsApp groups as one of the best means to transmit knowledge and skills to their myriad of learners across the country, due to its cheaply nature and easy accessibility even by marginalized communities.

2.1.1.2 Learning via Broadcasted Online Learning

Despite the onset of the COVID-19 contagion, the use of broadcasted media in the form of radios and televisions has been prevalent in Zimbabwe for long. According to Lee (2016), the use of televisions and radios to relay educative material to learners has been in practice since time immemorial, although challenges associated with this teaching and learning strategy are rampant, among them: lack of televisions and radios, inconsistent bandwidths as well as difficulties in assessing content leant via broadcasted media. Similarly, Sengere (2018) contends that in Zimbabwe, state radio stations and state newspapers have been very instrumental tools used by the Ministry of Primary and Secondary Education to occupy learners during lockdown induced by the deadly COVID-10 plague. Zimuto (2013) submits that, while televised lessons, or those broadcasted via radio are useful for learners, sometimes they are not consistent with the requirements of actual classroom learning

2.1.1.3 Learning through Emails, Facebook, Instagram and other social Platforms

Apart from WhatsApp groups and broadcasted ONLINE LEARNING, trending on Facebook and Instagram, as well as emailing are some of the social platforms used by contemporary teachers to deliver subject matter and get immediate feedback from their multitude learners. The sentiments opined by Matthews (2016) indicate that the Facebook pages formerly meant for social chatting and mass communication have of late been turned into an educational platform through which invaluable educative material can be transmitted. In the same vein, Rehman and Ali (2021)

observe in Pakistan that the COVID-19 pandemic has ushered in new methodologies andteachers are using emails, Twitter, WhatsApp and other online learning applications to send assignments to learners, and get feedback via the same method. Nonetheless, the dear nature of accessing the internet and procuring gadgets that are internetfriendly is an inhibition factor in other marginalized communities like rural areas.

2.1.2 Mathematics learning

Mathematics learning refers to the process of acquiring knowledge, understanding, and skills related to mathematical concepts, procedures, and problem-solving strategies. It involves the development of mathematical thinking, reasoning, and proficiency in various mathematical domains. It also encompasses a wide range of topics, including numbers and operations, algebra, geometry, measurement, statistics, and probability. It involves understanding mathematical principles, relationships, patterns, and structures. Students learn to apply mathematical concepts to solve real-world problems, make connections between different mathematical ideas, and communicate mathematical ideas effectively, (Julia Anghileri,2006)

Mathematics learning often involves a combination of conceptual understanding and procedural fluency where conceptual understanding focuses on developing a deep understanding of mathematical concepts, their properties, and the underlying relationships between them. Procedural fluency involves acquiring the skills and techniques to perform mathematical operations accurately and efficiently.

Effective mathematics learning involves active student engagement through hands-on activities, problem-solving tasks, mathematical investigations, and collaborative discussions. It emphasizes the development of critical thinking skills, logical reasoning, and mathematical communication. Technology tools and manipulative can also enhance mathematics learning by providing visual representations, simulations, and interactive experiences. Mathematics learning is not limited to rote memorization or following prescribed algorithms. It emphasizes the development of mathematical thinking and problem-solving skills, fostering creativity and flexibility in

approaching mathematical challenges. It encourages students to make conjectures, explore multiple solution strategies, and engage in mathematical reasoning and justification.

In summary, mathematics learning encompasses the acquisition of mathematical knowledge, skills, and problem-solving abilities. It emphasizes conceptual understanding, procedural fluency, critical thinking, and mathematical communication, preparing students to apply mathematics in various contexts and become mathematically literate individuals.

2.1.3 Challenges of using online instruction.

2.1.3.1 Lack of Technical Expertise on the Part of Teachers and Learners

The teachers and learners at the midst of implementing online learning as a teaching and learning approach also lack the technical expertise expected of them to fully implement the process. Chiridza, Yorodani, Sigauke and Katsaruware (2016) submit that the Zimbabwean situation is pathetic in terms of implementing any form of computer-based instruction due to limited technical know-how on the part of both classroom practitioners and learners. Supporting the same sentiments is Tsvere et al. (2013), who insists that most Zimbabweans are used to using online learning as a form of social chatting not as a teaching and learning method. This means that there is need for orientation regarding the use of online learning as a teaching and learning method, especially in areas like Mathematics where hand-outs with assignments questions can be sent via WhatsApp. The onset of the COVID-19 pandemic did not accord adequate time for teachers and learners to be adequately acquainted with the use of online learning to facilitate teaching and learning.

2.1.3.2 It is an Expensive Method

Despite its numerous merits, online learning as a form of teaching and learning is very expensive considering the nature of resources required by those who intend to rope it in teaching and learning. According to Gurcan (2015), online learning as a method of teaching and learning is like any other form of virtual learning that calls for additional resources to make it a viable approach. A study carried out by Lila (2019) indicates that the Albanian government if finding it an uphill battle to implement virtual learning platforms such as online learning due to the

additional demands in resources required by the method. The additional resources required in the effective use of online learning as a teaching and learning method include: internet connectivity, ICT gadgets consistent with the internet, electricity, infrastructure as well as personnel to implement the teaching and learning process.

2.1.3.3 It Heavily Relies on Internet Connectivity

The use of the internet during online learning communication should not be underestimated when teachers and learners intend to reap positive results. A study carried in Zimbabwe by Museka and Taringa (2019) and Karombo (2017) indicated that some of the marginalized communities in rural areas could not make use of online methods of teaching and learning owing to poor internet connectivity. Almost the entirety of all online learning platforms relies on internet bandwidths, which have to be strong if online learning communication can materialize. For example, if lessons are broadcasted via television and national radio, the failure at any moment for learners to access internet bandwidths may result in loss of learning time as it is difficult to retrieve a lost lesson. Another study by Tsvere, Swammy and Nyaruwata (2013) in Zimbabwe's revealed that it was indeed an uphill battle for people in the area to access proper internet connectivity.

