# BINDURA UNIVERSITY OF SCIENCE EDUCATION


**AN ASSESSMENT OF ONLINE TEACHING AND LEARNING OF PHYSICS AT ORDINARY LEVEL**

**BY**

**Nyembezi Esther Zviuya (B1646265)**

*A research project submitted to The Faculty of Science Education in partial fulfilment of the requirements of the Bachelor of Science Education Honours Degree in Physics.*

SUPERVISOR: DR ZEZEKWA

**BINDURA, ZIMBABWE**

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# BINDURA UNIVERSITY OF SCIENCE EDUCATION

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NAME OF STUDENT: **NYEMBEZI ESTHER ZVIUYA(B1646265)**

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PERMANENT ADDRESS: 126 first street, Paradise, Marondera

SIGNED: …… DATE: …….

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The undersigned certify that they have read and recommend to Bindura University of Science Education for acceptance, a dissertation entitled; *"AN ASSESSMENT OF ONLINE TEACHING AND LEARNING OF PHYSICS AT ORDINARY LEVEL:*' submitted by **Nyembezi Esther Zviuya(B1646265)** in partial fulfillment of the requirements for Bachelor of Science Education Honours Degree in Physics.

**STUDENT** **DATE**

**Zviuya N.E…..... ……**

**SUPERVISOR** **DATE**

**Dr Zezekwa** **2/11/22**

# ABSTRACT

*The purpose of the study was to assess online teaching and learning of physics at ordinary level using a case of a selected school in Mberengwa District, Zimbabwe. The objectives of the study were to determine the tools used by teachers and learners for online teaching and learning of physics at Ordinary level, to identify the challenges faced by teachers and learners during online teaching and learning and suggest possible solutions to mitigate these challenges. The researcher used a qualitative approach. A qualitative case study design was used. From a population of 50 participants, 5 were teachers 45 were students from junior secondary to Ordinary level. To obtain data the researcher used questionnaire survey, focus group discussion and interviews for the research participants. Data collected was analysed using descriptive statistics to report commonly held view. Qualitative data was analysed using thematic and narrative analysis. The researcher found out that the major challenges were poor network connectivity, no network in some areas, expense of data bundles such that some students could not afford to go online for e-learning, some students did not have gadgets that could connect to the internet and lack of knowledge on how to use the virtual learning platforms. The researcher concluded that students had a negative attitude towards learning Physics online* and *teachers did not attend to individual differences during online teaching and learning. The researcher recommends that multiple training workshops should be held in order to increase the student and teacher awareness of online teaching and assessment and teachers should be provided with financial help in the form of loans to improvise equipment that are difficult to get and not wait for the institution to provide everything. If implemented well all these may lead learners' change of attitude towards the learning of Physics through online platforms.*

# DEDICATION

This research is dedicated to my daughter Mazvita Gandi. She inspires me to achieve greater heights. Her presence remained the key driving factor to fulfill my dream. I greatly appreciate your presence my love. May God richly bless you.

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# TABLE OF CONTENTS

## Contents

# CHAPTER 1:

# INTRODUCTION TO THE STUDY

## 1.1 Introduction

The chapter is going to look at the background of study, purpose of study, the objective of the study, research questions, the assumptions, the importance of study, delimitations and limitations, definition of terms then finally the summary of the whole chapter.

## 1.2 Background of Study

Physics is a core subject that is crucial to the understanding of the world around us. ( Agommuoh and Ifeanacho 2013). Physics is also essential for understanding the complexities of modern technology and essential for technological advancement of the nation, (Erinosho 2013). Physics occupies a very sensitive position in Physical Science ( Shamim, Rashid and Rashid 2014) and that is why its teaching and learning must be taken seriously even online. Physics has been seen as a difficult subject yet it is one of the most basic science subjects whose concepts and techniques support the progress of other branches of science. Many believe Physics only deals with calculations alone and special algorithm yet it also has some projects that can be done online. Many Physics students have the wrong conception of the subject even before sitting for it that is why the researcher has opted to assess on the online teaching and learning since there seems to be an increase in the use of online learning due to COVID 19. There was a shift from face to face learning to online learning in all institutions of learning as the World Health Organization declared COVID 19 an international disaster and some regulations had to be adhered to so as to try and curb the pandemic. As such, the researcher has developed an interest in carrying out this research topic. This topic became of interest due to the restrictions caused by COVID 19 which caused the closure of schools. With the education system , this came as an eye opener as most of the learning activities were usually done using the face to face and there was need to use online learning which in our Zimbabwean case was not an easy move to accept as it had its own challenges .“COVID19 has ushered in a time of change and forced paradigm shifts in many areas. It has forced us to rethink the traditional school model and question the way we teach, Vishnu Karthik (2020).

It was very difficult at first to accept the online learning as it needed a lot of things to be put in place first before take-off but there was no way out. Https://www.urd.org/en/project/covid-19-

observatory/ states that in order to achieve this, entire countries have been put on 'pause', closing their borders and setting up confinements of variable enforcement, impacting not only economies but also education systems. The provision of ICT resources to the Zimbabwean education sector has been growing in leaps and can be traced back from 2000s. In the year 2005 the government of Zimbabwe developed a national ICT policy after the national science and technology policy of 2002 Makoza & Chigona (2013). All the policies which were developed in the 2000s were informed by the Nziramasanga Commission Report of 1999 which recommended the use of computers for teaching and learning. The National ICT policy that was adopted in 2005 makes significant references to the promotion of ICT in education Makoza & Chigona (2013).The government of Zimbabwe through the Ministry of Education encouraged the use of digital platforms to provide remote-learning, (Kangai, 2018). This has led to some private organizations coming up with free digital platforms to provide online learning. For example, the private Higher Life Foundation is providing free access to its virtual Ruzivo learning platform, though uptake is limited. Moreover, the Ministry of Primary and Secondary Education ensured the continuity of learning during the lockdown period by providing remote-learning services via digital resources. This was supported by The Minister of Higher and Tertiary Education, Murwira A (2020) who asserts that in response to the need to continue learning during the COVID 19 induced lockdown; our universities through their Innovation hubs are developing E-Learning platforms and other related applications using open-source software.

### 1.3 Statement of the problem

As a result of the Covid-19 pandemic, there has been a shift from whole face to face lectures to blended learning which includes online teaching and learning. All the schools both in urban and rural areas are assumed to be offering online lessons. The purpose of this study is to assess the level to which online lessons are integrated in the teaching and learning of physics.