2.1.3.4 It Can Promote Acquisition of Unscrupulous Behavior

In another dimension, the nature of both pupil-pupil and teacher-pupil interaction characteristic with online learning may also be abused by all the parties involved, consequently leading to unwanted behavior. In a study by Selwyn (2012), online learning can be a conduit through which learners may form dangerous relationships that can lead to unwanted behavior. Since online learning encompasses use of smart phones and other ICT itinerary, there are vast opportunities that the use of the online learning may encourage learners to meet and interact with people of varied intentions, endangering them consequentially. In the Zimbabwean context, Ncube, Dhlamini and Muchemwa (2015) observe that cases of 'improper association' are on the rise due to the increase in technological gadgets and the unlimited interaction they regularly carry out on online learning. Again, continuous exposure to online learning platforms has also exposed

learners to unwanted materials in the form of pornography and violent movies, which the learners inappropriately apply in their daily lives.

2.1.3.5 It May not Suit all Types of Learners

In another observation by an educationist based in South Africa, the onset of COVID-19 has forced education systems across the globe to adopt online ways of teaching and learning but most of them have not managed to address individual differences (Briwash, 2011; El-Badawy and Hashem, 2015). The use of televised or radio broadcasts serves to occupy all learners in a particular education level and give them something to do, but this method does not look at previously acquired skills, the learners' ability levels as well as the nature of help these learners may get in their homes. Baruah (2012) also argues that while lessons broadcasted via television or radio may be useful in other instances but its major drawback is that it overlooksother considerations like: available of these gadgets in the home, learners' maturity level as well as the availability of personnel to help learners at home.

2.1.3.6 It is Difficult to Carry out Effective Assessment Online

Another challenge that comes along with teaching and learning via online learning is the nature of assessment that can be carried out when online learning is being used as a teaching and learning method. According to the sentiments opined by Faizi et al. (2013), the use of televised or broadcasted ways of teaching and learning make it difficult for learners to get appropriate assessment. Although the presenters may issue tasks to be attempted tasks, it will still resound a daunting task for the learners to be adequately assessed. Similarly, Lee (2016) postulates that the much hyped nationally broadcasted lessons have faced a major challenge that learners are not properly given feedback and some of the learners do engage in cheating escapades just to assert providers of ICT itinerary. Yin (2016) recommends that parents of guardians be directly involved in the monitoring and supervision of the learners lest the latter may mislead the former in terms of what is reaped from online learning platforms.

CHAPTER THREE

RESEARCH METHODOLOGY

INTRODUCTION

The chapter explains the research methods used in data collection, analysis and presentation of data. Interviews, questionnaires and observations will be used to collect primary data whilst secondary data was obtained through case studies and reports. Quantitative analysis will be used to understand the frequencies, averages, correlation, chi square and qualitative data from interviews and secondary data was used to expand and explain the quantitative data.

3.1 Research Design.

This involve many interrelated and connected decisions involved to get reassured information to answer the research question (Aaker A et al 2000 Market Research). Both quantitative and qualitative will be used. Questionnaires (structured and non-structured) and interviews were used to get the challenges faced on the implementation of eLearning on studying mathematics at the area of study.This shows that the study will use mixed research design to try and gather all the relevant data needed to successfully answer the research question.

3.2. Population and sampling

A population is the total number of units from which data can be collected. According to Burns and Groove (2003:213), a population encompasses ‘‘all the elements that meet the criteria for inclusion in a study.’’ A population can also be defined as a group of individuals or items which share one or more characteristics, and from which data can be collected and presented for analysis. The researcher worked with teachers and Ordinary Level learners found in four selected secondary schools in Mazvihwa Cluster in Zvishavane District. Zvishavane District has 43 secondary schools, but due to time and monetary imbalances, the researcher targeted teachers and learners from four schools found in one cluster. The secondary schools are: Chinembeure,Zeruvi, Chivizina and Rubweruchena. Thus, the population for this study involved Ordinary Level Mathematics teachers and learners was selected from four secondary schools in Mazvihwa Zone of Zvishavane District. Due to the size of this population, the researcher intended to work on a small sample as detailed below. A number of students and teachers was used to fill in the questionnaires and return them after they have completed.

3.4 Sample and Sampling Procedure

Sampling is a process of selecting a group of people, events, or behavior with which to conduct a study. Polit (2021:239) defines a sample as ‘‘a proportion of the population.’’ Thus, a sample should be a subset of the entire population. According to O’Leary (2019), sampling is a systematic process, often strategic and mathematical, which involves using the most practical procedures possible for gathering a sample that can best represent a larger population. The researcher worked with teachers and learners in Zvishavane District. The researcher used purposive – selecting a sample basing on a certain characteristic - and random sampling – free and irregular selection - to come out with the require sample. Random sampling was preferred by the researcher as all the participants stand an equal chance of being selected for the study without much bias (Leedy, 2019).

3.5 Questionnaires

Creswell (2013) defines a questionnaire as a document containing questions designed to solicit information appropriate for data analysis. Popper (2019) also objectifies that questionnaires are contain questions related to the research’s sub-problems, and are mainly purported to collect

information that is useful in satisfying research objectives gathered. Moreover, questionnaires enable the researcher to collect data from respondents who may be far away through posting or mailing (Leedey, 2019). They are designed to align with the research goals and ensure data collected will be relevant and useful.

Researchers select a representative sample of target population to participate in the questionnaires. The findings from the questionnaires are interpreted and used to draw conclusions about the research objectives. The questionnaires in this research are open ended.

3.6 Observations

Sweetman et al. (2010) define an observation as a systematic data collection approach, in which researchers use multiple senses to examine respondents in natural settings.

3.7 Interviews

Perienen (2020) defined an interview as a purposeful discussion between two or more people. In this method the researcher follows a constant procedure and seeks answers to a set of pre designed questions through personal interviews. The purpose of research interviews is to see the sights of the views experience beliefs and motivations of individual on defined issues. The results of interviews depend on the style in which an interviewer phrases questions when conducting the interview. According to Hillmayr et al. (2020), interviews can be structured and unstructured. The interviews will be done at four different schools where the sample elements will be selected. Each teacher in the sample set will be asked individually. The researcher is to make sure that there is no one else in the room except the interviewee to avoid communication barriers or any other interruptions that may arise. The participants will be encouraged to express their views in detail about the problems they experienced, and their suggested solutions when teaching and learning of mathematics using online platforms.

3.8 Data Analysis

Data analysis is the process of inspecting, cleaning, transforming and modelling data ton uncover meaningful patterns, extract insights and make informed decisions,(Wickham,H, 2016). Tables were used to give the visual representation of the responses from questionnaires. Qualitative

data from interviews, observations and secondary data will be used to support the quantitative data.

3.9 Ethical Consideration

In an effort to stand by ethics, the researcher assure participants confidentiality and participants kept anonymity. The research also ensures consent and self-determination. Ethics are defined by Bell (2018) as acceptable standards governing research conduct and influence the welfare of human being. Confidentiality was also assured that questions were answered freely without fear of victimization. Basically researcher assured participants of their rights to privacy, right to anonymity right of fairness and right of informed consent.

3.10 SUMMARY

This chapter examines the methods and techniques that will be used by the researcher to gather data for this study. The researcher is to employ the descriptive survey research design in which questionnaires, oral interviews and participatory observations will be used to collect data for the study. The chapter discusses the merits and demerits of the research design and research tools used, and techniques adopted to lessen the challenges they pose. The study's population, sample, sampling procedures, as well as ethical issues prioritized were also analyzed in this chapter.

CHAPTER 4

4.0 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presented the findings of challenges of teaching and learning mathematics using online learning platforms. The findings are based on the interpretation and analysis of the data obtained through questionnaires and interviews. Descriptive statistics results in relation to the objectives of the research are laid out in this chapter.

4.2 Response rate:

4.2.1 Questionnaire response rate

There was a 100% response rate, implying that all the teachers who were given the questionnaires completed and returned them. The researcher attributes the high response rate to the nature of jobs of the teacher respondents, who have to be always at their schools. Again the researcher noted that self-administering questionnaires was an effective approach in enhancing high response rates. Creswell (2014) advises researchers to self-administer questionnaires so as to reduce burden of submission on the respondents. Moreover, the teachers recorded a 100% response rate since they were assured that the study would come with benefits for participants.

4.3 Demographic information of Teachers

4.3.1 Gender of Teachers

From the sample the researcher worked with 30% female and 70% male teachers. This means that of the 10 respondents, only 3 were females and 7 were males. This also follows that the researcher gathered sentiments of both male and female in teachers in this study. The researcher observed that more male than female teachers partook of the study since male teachers tend to dominate the secondary school setting, particularly in Mathematics. Thus, the evidence reveals that in Zimbabwean secondary schools, there are more male teachers than their female counterparts.

4.3.2 Ages of Teachers

Table 4.1

Age	**Male**	**Female**
x<30	1`	1

$30<x\leq40$	**4**	**1**
$40<x\leq50$	**1**	**1**
$x>50$	**1**	**0**

Table 4.1 above shows that the researcher worked with 2 teachers less than 30 years, 5 teachers between 30 and 40 years, 2 teachers between 40 and 50 years and only 1 teacher above 50 years of age. From table 4.3, it is also clearly shown that majority of the teachers are between 30 and 40 years, followed by between 40 and 50 years, an indication that the more elderly age groups were engaged in the teaching profession. The data also means that the researcher worked with respondents of varying ages, and each age group stood an opportunity to air out views concerning the challenges and opportunities available for Ordinary Level Mathematics teachers who intend to use online learning in teaching and learning. Thus, the varying age groups helped to add validity and reliability to the researcher's findings. The data displayed in table 4.3 above also reflects that the majority of Mathematics teachers in secondary schools are middle-aged, a situation that accords those vast opportunities to use online learning in teaching and learning.

4.3.3 Teachers' Highest Level of Educational Qualifications

Table 4.2

Qualifications	**Male**	**Female**
Certificate	1	0
Diploma	3	2
Degree	3	1

Table 4.2 indicates that of the sampled Mathematics teachers, 1 teacher had a Certificate in Education, 5 teachers had Diplomas in Education and 4 teachers had Degrees in Education. Though the study was not mainly concerned with the nature of the qualifications, it was worthwhile to note that all the teachers were properly qualified to discharge their duties in the teaching and learning of Mathematics. The above data does not only signify that the respondents were able to respond to the questionnaires, but it also signifies that there was a high likelihood of gathering authentic data on the opportunities and challenges facing Ordinary level Mathematics teachers when using online learning as a method of teaching and learning. The same data also reveals that the secondary schools in Zimbabwe are taught by properly qualified teachers.

4.4 Questionnaire responses

4.4.1 How long have you been using online teaching platforms for mathematics instruction?

Table 4.3

Teachers	Number of years	Gender
A	**1**	**F**
B	**2**	**M**
C	**3**	**M**

D	**4**	**M**
E	**5**	**M**
F	**3**	**F**
G	**2**	**F**
H	**1**	**M**
I	**3**	**M**
J	**3**	**M**

From table 4.3 it is evident that all teachers are making use of online teaching platforms for mathematics instruction. From the results of the table it indicates that many teachers have been using online teaching platforms for 3 years which is an indication of change of lesson delivery due to the COVID-19 pandemic. It also shows that male teachers use online teaching platforms more than the female teachers hence there is a correlation between gender and use of online teaching platforms instruction. More so, those with degrees are more flexible to use online teaching platforms. There is also a relationship between age and the use of online teaching platforms, it is those within the 30 to 40 years who uses online teaching platforms more often.

4.4.2 What are the main online teaching platforms you have used for teaching mathematics?

The teachers' responses strongly agreed that WhatsApp audios (80%) and radio broadcasts (60%) were the commonly used forms of teaching and learning online learning platforms. While 20% of the participants disagreed that learners can receive learning material through WhatsApp audios and radio broadcasts, the above data implies that the majority of teachers are of the opinion that it is very possible for learners to get into learning through the use of WhatsApp groups and listening to lessons presented via the radio. These sentiments reflect the findings of Duraku and Hoxha (2020) and Chick (2020), who respectively indicated that WhatsApp groups

and radio broadcasts are now the most recommended teaching and learning online learning platforms in teaching and learning of Mathematics at Ordinary level. However, these sentiments oppose Zanamwe et al. (2013), who observe that while teachers strongly agreed to the use of WhatsApp and radio broadcasts, they were not accessible to many due to the expensive nature of gadgets required.