### 1.4 Research Questions

1. What tools are used by teachers and students for online teaching and learning of physics at Ordinary level?

2. What are the challenges faced by teachers and students during online teaching and learning?

3. How can these challenges be addressed?

### 1.5 Importance of the Study

There is so much is the assessment. The study reveals how online teaching and learning is effective in physics. The findings of this study would be of great importance to:

#### 1.5.1 Learners

There should be able to have their learning done online. This has been supported by Dr Zhou cited by Matimaire K (2020) who said that solutions to the education crisis posed by Covid 19 must ensure two basic human rights, which are learner's right to education with equal measure… the MoPSE concurs and recommends online learning as the most suitable solution under such circumstances. This means that the government has seen it vital to take learners education as important as any other basic right. Misihairabwi-Mushonga cited by Matimaire (2020) also supported the idea saying everyone should focus on online learning as it is the only way to help learners learn even in physics.

#### 1.5.2 Teachers

Teachers will be encouraged to utilize varying modern methods of delivering lessons through technologies on the market, that's online teaching. This may be the beginning of effective teaching which places the learners at the center of learning as they manipulate various e-learning activities in physics.

#### 1.5.3 Curriculum planners and policy makers

Through this research curriculum planners and policy makers who have incorporated online learning in the updated curriculum may use the findings to vigorously campaign for the use of e-learning in all other learning areas. It is up to them to design the syllabus in such a way that it employs online learning tools as one of the main teaching and learning media. Learning becomes more meaningful when information is organized and presented in such a way that it relates easily

to the learners' existing knowledge through manipulative devices, videos, images, sounds and some prepared and recorded lessons on software

### 1.5.4 The researcher

Researchers can gain an insight into the pros and cons of using online learning in teaching and learning of physics as caused by the Covid 19 pandemic.

### 1.5.5 The community

The assessment is likely to benefit the community by creating opportunities for application of online learning even in their daily lives and to get used to the new normal where most of the teaching and learning will be done online. This could be through activities carried out as parents help the learners with their work. Such activities may generate interest and appreciation among the community on the use of tools as they share information coming from the school and do the work in the comfort of their homes. If the results of the assessment show a positive impact of online learning on learners' performance, the community may embrace the technologies and use them to broaden their knowledge on various academic and professional areas through distance learning for example on-line exercises being offered in physics.

The study's results will help inform teachers and parents about the extent to which the use of online learning would enhance children's learning. Furthermore this knowledge is important because responsible authorities will take necessary steps in helping facilitate and encourage teachers to use online learning in the teaching and learning process in the secondary school environment.

### 1.5.6 Schools

Schools could fulfill their purpose of providing high standard lesson delivery using a diversity of effective methods explained during the research. Staff development sessions in e-learning based on the research findings and recommendations would be of great significance. Schools could find more teachers who are ICT literate thereby helping out in assessing the use of online learning.

## 1.6 Assumptions

The results that are to be deduced from the research can be a clear reflection of the performance improvement in Physics. Chosen respondents to be reliable representatives and assumed to cooperate and provide reliable information. All information given by participants will be true.

### 1.7 Delimitation of the study

The research was carried out at a selected school situated in Mberengwa District in Midlands Province in Zimbabwe. The students at this school are taught by computer literate teachers who use online learning when teaching hence the need to research on this particular school.

Physically the researcher conducted her research at the named school in the Midlands Province. The school is easily accessible and the teachers and students have access to the school computer laboratory and internet since they already have computer lessons which are compulsory. The researcher chose the school because it is well connected to the internet. The researcher targeted the students and Science teachers. The research used a sample of 5 teachers and 45 students from the school under research. Snowball sampling was used to select the sample. Questionnaires and interviews will be used throughout the research to obtain relevant information from both Science teachers and learners.

### 1.8 Limitations

The researcher faced several limitations. The researcher faced constraints in making follow up on some learners because of where they live and the distance from the school. Furthermore some participants simply filled in questionnaires without intensively grasping the demands of the questions. As a result some of the opinions and views which are attained may not reflect the truth about the question under research. Also along with this line of argument, questionnaires got lost and some participants decided to keep some. As such it was difficult to recover. In the case of interviews the researcher met interviewees who were not cooperative. They just gave answers which they knew would please the interviewer. As such biased information was obtained thereby affecting the validity, reliability and trustworthiness of the data. Also interviews consumed time. In addition interviewees may not give relevant information maybe because of ignorance However the researcher involved the teachers of the aforementioned school a lot in trying to make the research a success.

## 1.9 Definition of Terms

Online teaching and learning – refers to education that takes over the internet. It is also referred to as e-learning.

Assessment -

Physics- is the branch of science that deals with structure of matter and how fundamental constituencies of the universe interact.

## 1.10 Summary

This chapter introduced the research questions, thereby incorporating justification and assumptions. It also outlined the importance of the study and defined the key terms to keep the study within focus. Chapter two will focus on literature review

# CHAPTER 2
# REVIEW OF RELATED LITERATURE

## 2.0 Introduction

This chapter deals with reviewing of the related literature. Reviewing literature is the process of searching, systematically compiling, assessing and scholarly interrogating previous literature in order to inform or demonstrate its relationship with any current research. The chapter also ends with a summary and then introduces the following chapter.

## 2.1 Online teaching and learning

Online learning is the newest and most popular form of distance education today. Within the past decade it has had a major impact on secondary education and the trend is only increasing. According to the Sloan Consortium, online enrollments continue to grow at rates faster than for the broader student population. Online learning (e-learning) describes any form of pedagogy delivered using digital technology. Such methods incorporate visual graphics, text animations, videos and audio. In addition, online pedagogy can also facilitate group learning, and the assistance of instructors within specific fields (Wan Aziaris, 2015). Online learning is also defined as a teaching and learning process between teachers and pupils that involves various digital mediums, such as 'Whatsapp', 'Zoom', and' Google Classroom'. In addition, online learning does not refer to direct learning alone. Any assignments or activities, provided by the teacher online, are considered part of online learning The e-learning approach empowers students as active learners instead of just passive learners absorbing information. According to Ratheeswari (2018), in the digital age, the use of Information and Communications Technology (ICT) allows students to learn and apply the skills that they needinthe21st Century. Furthermore, online learning is the best medium by which to ensure the continuity of students' learning during the COVID-19 pandemic (Ariffin et al., 2020; Fauziana, 2020; Mansor et al., 2021; Raheim, 2020; Samat et al., 2020). According to Pusvyta Sari (2015), online learning is an alternative pedagogy for the era of technological development and communication, and students in particular need to adapt.