In addition, the teacher respondents disagreed that television broadcasts were essential in delivering lessons, while other teachers also strongly disagreed that learners could access learning materials via newspapers and through the use of online sources like Twitter handles, Facebook or You-Tube. This data indicates that the teachers felt that television broadcasts were not feasible for use in the Zimbabwean scenario, as their use was affected by many external factors. These findings are akin to the ideas of Rehman and Ali (2021) who acknowledge that it was an uphill battle for developing countries like Zimbabwe to adopt use of televised learning as their countries have challenges with electricity availability, bandwidth connectivity as well as limited resources. These results imply that although other developed countries were benefitting tremendously from televised online learning to facilitate learning; this was not directly feasible for the Zimbabwean situation. In the same vein, the sentiments by the teachers that it was not possible for secondary school learners to use online learning platforms and newspapers consolidate the assertions of Chick (2020), who claims that virtual learning and use of newspaper articles were not effective teaching and learning techniques in marginalized communities devoid of gadgets, internet connectivity and a supportive environment. This implies that, teachers underscored the importance of virtual learning via online learning platforms, but they deemed them inappropriate in the context of rural and underdeveloped communities like those found in Zimbabwe. Nonetheless, 10% of the teachers agreed that newspapers and online methods could be used to send teaching and learning materials to learners, indicating that it is a matter of resource availability.

4.4.3 What are some specific challenges you have encountered when using online teaching platforms for mathematics instruction?

4.4.3.1 Internet connection.

All the participants agreed that poor or lack of internet connection is a huge challenge for the implementation of mathematics online education in secondary schools. One thing that seemed to disturb participants the most was poor quality of the internet lines even in big cities. Lack of the Internet and the poor quality of the Internet is one of the main problems, especially in our country. The Internet exists but is not divided equally everywhere. Internet is somewhat good in the cities, but in the countryside, the internet line is very bad or doesn't have, leading to the lack of online education in the rural areas. The study concurs with Kibuku (2020), according to Kibuku (2020), some students have not been able to have internet access due to poor financial conditions. Poor quality internet or a lack of it thereof, has immense negative impact on the implementation of mathematics online learning according to Budur (2020). The most affected were those living in the rural areas which are remote where signals are weak and thus participating in class work was hard. Online sessions, therefore, were faced with interruptions because of the poor internet. From the definition of online learning as an internet-based learning (Rapantar et al., 2020; Dhawan, 2020; Singh & Thurman, 2019; Stewart et al., 2021), it means that a lack of a strong and/or stable connection to the internet is a major stumbling block with regard to online education.

4.4.3.2 Digital literacy

With the online education introduced in the region, some services became freely available for use of most institutions for example Wi-Fi. While there were no local platforms in place, the international ones such as Google Classroom and Zoom were easily accessible. Nonetheless, the participants said that it was still hard for learners and educators to educators to use the technological devices, affecting the whole process of integration of online teaching. OFCL7 et al, 2021 postulated that some teachers are unable to use the technological tolls, particularly those who are an old generation. From the research, the researcher found out that those above 40 years are resistant to change hence failure to use the technological devices. All these findings revert back to the perception of usefulness from students and teachers. To be ready for implementation,

teachers and students should show commitment and positive attitude towards online learning systems (Martin et al, 2020).

4.4.3.3. Lack of teachers' experience in managing online classes and evaluating students.

The participants noted that considerable number of educators could not control online classes and did not know how to carry out the evaluation process. Of course some teachers had no experience and had an impact on the process and students. Because online learning was new and no preparations, plans, courses, workshops had been done, and teaching staff only had experts in classical classes. Therefore, it certainly had an impact on the performance of the course and the way students were controlled. Semma et al, (2020) agreed to the fact that some teachers lack enough experience in using digital technology which makes it hard for them to organize learning materials. Looking at instructional delivery in this context, it can be stated that teachers with vast knowledge on the usage of digital technology will have more motivation teaching online than their counterparts with less or no prior experience.

4.4.4 What mechanism can be implemented to improve the use of online teaching?

Respondents indicated that there was need to closely monitor learners during online learning virtual lesson sessions and teachers need adequate remuneration to engage in online teaching and learning of Mathematics. These reflections imply that teachers feared that learners who are not monitored by their guardians or parents during ICT use may end up abusing the facility and teachers were also supposed to be adequately paid for services rendered during online lessons since they were more demanding than face-to-face lessons. The sentiments opined by the teacher respondents are akin to the ideas of Chiridza et al. (2016) and Tarisai and Manhibi (2017), who aver that if learners are not closely monitored during online learning teaching and learning, they may engage in cheating or other unscrupulous activities. The researcher however feels that since teachers are already on the government payroll even during lockdowns, they should not demand further remuneration when using online learning.

Again, 80% of the teachers agreed that it was the duty of schools to offer technical support to teachers to enable them to successfully engage in online learning teaching and learning approaches that can help in teaching and learning of Ordinary Level Mathematics. The

sentiments of the teachers were that online learning involves extra costs as in ICT gadgets, internet data bundles as well as other supportive accessories, and without technical support from schools, individual teachers could not initiate these from their own pockets. These sentiments go hand in glove with the findings of Duraku and Hoxha (2020), whose line of thinking is that if teachers are not given adequate itinerary for use in online learning lessons, especially during the COVID-19 era, the learners will not receive any learning material. The sentiments of teachers were that they should be provided with tools for managing their classes effectively including grading tools, analytic and communication features. Also, comprehensive teacher training supports to ensure they are equipped with necessary skills to effectively utilize online teaching platforms and create engaging mathematics lessons.

4.5 Analysis of Results from Interviews

4.5.1 The extent to which online learning is used in Teaching and Learning of Ordinary level Mathematics

The results obtained from the interviews indicated that learners had mixed feelings regarding the extent to which online learning can be a tool to facilitate the teaching and learning of Mathematics at Ordinary Level. Some of the learners were of the opinion that online platforms should be used for social interaction and not an instrument to aid teaching and learning since it had numerous complications. Of the learners, 60% indicated that they were eager to use online learning in teaching and learning but schools had no mechanisms put in place to support the cause. The learners indicated that they expected the schools to play a pivotal role in providing support to enable them to adopt online methods of learning. These sentiments resemble what Lila (2014) opines when he insists that there are many hindrances that make individuals negatively perceive use of online learning in teaching and learning.

4.5.2 The Merits of using online learning in teaching and Learning of Mathematics

The learners, in spite of them proclaiming that they do not have access to ICTs that promote the use of online learning to facilitate learning, indicated that they were aware of the listless

merits derived from using online learning platforms for teaching and learning. Seventy percent (70%) of the learners hinted that online learning was indispensable in teaching and learning of Mathematics as they acted as it: improved their interactive skills, allowed them to work at their own pace in the comfort of their homes. This finding is consistent with the assertions of Rehman and Ali (2021) who advocates for use of online learning in teaching and learning.