The complete online modality of the instructional approach during the Covid 19 era can be feasible. For example, in China that was the first epicenter of the virus, more than 180 million children were ordered to remain at home. But while schools were closed for quarantine, education had to continue but this time in an altered manner. It was implemented online through a variety of online lessons and electronic textbooks(Patrinos & Shmis 2020) It is unfortunately quite likely that many students will experience significant trauma, additional stress and anxiety(Holmberg 2018).Based

on past studies conducted in post-disaster contexts, it would seem that the psychological impact of the disruption of routine due to disasters, as observed in Australia, in Ethiopia, in India and in Vietnam, have a severe impact on educational outcomes(Holmberg 2018).Teachers, too, suffered some psychological consequences during this crisis. The education system in Zimbabwe was already stretched before the COVID-19 pandemic as a result of multiple crises, including the impact of Cyclone Idai in 2019, the economic crisis, climate-induced drought as well as food shortages. The COVID-19 epidemic has interrupted the teaching and learning for students and promoted online learning. The epidemic poses great risks to the nutritional status of children from poor households, violence among children from fragile families and as well as mental well-being among both children and teachers. Without a conducive and disease free learning environment, COVID-19 posed a risk to learners' health and wellbeing as purported by Education Cluster strategy (2020).

Relying on and adapting to eLearning during a pandemic caused a shift in adopting more online elements in the teaching by the educators. This, however, has many practical problems and limitations, in terms of availability of digital technologies for education. There is a vast "digital inequality" that exists in society. One cannot assume that all students, as well as teachers, would have access to internet connectivity and associated powerful devices outside of their school, to be able to communicate.(Miliszewska 2007)

The students who have less ability to self-regulate or study autonomously struggle with no teacher providing in-person support. The online videos, digital content, and discussion forums may not provide a holistic teaching-learning outcome in physics. The sudden shift to adapt and implement online learning has led to over-work, stress among the teaching fraternity. The teachers need to re-imagine modes of curriculum planning, development of e-content, assessment, and reporting which may have been developed without proper planning and forethought. To achieve more focused learning outcomes and develop effective e-learning methods, teachers should be provided with professional autonomy and trusted with their judgment; and ensure clear and compassionate communication with all the stakeholders of the higher education. Rashid and Yadav (2017). One might argue that remote learning may offer an advantage for individuals who are unable to attend a traditional full-time face-to-face lesson due to personal or financial circumstances. And even within traditional secondary school institutions, hybrid or blended forms may help improve the

quality of face-to-face teaching by moving content delivery online and focusing in-person sessions on active learning Bowen,(2018); Riffee,( 2016).

For the populace with access, the quantity would be twisted towards elevated socio-economic households and urban households; an awe-inspiring preponderance of whom are private school students who already have a learning benefit over their community school peers. For children from poorer backgrounds who tend to have less access to internet connectivity, computers, and other devices, and reside in rural areas where local languages take dominance over English, online-learning uptake will be limited. Ngogi and Mahaye (2020) said that the crisis has provided an opportunity for the education institutions to quickly improve their ICT operations. However, the greater parts of them do not have the capacity to fully deliver whole physics online.

While a momentous number of schools have been implementing blended learning (a mixture of face-to-face and online learning) in order to increase access and improve learning, hardly any had intentions for their face-to-face delivery to be completely replaced. However, going online is not that simple on a school where only 24% of the population has access to the internet, and poor connectivity, exorbitant costs and frequent power interruptions are serious challenges Abdullahi Aborode (2020)

The COVID-19 pandemic forced schools to adapt to the rapidly changing situation in a way that was unimaginable a few months .A comprehensive list of immediate and long-term challenges and interventions follows, and together those inform an assessment of the potential for some positive outcomes from these unprecedented times. The current situation has challenged deep rooted notions about the role of higher education institutions in providing quality education, mode of delivery, accessibility, the importance of lifelong learning, and educator's perceptions about the type of learners. This may provide insight to the educators and policymakers for the overall improvement of the education systems.

World Bank group education (2020) posits that broad scale institutional disruption took place, staff and student illnesses—provision of appropriate support was high due to the pandemic which resulted in the closure of schools. Mass student displacements and/or loss of vital school services and support took place resulting in stoppage of lectures in the middle of terms. Technical 'debt' even advanced, wealthy countries find themselves hampered by the use of outdated technology platforms. There was need to maintain instructional operations, including coursework, exams, and awarding of marks– modification of assessment modalities and maintaining or closing research

operations, including on school laboratories and facilities, field work .Curtailing of international mobility, including logistical implications for repatriation or locally housing international students and staff was a great challenge as these students had to follow the WHO regulations pertaining to COVID19. Staff and school furloughs were another challenge for the schools. Equity implications academic, social, financial, physical for low-income/at-risk students (potentially those with covid-19 health vulnerabilities) was encountered. Increased inequity/inequality in access and retention, as at-risk students return at lower levels due to increased financial and situational constraints (family obligations, changes in personal circumstances, support networks diminished or dismantled by campus closures, etc.).

Reduced private funding for pupils in terms of household, firms and other third-party funding (Vishnu Karthik 2020) .Permanent closures of classes and schools resulting in permanent loss of skills and human capital in academic and administrative positions was also a challenge faced by just enrolled students. Inequality in connectivity was another challenge experienced due to COVID 19.Students do not have enough connectivity and devices for e-learning at home, and this is particularly so for the most remote and the poorest. The digital divide remains strong, between schools and within schools. International bandwidth and local server (and hosting/data storage) capacity were not designed for the massive load that was coming. While most faculty members are active online, many have not taught in online mode before this crisis. Haleem *et al* (2020) posted that while there is a lot of material online, there is little 24/7 technical and pedagogical support available for them. On the medium-term, academic staff will need digital skills training. Students' capacity to adapt to the online scenario was difficult. Many, if not most, students are not experienced as online learners. While they may be quick to adapt, students face challenges that lead to dissatisfaction with their academic experience. Feedback from students can be leveraged to strengthen teaching, but feedback can also risk exposing frustrations that are challenging to address. A lot of mistakes were done. There was need to set some regulations to guide students on using the online platforms. The regulatory environment is not (yet) aligned to online learning (WBA 2020).

With the fragility of the economic situation of Zimbabwe, the socio-economic impact of COVID-19 was felt hardest by the most vulnerable children in the country, plunging them further into educational hardships. The impact of the COVID-19 pandemic extends far beyond the sphere of physical health. Children who dropped out of school as a result of this crisis, faced not only a

higher risk of child marriage, child labor, and teenage pregnancies, but saw their lifetime earnings falling drastically. An entire generation of students suffered damage to their learning and earning potential. Zimbabwe learners were further at a disadvantage in terms of access to digital and distance learning since only 30.3% of households have access to the internet by any device from home, and only 40% of households have a radio set, with 35.7% having a TV set. Innovative approaches need to be applied to meet this urgent need according to World Bank education (2020). Learning declined and dropouts increased, especially among the most disadvantaged**.** Learning inequality increased, because only students from wealthier and more educated families had the support to learn at home. Finally, dropout risk rose, as the lack of encouragement from lecturers reduced the attachment to schooling for marginal students. Students' mental health suffered, due to isolation during social distancing and the traumatic effects of the crisis on families. Youth out of school engaged in more risky behavior, and adolescent fertility increased. Many students left schooling forever, and the higher dropout was concentrated in disadvantaged groups. Most parents moved their children from private to public institutions, adding pressure and lowering quality in already over-stretched public education systems. Vishal 2020 stated that fiscal pressures led to a drop in education investments, reducing the resources available to lecturers. Teaching quality suffered (either online or after the COVID era) as the health crisis hits some lecturers directly, and as others suffered from financial pressures due to salary cuts or payment delays. The lack of student assessments during the closures meant that teachers were flying blind on learning as they try to support their students remotely. Finally, the supply of schooling contracted as a lack of revenue forced private institutions out of business. Long-term costs were left unchecked, these impacts exact long-term costs on both students and society(Vishnu 2020).

Given the likely increase in learning poverty, this crisis could prevent a whole generation from realizing their true potential. Students who are forced to drop out of school or experience significant declines in learning will face lower lifetime productivity and earnings. Inequality will rise, because these impacts will likely be greater for students from poor and marginalized households. The children who need education the most to climb out of poverty will be the ones most likely to be deprived of it by the e-learning. This decline in economic prospects could lead in turn to increase in criminal activities and risky behaviors. (World Bank 2020)

**2.2 Tools used by teachers and students for online teaching and learning.**

The sudden transition to remote teaching has left many teachers, as well as students, faced with various challenges, from not having access to the internet to finding the proper tools to overcome the boundaries of online teaching. Every online teacher and student will need software tools that will allow them to connect with each other easily and quickly.

### 2.2.1 Online Communication Tools by Rucker (2016)

Effective communication is the key to successful teaching and learning, whether in a physical classroom or a virtual classroom. However maintaining online communication with not one, but over twenty is undoubtedly challenging. Communication platforms help overcome it, they enable communication with larger groups, with video conferencing, instant messaging, audio calls and many more, from everywhere. Some of the tools on demand are Zoom and Google Meet

#### 2.2.1.1 Zoom

Rucker (2016) posted that it is probably the most popular online software in the market for holding classes. Zoom offers a chat function to chat with the whole class or individual students, breakout rooms to separate into groups for discussions. It also offers a share screen function to share the screen or allow students to share their screen.(Rucker 2016) It consists of a built-in whiteboard with text and drawing features to share with the students. The free version allows even 100 participants, unlimited one-on-one meeting but allows only 40minutes for group meetings. Zoom is a great option for teachers who need a platform to teach their students since the app is used worldwide and most people are comfortable and familiar with its functions.

#### 2.2.1.2 Google Meet

It is another popular software application for online tutors, virtual teachers and anyone doing e-learning because of its integration with Google's suite of other apps like Google classroom and Google drive. Google Meet offers a share screen for students and groups chat to students for up to 1hour. A chat box to chat with the students is also provided.

## 2.3 Challenges faced by students and teachers during online teaching and learning

With Covid-19 pandemic, it has become clearer that education system is susceptible to external dangers Bozkurt, A. & Sharma, (2020). Emergency remote teaching in a time of global crisis due to Corona Virus pandemic. Ribeiro (2020 ) rightly noted that this digital transformation of

instructional delivery came with several logistical challenges and attitudinal modifications. While addressing student assessment during this pandemic on how districts can legislate unbiased and evenhanded grading policies based on these recommendations; (i) pandemic-related anxiety will have negative effects on student academic performance, (ii) academic performance of students might be affect by racial, economic and resource differences, and (iii) the larger parts of instructors were not effectively ready to deliver high-quality instruction remotely. The challenges discussed here are limited to digital transformation of instructional operations during the period of Covid-19 pandemic.

### 2.3.1 Technology

Online learning in its entirety is dependent on technological devices and internet, instructors and students with bad internet connections are liable to be denied access to online learning. The dependency of online learning on technological equipment and the provision of the equipment was a big challenge for institutions, faculty and learners Yates D (2020) while answering a question posted on Research Gate, by John R. Yamamoto-Wilson a retired professor from Sophia University, on the effects of Covid-19 and online learning on instructors and teaching stated that students with outdated technological devices might find it hard to meet up with some technical requirements of online learning, citing an example of a student who wanted to take mid-semester e-quiz by using Respodus. This particular student could not download the browser after several attempts and it was later discovered that she was using an outdated device that is not compatible with the browser. This researcher also cited students with accessibility problems that may find it difficult to follow instructions posted on the course announcement section of programs and a typical example of that is when the instructor posted on the course announcement page that there won't be class on a particular date, one of the students still sent mail asking if class would be held on that date.

### 2.3.2 Socio-economic factors

As a result of inequality in the socio-economic status of students, some rely on the computer and free internet in school Demirbilek, M. (2014). Due to the closure of schools, the migration process of these set of students is expected to be slow. It becomes undeniable that students with low socio-

economic background will definitely find it difficult to migrate as early as expected since they cannot come to school due to the pandemic. Fishbane, L. & Tomer, A. (2020) researched on what students with no internet access are to do during this Covid-19 pandemic and their results showed that as the level of poverty increases in the community, the rate of internet accessibilities declined rapidly and by implications, students with no or low socio-economic power to afford broadband connection are most vulnerable to fall behind or encounter additional challenges to meet up with others in online learning.