4.5.3Challenges Associated with Use of Online learning in Teaching and Learning of Ordinary Level Mathematics.

Furthermore, as regards the challenges they encounter in their respective schools, all the learners (100%) lamented that there was inconsistent electricity supply and erratic Wi-Fi services, 60 % argued that there were no computer laboratories and 90% indicated that there were inadequate ICT gadgets to enable them to fully implement online learning in teaching and learning of Ordinary level Mathematics. Though it was not able to prove, the researcher noted that some of these challenges were surmountable if parents of the learners were innovative enough to rope in online learning in teaching and learning. The challenges highlighted by learners were akin to what was found by Tunjera eta l. (2014), who noted that lack of electrical power and Wi-Fi services derailed the implementation of online learning platforms in teaching and learning to a greater extent. Again, Gon and Rawekar (2017) also emphasized that schools should build computer laboratories as a precursor to use of online learning platforms to facilitate the teaching and learning process.

The learners also insisted that they were facing a litany of other challenges that militated on their efforts to rope in online learning as a teaching and learning platform. The majority of the learners (80%) indicated that they were not exposed to ICT appliances both at home and at school, hence their high level of computer illiteracy. Though it was not necessary for learners to be computer literate to enable effective implementation of online learning in teaching and learning, the researcher noted that the presence of computers in the home or at school was a necessity to motivate the learners to have massive interest in school work. Again, the learners indicated that online learning is very expensive (80%), it is affected by internet bandwidths (70%) and that it was difficult for them to get valid and reliable assessment via online learning. The sentiments of the learners are congruous to the findings of Lee (2016) who avers that online learning is expensive and difficult to make assessment.

4.5.4 Ways of improving the use of online learning in teaching and learning of Ordinary level Mathematics.

As regards mechanisms to put in place to improve online learning teaching and learning, the learners indicated that they should be strictly monitored when they are using ICTs, as they came along with numerous shortcomings. This means that learners were aware and fearfulthat though computer technologies in online teaching and learning were beneficial to them, there was also a likelihood that they may engage in non-educative material that can hamper effective learning, especially if they work under no supervision. The researcher was fascinated by the learners' response as she realized that learners were also mindful that they could abuse ICTs if left unattended. This finding is analogous to the views of Chiridza et al. (2016), who hints that while use of ICTs in teaching and learning via online learning is instrumental, it requires meticulous attention and surveillance. Tarisai and Manhibi (2017) also recommends that whenever learners are using computers, they should be under the supervision of an older person, to dissuade them from accessing undesirable materials, in the form of pornography or nude pictures.

Moreover, the learners also indicated that since teachers were in low spirits, the government was supposed to look into teachers' remuneration packages to motivate them to be innovative. The learners indicated that teachers were facing widespread social and economic challenges that needed to be addressed before they could be tasked to engage in online learning using online learning approaches. These sentiments are parallel to ideas of Zimuto (2013) who argues that demotivated teachers are not innovative in terms of adopting newteaching and learning methodologies such as online learning. Again, the learners also felt that the government is supposed to weigh in with assistance to schools, since most of them are still operating without electricity and internet services. Tsvere et al. (2016) supports these sentiments by teachers, claiming most marginalized schools cannot do virtual learning.

4.6 Analysis of Results from Observations

4.6.1 Participation of Teachers on WhatsApp Groups during online learning Teaching

The researcher was able to observe the extent to which online learning was used in teaching and learning of Mathematics at Ordinary level, especially the level of participation of teachers on

online learning platforms and noticed that teachers were eager to help learners. Over 70% of the teachers were actively involved in the WhatsApp groups created to help learners with various aspects of acquiring content in Ordinary level Mathematics. This observation showed that teachers were really ready to help learners, especially on WhatsApp groups. The researcher could not ascertain the source of motivation for teachers' participation on WhatsApp forums, but suspected that teachers were also eager to benefit from each other's input as well as the need to ascertain the extent to which learners read in advance on some given work. The results obtained are not supportive of the propositions of Zanamwe et al. (2013), who feels that teachers are not comfortable with learning via online learning such that they may not participate with confidence.

4.6.2 Participation of Learners during WhatsApp Group Online learning

The researcher also observed that while teachers were actively involved on online learning platforms such as WhatsApp, only a few learners took part. The researcher observed that only close to 30% of the learners were directly involved. The researcher realized that the majority of learners had no smart phones and those they were using were their parents or guardians'. This was shown by the limited participation exhibited by the learners and the excuses given thereafter that the phone was not available for the learner to access it. This observation is akin to the findings of Sengere (2018) who avers that there is limited availability of ICT gadgets for use by learners was an inhibition factor to effective use online learning as a learning approach.

4.6.3 Availability of common infrastructure in the schools to facilitate online learning in Mathematics

In the four sampled schools, only two (50%) had computer laboratories which were used to facilitate the teaching and learning process using online learning. The researcher also noted that two other schools had no computer laboratories, libraries, as well as subject base rooms to use for the upkeep of ICT gadgets. Most ICT gadgets at the schools devoid of ICT infrastructure were either kept in the school classrooms, the schools' storerooms or the Senior Master's office. It was also observed that no computers were kept in the Head of Departments' offices in all the sampled schools. Conclusively, the researcher noted that there was inadequate infrastructure to safeguard existing ICT resources. This assertion indicated that all the sampled schools had inadequate infrastructure, in tandem with the sentiments of Gon and Rawekar (2017) and Chick

(2020) who hint that infrastructural deficiencies are an inhibition factor for the upkeep of ICTs in many schools.

4.6.4 Availability of ICT gadgets in the sampled schools to ascertain feasibility of online learning teaching and learning

The researcher noted that there were a lot of countless ICTs in the sampled schools but they were not put to good use by concerned teachers. For example, it emerged that the computer laboratories were available at two of the sampled schools, but computers were not allowable to use for online teaching and learning of other subjects, save for Computer Science. Moreover, the researcher established that all the sampled schools had laptops donated by political figures in the area, well-wishers and the late President R. G. Mugabe, but they were mainly used for administrative and clerical purposes. Sengere (2018) notes that it is not only the availability of ICTs in a school which matters, but also the accessibility of the materials to the end users - teachers and learners.

4.6.5 Availability of electricity and internet services in the sampled schools

From observations made at the sampled schools, the researcher noted that there are inconsistent power supplies. Like other areas, the schools were affected by load shedding, and there were no back-up generators, hence no continuous power supplies. Similarly, there were no internet (Wi-Fi) connections at all the sampled schools, as seen by no learners browsing through various websites in the computer laboratory. Even the researcher witnessed that both power supplies and internet services are never available, and the teachers and learners could not access the facilities at their own convenience. This information means that there are no opportunities for teachers and learners to use online learning in facilitating the teaching and learning of Mathematics at Ordinary Level. Karombo (2017) posit that the unavailability of internet and electrical power is detrimental to the use of online learning methods in teaching and learning.

4.7 SUMMARY

The conclusions of this study were revealed based on the factual conditions experienced by mathematics teachers and students. The difficulties felt by the teachers and students were explored in more detail so that they could enrich the information and knowledge that had also

been obtained previously. These difficulties can be caused by the five factors that have been described, so for future improvement, it is necessary to pay attention to these factors. Besides, the difficulties can be minimized by paying attention to suggestions and conditions to achieve optimal results of online learning. The next chapter dealt with summary, recommendations and conclusions.

CHAPTER FIVE

SUMMARY RECCOMENDATIONS AND CONCLUSION.

5.0 Introduction

This chapter provided a summary of the research findings and also offers some research solutions to make teaching and learning of Mathematics using online platforms effective. The chapter also offers a scope for future studies.

5.1 SUMMARY

This study was carried out in four secondary schools Zvishavane District. The main purpose of undertaking this study was to ascertain the challenges facing teachers in implementing online teaching and learning of mathematics at ordinary level. The main objectives of the study were to examine barriers teachers view as significant to e-learning and to provide possible mitigation measures to challenges to online learning.

The literature review section established the extent to which online learning is used and applicable in the teaching and learning of mathematics, the merits from use of online learning, and the challenges scuttling the effective use of online learning. Finally the sentiments of earlier researchers on what is being done in other countries as a way of implementing online teaching and learning.

The study adopted a descriptive survey research design and a mixed approach research paradigm that was both quantitative and qualitative in nature. The researcher used questionnaires, interviews as well as observations to gather evidence for this study. These were administered to teachers because the research focused on teachers' conceptions on online teaching. The researcher worked with a sample of 10 teachers selected from random schools.

5.2 CONCLUSION

5.2.1 Barriers to online teaching and learning implementation.

As regards factors that militated on the teaching and learning of mathematics through online learning , it was established that availability of ICT resources on both teachers and learners, poor internet connectivity as well as erratic availability of electricity are chief negative factors impacting on the teachers' efforts to integrate online learning. This implies that respondents felt that online learning platforms were beyond the reach of many intended users .

Nevertheless teachers refuted that they technical expertise to implement online learning. The educators argued that although they were having challenges with use of various ICT gadgets to initiate teaching and learning of mathematics via online learning, they would soon gather confidence and end up adjusting to international standards. The researcher concluded that with adequate support, teachers were ready to implement online teaching and learning in mathematics.

5.3 RECOMMENDATIONS

In the light of the findings of this research and in order to improve the quality of teaching and learning, the following recommendations were brought forward:

- The study should be carried on many schools to enable gathering of data from a remarkable population that can allow for generalization of findings.
- Schools should offer technical to teachers in terms of ICT gadgets and internet bundles to ease the process of virtual learning.
- The Zimbabwean government should also be on the ground with tangible assistance when recommending the implementation of online lessons, not heaping much of the burden on schools and the parent community.
- Parents of secondary school learners should be closer to their children to enable monitoring and evaluation during virtual learning.

5.3.1. Coordination and Communication

By building good coordination and communication among teachers, homeroom teachers, students, and parents so students can be well controlled to participate in online learning.

5.3.2. Training

Schools should train teachers on how to use zoom, teams, team viewer so as to do smooth flow online discussion and teaching. Also providing training to teachers about the procedures or technical preparation of the learning media and practical assessment procedures during online learning. The training can be initiated by the school, government, or in collaboration with certain institutions. Improve the quality of teachers through self-taught learning, or attending seminars / workshops that provide knowledge to maximize online learning.

5.3.3. Internet

Providing adequate facilities for teachers and students especially the Internet, is very important in supporting online learning. The schools should take the Telone facility of providing internet to schools as they install at low cost.

5.3.4. Online Learning Media/Platforms

Promote the use of online learning media/platforms that support direct communication or two-way interaction so that learning can be more communicative and meaningful. Providing alternative methods and learning media that are varied and interactive to attract students' interest in online learning. Teachers and students should use Teams, Team Viewer, Zoom and other facilities which allows group interaction so as to do face to face interaction from different vicinities. Since all learning activities were carried out online, the teacher must understand and find an online instruction model suitable for the students' condition and the taught topics.

5.3.5. Evaluations

The government and schools conduct periodic evaluations of the merits and obstacles in online learning so that the problems can be directly addressed. Schools should have negotiated with network providers to install network boosters nearer to them. Furthermore, teachers need to understand appropriate learning scenarios for individual, group, and community learning. Some instructional methods selected to implement online learning included lecturing, case studies, debates, discussions, student-led discovery, experiential learning, educational games or competition, brainstorming, and drill and practice.

5.3.6. Government Assistance

Schools should apply for government assistance with the provision of computers for students to use at school lab when they are unable to acquire the required gadgets for themselves.

REFERENCES

Arias, Omar, David K. Evans, and Indhira Santos. 2019. *The Skills Balancing Act in Sub-Sahara*

Aboagye, E., Yawson, J. A., & Appiah, K. N. (2021). COVID-19 and E-Learning: The Challenges of Students in Tertiary Institutions. Social Education Research, 1–8. https://doi.org/10.37256/ser.212021422

Adarkwah, M. A. (2021). "I'm not against online teaching, but what about us?": ICT in Ghana post Covid-19. Education and Information Technologies, 26(2), 1665-1685.

Akkara, S., & Mallampalli, M. S. (2020, October). Online Teaching and Learning in India During Lockdown and Its Impact on Teaching Practices. In International Conference on Interactive Collaborative and Blended Learning (pp. 151-158).

Blanche, M., Durrheim, K. and Painter, D. (2017) Research in Practice: Applied Methods for Social Sciences. 2nd Edition, UCT Press, Cape Town.

Brende, B. (2015). Why education is the key to development. World Economic Forum.

Bryman, A. (2008). *Analysing Qualitative Data.* London: Routledge.