### 2.3.3 Human and pets' intrusions

Human and pets' intrusion here is the unexpected appearance or interruption of family members, friends and or pets that may cause disruption or diversion of online learning participants' attention during the online teaching and learning process. Malcolm Brown, the Director of Learning Initiatives at EDUCAUSE also cited pets' intrusions, through situations where online learnings are in progress via videoconference and someone's pet such dogs will be barking, or cat will walk across the table said Manfuso, L. G. (2020) .

### 2.3.4 Digital competence

Digital competence is the group of skills, knowledge and attitudes needed when using ICT and digital devices to perform responsibilities such as problem solving, information management, collaboration with respect to effectiveness, efficiency and ethics alludes Ferrari, A. (2012).In this jet age, not all digital natives possessed digital competence that are not limited to education but all spheres of life alludes Bennett, S.  Maton, K. , & Kervin, L. (2008). Students and instructors with low digital competence are liable to lack behind in online learning. There are situations whereby online learning participants go naked unconsciously by either visiting the comfort station or dressing up for the online class, and this can be linked to unconscious use of the platform as a result unethical use of digital devises that can be avoided through digital competence. Due to digital transformation of instructional activities during this pandemic, libraries are to follow the trend in order to deliver effective services to faculty, students and other stakeholders through digital library, students and faculty with low digital competence might find it difficult to make optimal utilization of the digital library says Omotayo, F. O. & Haliru, A. (2020). Perception of

task-technology fit of digital library among undergraduates in selected universities in Nigeria and has established digital competence as a variable with positive correlation and substantial effects on the application of digital library by higher education learners.

### 2.3.5 Assessment and supervision

After instructional delivery here comes assessment where instructors measure learning activities to ascertain the instructional objectives through test, quiz and examination. Osterlind, S. J. (2002). There exist numerous literatures on test and measurement theory and analysis with little details on planning, development and test items writing by instructors. In online learning, assessments are often carried online whereby instructors are limited to proxy supervision of learners making it impossible to regulate and control cheating purports Arkorful, V.& Abaidoo, N. (2015).There are several students testing formats that are applicable with e-learning and such ICT enhanced testing formats include constructed-response, performance-based formats, sentence-completion or short-answer, matching, true-false and cloze-procedure. Flaherty, C. (2020) added that it is unimaginable to claim that learners are getting the same learning experiences and chances through online learning during this pandemic and this will make assessment more complicated.

### 2.3.6 Heavy workload

The quick and sudden digital transformation process of universities has huge workload on ICT units of institutions to build e-platforms, integrated existing external applications into their systems and as well as full migration into external applications. Instructors also share part of the workload because they are responsible for transforming their course contents to be e-platform-friendly to the learners. This heavy workload is expected to cause unforeseen financial and time cost alludes Akkoyunlu, B. & Soylu, M. Y. (2015). Monique Sendze, the Chief Information Officer for the Colorado School of Mines in interview granted to EdTech Magazine, stated that they were on crisis-response mode of acquiring new licenses and improvement of current licenses to carter for the tremendous increase in the number of users that will be using e-learning tools of the school simultaneously said Manfuso, L. G. (2020). There were also complaints of students receiving more emails from the university, some of these emails contain important messages, while others are irrelevant messages and to instructors, these emails are irrelevant to them because those messages

are students focused. These loads of emails have added to the stress of students and faculty and this may result in mental health problems.

### 2.3.6 Compatibility

The compatibility of online learning with social science and humanities has been proved effective while researchers have also contested its compatibility with sports sciences, engineering and medical sciences where hands-on practical experiences are required as part of instructional activities said Leszczyński, P. et al (2018). Remote laboratories are used as alternative laboratories in online learning and such virtual laboratories offered by online learning can only fill the theory-to-practice hole Iqbal et al (2015). Online learning cannot be effectively and efficiently applied in some disciplines and this compatibility gap is yet to be filled alludes Leszczyński et al. (2018). According to Murphy (2020 )based on the Association of American Medical Colleges (AAMC) recommendations, medical students were directed to abstain from having direct contact with patient in the middle of March 2020, medical-trainees of Brown University were in clerkships and the school were able to "augment" medical students training by migrating some aspects of clinical education to online platform. However, those students are to go back to the wards to complete the direct-patient interaction that is required in clerkship as soon as the suspension due to the Covid-19 has been lifted. This implies that online learning is not compatible with clinical but can only be used to augment face-to-face training method pending the time there will be chance to go back to the normal traditional setting asserts Leszczyński et al. (2018 ).

## 2.4 Ways of addressing online teaching and learning challenges

Time will inevitably bring about the increased adoption of classroom technology on a large scale. First, it is extremely important that teachers have a say in what technologies they will use in their instruction. Teaching is a deeply personal experience, and when educators feel as though they have lost the ability to teach in a manner that best suits them, it can be frustrating and discouraging. No single educational technology will be perfect for a teacher, and educators should have the ability

to select a technology that they feel most comfortable with. By allowing the teachers more freedom of choice they will retain the very important sense of classroom control. Althoff & Leskovec(2015).

A second solution to encouraging acceptance of classroom technology is a call for better organizations of available technologies. While a typical internet search will turn up thousands of results for educational technology tools, there are very few places that effectively organize and evaluate available technologies. Teachers should be able to easily find and access rigorously tested technologies within a specific learning domain. In fact, this book can serve as a valuable resource to teachers looking to find such technologies. Better organization of empirically validated educational technologies will serve to save valuable time and will place less of a burden on the teacher.

**Teacher Skills and Knowledge**

Pedagogical content knowledge (PCK) has long been discussed as crucial for effective teaching (Shulman, 2016). Effective educators must not only be experts, but also understand how to use the affordances of different pedagogies for particular content topics. With the advent of numerous novel technologies over the past decades, educators have an abundance of technologies to leverage to make their teaching and learning more effective. Although the potential benefits are clear, the number of possible combinations of technologies and pedagogies for different tasks and students is overwhelming. The TPACK framework expands on the focus of PCK to also include technology as a knowledge domain (Mishra & Koehler, 2016). TPACK focuses on technology, pedagogy, and content knowledge individually, and also on their interactive combinations; this leads to a sum of seven types of knowledge that TPACK supporters argue are crucial for ideal integration: content knowledge, pedagogical knowledge, technological knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge, and technological pedagogical content knowledge.

Clearly, educators with expertise in the three core knowledge types will have some proficiency in the combined types. However, there is specialized knowledge in the combined domains. Technological pedagogical knowledge (TPK) requires more than knowing useful pedagogical techniques and familiarity with technologies; it requires an understanding of how particular

technologies can provide support for particular pedagogical strategies or techniques. As an example, the selection of a social networking tool for collaborative learning must be informed by the affordances specific to each platform (e.g., Twitter might encourage a great number of messages to be shared, but following threads of conversations between numerous students would be very difficult). Technological pedagogical content knowledge (TPACK) additionally requires an understanding of how technologies can support pedagogies for specific domains.

The TPACK framework has been conceptualized in different ways, but most relevant for our current discussion is that it is often viewed as the complete set of knowledge necessary to teach with technology (Mishra & Koehler, 2016). Thus, a goal is to promote these knowledge domains; clearly, most of these knowledge domains are already heavily emphasized during teacher training and professional development (e.g., mastering the content in which a teacher specializes). The intersections between technological knowledge and content/pedagogical knowledge, however, is more specialized and less frequently taught. For example, consider the case of calculations. Teaching calculating techniques and strategies (requiring content knowledge) through deliberate calculating practice and feedback (requiring pedagogical knowledge) is something successful writing teachers do and an example of pedagogical content knowledge. Digital technology can further support instruction by allowing teachers to provide feedback through word written documents. This is an example of TPACK; however, training on the capabilities of different technologies might allow teachers to further optimize the experience for students. Programs such as my Access or the Writing Pal can provide automated immediate feedback, increasing the efficiency with which students receive feedback (Allen, Jacovina, & McNamara, 2015). Without training, teachers are unlikely to understand exactly how these feedback mechanisms works and therefore will not optimize their effectiveness (e.g., Grimes & Warschauer, 2018). Thus, training on TPACK might be helpful for writing instructors. TPACK can be taught effectively, making this goal tenable. Researchers investigating how TPACK knowledge in preservice teachers developed over an 11-month Master of Arts in Education (M.A.Ed.) program generally showed positive increases in knowledge (Hofer & Grandgenett, 2015). Brantley-Dias and Ertmer (2015) gave the caution in extending TPACK too far; although it might seem advantageous to encourage teachers to develop their knowledge in each of the 7 domains, there is little evidence that such a practice leads to more effective teaching. We respect this caution and view TPACK as something that teachers should be aware of and discuss, but that does not have a definitive end goal. Despite any

weaknesses in the TPACK framework by Shulman (2016) there have been interesting, though not strongly empirically supported, activities and suggestions that have come from it. First, it provides common language for educators to discuss methods and techniques for improving knowledge related to technology. For example, a TPACK game has been used by various groups as part of professional development (Richardson, 2010). Such activities are ways for teachers to increase their knowledge of technology.

### 2.5 Summary

This chapter presented the review of related literature on online teaching and learning, its challenges at secondary school. This was done to give credit to those who laid groundwork on COVID 19 related studies, writings and publications while helping to expose research gaps and aid the authenticity of findings to be made in and through this study. Reviewed literature was presented under given sub-headings. The next chapter will focus on the methodology of the research.

## CHAPTER 3

## RESEARCH METHODOLOGY

### 3.0 Introduction

This chapter focuses on the methodology of the research and on such it will present the research design, population of the study, sample size and sampling procedure, data collection procedures, research instruments and the data presentation and analysis procedures.

### 3.1 Research Design

Qualitative method was used in the study. According to Bunson (2015) research design is an aspect of a phenomenological study design to research guide data collection and analysis. Qualitative research is an inquiry process of understanding based on distinct methodological traditions on inquiry that explode a social or human problem (Boling, 2016). The researcher builds a complex, holistic, picture, reports details of informants, and conducts the study in a natural settings. The qualitative research approach was further explained by Stake (2010) who stressed that it is hard and uneasy to have a better understanding of a human world scientifically. The present study explored and illuminated online teaching and learning of Physics at Ordinary level. Qualitative research is used to explore the likely antecedences and factors about little has been known and explored (Caplan & Denny, 2014).

The nature of the sub-researched questions which guides this research gives a solid base for conducting this research with a qualitative approach as this kind of approach can be used to explore and illuminate the phenomenon mainly focusing on types questions like "how and what". Identification of hypotheses or variable is not something which is easy to do and must be explored to give a broad perspective of the topic under research (Crawford, 2016). Another reason why the researcher had to conduct the present study via qualitative approach is to provide a detailed view of the topic from the views of stakeholders about it in interviews and observations. The qualitative research is seen as the research methodology that engages in research that probes for deeper understanding and insight rather than examine surface features (Davison, 2015). Face to face interviews with 15 pupils were going to be done since COVID 19 measures were uplifted. The researcher is the one who has control over the interview, she can keep the interviewee focused and on track upon completion. Using open ended questions and prolonged engagement with respondents makes it possible to discover new information which at times is difficult to establish using quantitative measures (Davison, 2015). 50 people picked randomly will be used for research findings. Bar graphs and pie charts will be used for data presentation.

### 3.2 Population

As defined by Kumar (2020) a population is the collection of respondents who had relevant information to the study from which outcomes are to be attained. In fact, it is conceptual initiative larger group from which the researcher draws an illustration to which the end result from the test will be generalized. On this aspect it can be synthesized that population is all potential rudiments

that can be incorporated in a research that includes one or more features that are significant to the study, thus a class where the researcher selects a sample. Actually, all the aforementioned people were part of the population from which the population sample was drawn.

### 3.3 Research Instruments

According to Kumar (2020), research instruments may simply mean the tools which are used on collecting information in a quantitative or qualitative field of study adding that, such instruments are chosen in line with research methods and objectives. As such this study interview and observation schedules guides to gather information through Focus Group Discussions, Key Informant Interviews and In-depth Interviews.

#### 3.3.1 Questionnaires

These are a list of predetermined questions; the similar questions prearranged and provided to the similar respondents should be presented in an orderly manner so that data will be obtained from the similar elements in research test to have same coherent data helps in answering research questions, Jaques (2017). In this respect when using a questionnaire, respondents have to appreciate the subject and understand it and then inscribe relevant information to the researcher. Bunson (2015) stresses that questionnaire holding both unrestricted and close-ended questions created the most important tool of probing and exhausting the respondent's understanding on concepts under study. Kumar (2020) is of the view that in open ended questions the rationale is to motivate the respondent to provide an all-embracing and developmental answer as it will be employed to disclose facts and attitudes. This allowed respondents to unequivocally revealed information and opinions as solutions to challenges whilst the closed ended questions direct and provide mutually exclusive particular answers starting where respondents are instructed to select for the researcher to have the exact or precise data.