Cassibba, R., Ferrarello, D., Mammana, M. F., Musso, P., Pennisi, M., & Taranto, E. (2020). Teaching mathematics at distance: A challenge for universities. Education Sciences, 11(1), 1-20. http://doi.org/10.3390/educsci11010001

Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crisis. Journal of Educational Technology Systems, 49(1), 5-22.

De Cuyper, W. & Pau Sole, G. (2020). *Zimbabwe Situation Report*. Retrieved from https://reports.unocha.org/en/country/zimbabwe/

Denzin, N. K., & Lincoln, Y. S. (2011*). The Sage Handbook of Qualitative Research*. New Delhi: Sage.

Ellis, R. (2017). "Field Guide to Learning Management Systems."

Faidhi, K.D. (2020). Electricity shortages made worse by pandemic, financial crisis. Retrieved from https://www.rudaw.net/english/kurdistan/170520202

Fedele, F., & Li, K. (2020). Reasoning and problem solving: An assessment on two general education courses. University of West Florida.

Fritz, A., Haase, V. G., & Rasanen, P. (Eds.). (2019). International handbook of mathematical learning difficulties. Springer.

Gergen, K. J., & Davis, K. E. (Eds.). (2017). The social construction of the person. Springer Science & Business Media

Hildebrandt, V. (1990) Management of Child Development Centres. New York: Merrill Publishing Company.

Huang, R., Liu, D., Tlili, A., Yang, J., & Wang, H. (2020). Handbook on facilitating flexible learning during educational disruption: The Chinese experience in maintaining undisrupted learning in COVID-19 outbreak. Smart Learning Institute of Beijing Normal University.

J. J. Joaquin, H. Biana, and M. A. Dacela, “The Philippine higher education sector in the time of COVID-19,” Frontiers in Education, 2020.

Jarvis, D. H (2020). Teaching mathematics teachers online: Strategies for navigating the interaction of andragogy technology and reform-based mathematics education (pp. 187-199).

Juliane, C., Arman, A. A., Sastramihardja, H. S., & Supriana, I. (2017). Digital teaching learning for digital native; Tantangan dan Peluang. Jurnal Ilmiah Rekayasa dan Manajemen Sistem Informasi, 3(2), 29-35.

Laskaris, D., Kalogiannakis, M., & Heretakis, E. (2017). 'Interactive evaluation'of an e-learning course within the context of blended education. International Journal of Technology Enhanced Learning,

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers’ adoption and integration of ICT in teaching/learning process. Educational Media International, 55(1), 79-105.

Mart, Ç.T. (2017). Student evaluations of teaching effectiveness in higher education. International Journal of Academic Research in Business and Social Sciences, 7(10), 57-61

Mehall, S. (2020). Purposeful Interpersonal Interaction in Online Learning: What Is It and How Is It Measured? Online Learning, 24(1), 182-204.

Mirzajani, H., Mahmud, R., Ayub, A. F. M., & Wong, S. L. (2016). Teachers’ acceptance of ICT and its integration in the classroom. Quality Assurance in Education.

Park, S. Y. (2020). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. Journal of Educational Technology & Society, 12(3), 150-162.

Perraton, H. D. (2021). Open and distance learning in the developing world. RoutledgeFalmer.

Pratiwi W. R. The Practice of Digital Learning (DLearning) in the Study from Home (SFH) Policy: Teachers' Perceptions. Journal of Southwest Jiaotong University, 2020, 55(4). https://doi.org/10.35741/issn.0258-2724.55.4.17

Quadri N. N., Muhammed A., Sanober S., Qureshi M. R. N., and Shah A. Barriers effecting successful implementation of e-learning in Saudi Arabian universities. International Journal of Emerging Technologies in Learning, 2017, 12(6): 94-100

Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. Computers & Education, 144, 103701.

Sandars, J. (2021). Cost-effective e-learning in medical education. In Cost effectiveness in medical education (pp. 40-47). CRC Press.

Shearer, R. L., Aldemir, T., Hitchcock, J., Resig, J., Driver, J., & Kohler, M. (2020). What students want: A vision of a future online learning experience grounded in distance education theory. American Journal of Distance Education, 34(1), 36-52.

Singh, V., & Thurman, A. (2019). How many ways can we define online learning? A systematic literature review of definitions of online learning

Stewart, Anissa R.; Harlow, Danielle B. & DeBacco, Kim (2021). "Students' experiences of synchronous learning in distributed environments". Distance Education. 32 (3): 357–381

UNICEF. (May 2020). Bringing learning to home through education television. Retrieved from https://www.unicef.org/mena/stories/bringing-learning-home-through-education- television

White R. (2016) Design, innovation and management, Norwick, Brazil
World Bank. (2020). How countries are using edtech (including online learning, radio, television, texting) to support access to remote learning during the COVID-19 pandemic