The questionnaire also endorsed respondents to offer probable solutions to all the acknowledged challenges. In the study, questionnaires were administered to selected teachers and some students. The questionnaires were used in this study in consideration of the fact that they were found to be less expensive to administer to the respondents who could also be interacted with online on a one on one basis since only a few selected individuals from the teachers and students. Questions were posed and answered in an orderly manner allowing the respondents to give unique responses while

guided by the questioning instruments. In this research 20 participants were given questionnaires to respond to.

The questionnaire included six questions for the pupils and five structured questions for the teachers. The questions were strictly made from the research questions.

### 3.3.2 Interviews

The assessment of online teaching and learning to secondary students during and after the Covid 19 lockdown were also explored through the in-depth interviewing of sampled individuals from the research population. Interviews were also used as a data gathering technique in the study. According to Holmberg *et al* (2018) an interview is a good way of accessing people's perceptions, meanings, definitions of situations and constructs of reality. This method of collecting data involves presentation of oral-verbal stimuli and reply in terms of oral-verbal response. The researcher chose this technique because it allows one obtain feedback instantly. The implementation of interviews in the conduct of the study proved to be advantageous. This was because interviews between the researcher and the participants gave the participants ability to give a full picture of their situation without fear. Interviews were recorded which were later transcribed and analyzed. Notes were taken during and in between interviews to ensure a complete description of issues raised.

Holmberg *et al* (2018) argue that an in-depth interviewing serves to provide a window on reality from the point of view of the participants and to allow them to tell their story as they wish, identify the issues that are important to them. In line with this view, the researcher found it worth taking an in-depth interview so as to gather a rich novel of information from the population under research. The researcher was in a position to note specific responses and get rid of any misunderstandings using in-depth interviews during the study.

The in-depth interviews were administered to ten interviewees. Seven questions were posed by the interviewer to both ladies and gentleman.

#### 3.3.2.1 Advantages of interviews

The open ended-ness allows the participants to contribute as much detailed information as they desire and it also allows the researcher to ask probing questions as a means to get the answers needed Williamson (2018). Standardized open ended interviews are likely the most popular form of interviewing utilized in research study because of the open ended questions, allowing the

participants to fully express their viewpoints and experiences said Qu & Dumay (2017). Another advantage of interview is that the nonverbal gestures can help the researcher to determine if the respondent is lying or telling the truth.

An interview guide will be used but additional questions can be asked and some may be questions that have not been planned to be asked (Williamson 2018). Interview gives the researcher opportunities to probe for views and opinions of the interviewee. Probing is a way for the interviewer to explore new paths which were not initially considered (Williamson 2018)**.** The researcher conducting semi structured interviews is at liberty than conducting a structured interviews (Qu & Dumay 2017).In semi structured interviews the interviewer does not do the research to test a specific hypothesis but has a list of key themes, issues and questions to be covered as purported by Vincent (2016).Interviews allows the researcher to collect people's views, ideas, opinions, values and beliefs about a certain topic. Interviewees can be given a sample of questions to prepare for the interview.

### 3.3.1 Focus Group Discussions

Kumar (2020) posits a Focus Group as a group of people who may be asked questions about their opinion, perceptions, beliefs or attitudes towards a certain phenomenon or a product rendered to them. On this study questions were being posed and responded in an interactive group setting from a social media group created by the researcher where male and female students from the school were used to discuss on and explore their learning experiences during the Covid 19 lockdown. The Responder -Moderator focus group where the researcher acts as a moderator so as to ensure that the discussion done will stick to the expected focal point and not yield unintended consequences as concurred by Holmberg (2018). The same author warranted the usage of Focus Group Discussions in typical qualitative research settings stating that such discussions yield information and insights that may be less accessible in forms of interactions found in a group setting.

To that end it was observed that shared verbalized experiences that stimulated memories, constructive debates and regurgitation of facts and concepts among other aspects that characterized Focus Group Discussions done on this study worked quite well and went quiet at length to solicit and elicit important research findings. More so the Focus group discussions as was postulated by Kumar (2020) provided a favorable platform for the researcher and the respondents to interact well particularly through the usage of native and familiar languages. This follows postulations made by

the above cited author who posits that, the usage of a familiar language in Focus Group Discussions ensure and enhances a deep understanding of concepts and issues at stake through the discovery of a common meaning and reaching of a common agreement using a common language to describe and discuss on a phenomenon.

However, Davison (2015) note that a fundamental difficulty with focus groups is the issue of observer dependency. Thus there is a tendency of the results obtained being influenced by the researcher or his or her own reading of the group's discussion. Although some participants have a tendency to provide brief answers, the researcher has an opportunity to probe questions because of their flexibility advocates (Holmberg *et al* 2018). A Focus Group Discussion with 10 members in the group was used.

Questions on the tools used for online teaching and learning were focused on in these discussions.

### 3.3Sample size and Sampling Procedures

Holmberg *et al* (2018) define a sample as a representatives or an element of the populace with the reason of ascertaining procedure or features of the entire population. Chiromo (2016) suggests that population sampling is a process of selecting participants for the study from the total population so as to save available time and money. In fact, sample size directly shows the numeral elements that will be hauled out from the entire population and utilized as a measurement of tribulations that tertiary students in the tertiary institution under research are faced due to mounting problems or challenges emanating from the impact of Covid 19 lockdown.

The study used a sample size of 50 participants randomly chosen from different classes in the institution. 10 people participated in the Focus group discussion, 15 participated in the in-depth interviews and 5 of them were Key informants while the last 20 were Questionnaire respondents. Two interrelated techniques were used during the research process, that is, the purposive/judgmental sampling technique and brought in some aspects of systematic sampling to synthesize the qualitative approach which the researcher also aimed to fuse in to add to the quantitative data gathering, presentation and discussion steps.

According to Holmberg *et al* (2018) a sampling method refers to the technique(s) used in depicting samples from the targeted population, typically in such a way that will assist in answering pre-determined research objectives and questions requiring answers from the respondents going to be selected.