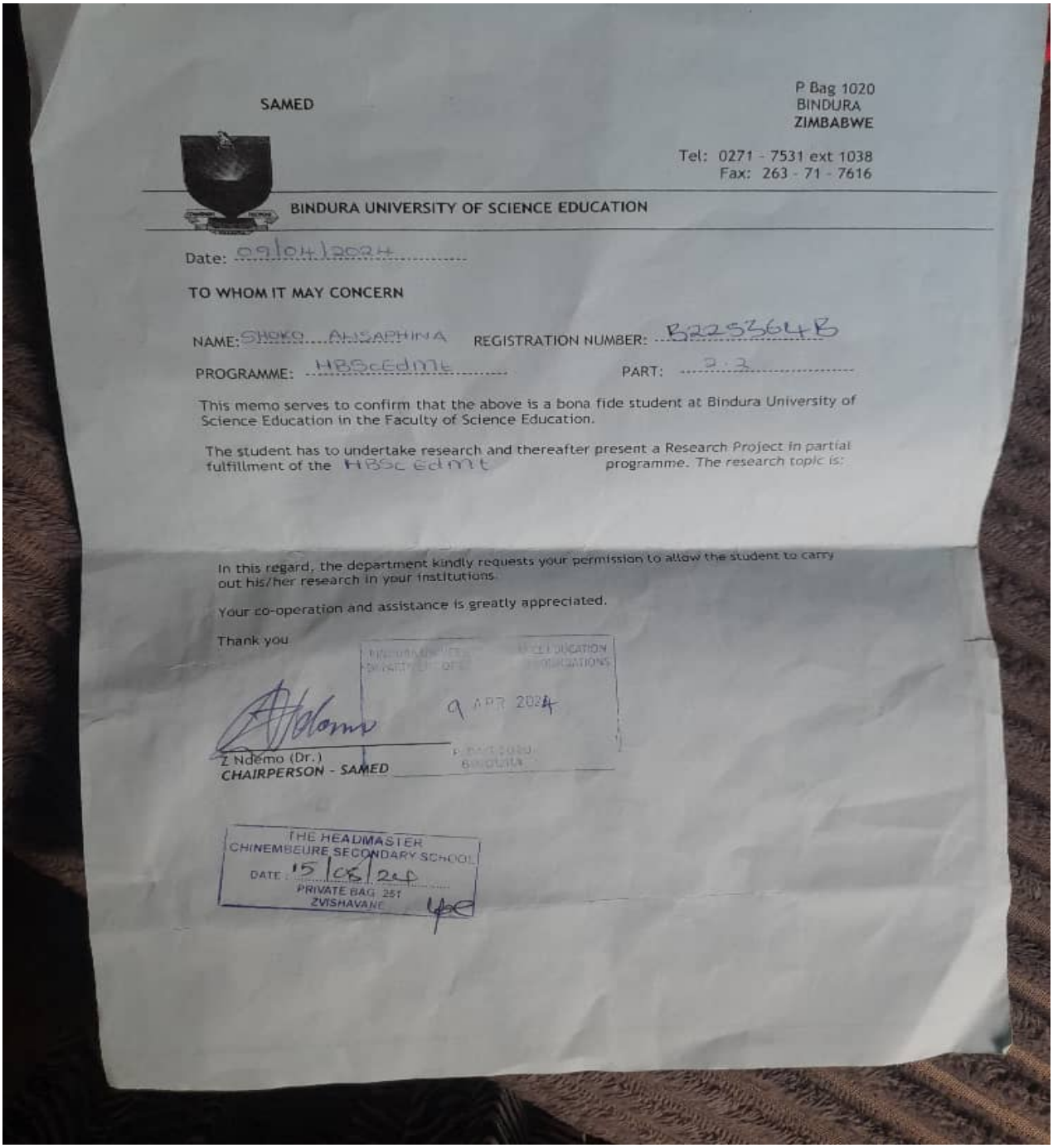
Y. D. Wang, “Building student trust in online learning environments,” Distance Education, vol. 35, no. 3, pp. 345–359, 2019.

Yen, J. C., & Lee, C. Y. (2016). Exploring problem-solving patterns and their impact on learning environment in a blended learning environment. Computers & Education, 56(1), 138-145.

Yusuf, B. N., & Jihan, A. (2020). Are we prepared enough? A case study of challenges in online learning in a private higher learning institution during the Covid-19 outbreaks. Advances in Social Sciences Research Journal, 7(5), 205-212.

APPENDICES

APPENDIX A



SAMED

P Bag 1020
BINDURA
ZIMBABWE

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

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 09/04/2024

TO WHOM IT MAY CONCERN

NAME: SHOKO AHSAPHINA REGISTRATION NUMBER: B2253648

PROGRAMME: HBScEdMt PART: 3.3

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 HBSc EdMt programme. The research topic is:

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

9 APR 2024

Z Ndemo (Dr.)
CHAIRPERSON - SAMED

THE HEADMASTER
CHINEMBEURE SECONDARY SCHOOL
DATE: 15/05/24
PRIVATE BAG 251
ZVISHAVANE

APPENDIX B

QUESTIONNAIRE FOR TEACHERS

Question 1: How long have you been using online teaching platforms for mathematics instruction?

Section A: Demographic Data

1. Sex: Male [ ] Female: [ ]
2. Age: Below 30 years [ ]
   Between 30 and 40 years [ ]
   Between 40 and 50 years [ ]
   Above 50 years [ ]

3. Educational qualifications

Certificate in education [ ]

Diploma in education [ ]

Degreed (with secondary education) [ ]

Degreed (without secondary education) [ ]

4. Working experience

   Less than five years [ ]

   Between 5 and 10 years [ ]

   Between 10 and 15 years [ ]

   Above 15 years [ ]

Research Questions

Question 1: How long have you been using online teaching platforms for mathematics instruction?

[ ] years

Question 2: What are the main online teaching platforms you have used for teaching mathematics?

1…….....

2…….

3……

Question 3: On a scale of 1 to 5, with 1 being "not challenging at all" and 5 being " very challenging", how would you rate the overall usability of online teaching platforms for mathematics instruction? [ ]

Question 4: What are some specific challenges you have encountered when using online teaching platforms for mathematics instruction?

1……..

2……..

3……..

4……..

Question 5: What mechanism can be implemented to improve the use of online teaching platforms in mathematics?

1……..

2……………………………………………………………………………………..

3……………………………………………………………………………………..

4……………………………………………………………………………………..

Observation Guide

The researcher shall observe the following.

1. Platform usability:
    - Observe the ease of navigation and user interface of the online teaching platform.
    - Note any difficulties encountered when accessing specific features.
    - Pay attention to the platform's responsiveness and loading time.
2. Student engagement:
    - Observe how students interact with the online teaching platform.
    - Note if students actively participate in discussions, submit assignments or ask questions.
    - Pay attention to indicators of student motivation and interest in the mathematics content.
3. Technical issues:
    - Observe any technical issues that arise during online teaching session.
    - Note if there is any connectivity problems.
    - Pay attention to the impact of these technical issues.
4. Communication and collaboration:
    - Observe how effectively the online teaching platform facilitates communication and collaboration.
    - Note if students can easily interact with each other through chat.
    - Pay attention to clarity of instruction and feedback provided.
5. Assessment and feedback:
    - Observe how the online teaching platform supports assessments and feedback in mathematics instruction.
    - Note if students receive timely and constructive feedback on their assignment or assessment.

INTERVIEW QUESTIONS

1. Which forms of online learning platforms are used for teaching and learning of Mathematic
   ?.....
   .....
   .....
   .....
2. How do you benefit from online learning use in the teaching and learning of Mathematics?.....
   .....
   .....
   .....
3. What challenges do your teachers face in using online learning in teaching and learning of
   Mathematics?.....
   .....
   .....
   .....
4. What do you think can be done to improve the use of online learning in teaching and learning of Mathematics at your school?.....
   .....
   .....
   .....