### 3.3.1 Convenience Sampling

Convenience sampling was used to select the participating school. According to Dörnyei (2017) convenience sampling is a type of nonprobability or nonrandom sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study. It is also referred to the researching subjects of the population that are easily accessible to the researcher (Given et al, 2018). Convenience samples are also regarded as 'accidental samples' because elements may be selected in the sample simply as they just happen to be situated, spatially or administratively, near to where the researcher is conducting the data collection. Ecological data are often taken using convenience sampling, here data are collected at Bayayi Secondary a school in Mberengwa District in Midlands Province. Data was taken subjectively at a school. With numbers derive from convenience sampling, one can make only weak statement about some characteristic of the sample itself rather than a formal inductive inference concerning the population of interest. Further explains that, "captive participants such as students in the researcher's own institution are main examples of convenience sampling" .Convenience Sampling is affordable, easy and the subjects are readily available. The main objective of convenience sampling is to collect information from participants who are easily accessible to the researcher like teaching staff where the reseacherer resides. Although commonly used, it is neither purposeful nor strategic. The main assumption associated with convenience sampling is that the members of the target population are homogeneous

### 3.3.2 Purposive Sampling

Purposive sampling which was used on the study is a sampling technique in which researcher relies on his or her own judgment when choosing members of population to participate in the study; (Holmberg *et al* 2018). The above mentioned author adds that it occurs when elements selected for the sample are chosen by the judgment of the researcher. Researchers often believe that they can obtain a representative sample by using a sound judgment, which will result in saving time and money. Alternatively, purposive sampling method may prove to be effective when only limited numbers of people can serve as primary data sources due to the nature of research design and aims and objectives. According to Rucker et al (2016), sampling in qualitative research assists a researcher to gain insight on the researcher phenomena working with a feasible manageable number of respondents.

Purposive sampling was found to be ideal on the study in light of the fact that it ensured that only respondents who were affected by the lockdowns caused by the pandemic. Aspects of systemic sampling were brought in to ensure that both boys and girls participated. The focus was on extracting features of the population that are able to offer relevant and required data for the effectiveness of the study that was at most excellent, allowed the researcher to accurately respond to the research problem and objectives of the study.

As noted by Leedy (2018) purposive sampling should be employed as part of non-probability sampling in which the researcher will deliberately choose relevant considering that the selected people should have related characteristics relevant and significant to the study. Embedded in this study also was the idea that those persons who supply information managed to provide relevant and suitable data especially where the nature of study required a diminutive sample and subjects with suitable variability. According to Kumar (2020) the use of purposive sampling acts as a representative compartment of the whole population, created to provide a precise and required data that the researcher passionately looks for. The other underlying principle of the Purposive sampling method was that it allowed the researcher to apply his knowledge on who to provide questionnaires and who should be interviewed considering the research problems whilst cherry-picking participants from the institution in which the study was done. Purposive sampling is one of the most cost-effective and time-effective sampling methods available. As Lucienne et al (2019) concluded the purposive sampling technique can be effective in exploring anthropological situations where the discovery of meaning can benefit from an intuitive approach.

### 3.3.3 Simple Random Sampling

Simple Random sampling was used to select participating students. One of the most outstanding features of this method is that each member of the population has an equal chance of being selected (Wimmer & Dominick, 2016). The simple random sampling operates in two ways: replacement of the subject after being selected and non-replacement of the subject after selection. When it is sampling with replacement, any member of the population that is selected still has a further chance of being selected because after the first selection it is returned to the fold. On the other hand, when it is random sampling without replacement a member of the population that is selected is removed from the fold and cannot be selected again. Random sampling without replacement is the most used random sampling method.

The approach that was used in random sampling is the use of a table of random numbers. In this method the researcher arbitrarily picks the starting by going up, down, left and right on the table or random numbers, or even randomly throughout the table (Wimmer & Dominick, 2016). Apart from the use of the table of random numbers, a crude method can also be used in the simple random sampling. In some cases every member of the population is represented by a serial number. The serial number is written on a tally and put in a bag and mixed. The researcher then closes his eyes and picks out one tally at a time till the required number of sample is picked. The serial number on the selected tally then determines the particular member of the population to be selected for study.

### 3.4 Data Collection Procedures

Data collection may generally be understood as the way through which information is obtained from the selected research subjects as posited by Kumar (2020). The same author further added that the procedures for data collection may involve the collection of data from primary and secondary sources that include books, journals, pamphlets and the internet to mention but a few examples. Primary data on the study was obtained through Focus Group Discussions and interview. Questions were asked while the researcher wrote down the responses for use on data presentations.

### 3.5 Data presentation and analysis procedures

Findings gathered in and through Key Informant Interviews, In-depth Interviews, Focus Group Discussions and questionnaires were presented in a descriptive fashion following respective instruments used on the data gathering process. Analysis of data followed sub themes with descriptive statements. The process reflects the link between research questions and objectives as well as study assumptions with the gathered and presented data. Analysis of data was also informed by the literature review. Data from interviews was tabulated, data from focus groups was presented in pie charts, data from questionnaires was presented in graphs and then SPSS statistical software package was used to analyze data

### 3.6 Summary

This chapter focused on the methodology of the research and on such it presented the research paradigm, population of the study, sample size and sampling procedure data collection procedures,

research instruments and the data presentation and analysis procedures. The following chapter will avail the presentation and discussion of findings made on the study

# CHAPTER 4

# DATA PRESENTATION, ANALYSIS AND DISCUSSION

## 4.0 Introduction

In the previous chapter the emphasis was on research methodology employed in carrying out this study. This chapter will look at data presentation analysis and discussion. The study is on an assessment of online teaching and learning of physics at ordinary level. The chapter will start by analysing the tools used by teachers and students for online learning, followed by the challenges faced on online teaching and learning. Discussion on how the challenges may be addressed will also feature in this chapter.

Fifty (50) participants were selected to take part in the research. These participants were selected from Form 1 (Junior secondary) to Form 4 (O'level) and some teachers (staff members). The participants' demography is presented in table 4.1.

**Table 4.1 showing the demography respondents**

| level | Male | Female | Total |
|---|---|---|---|
| **'O' level** | **9** | **11** | **20** |
| **Junior secondary** | **10** | **15** | **25** |
| **Staff members** | **2** | **3** | **5** |
| **Grand Total** | **21** | **29** | **50** |

***Table 4.1: demography of respondents***

## 4.1 Tools used by students for online learning


***fig 4.1 possession of gadgets used by students for online learning***

From the questionnaire administered to students, sixteen (16) of them said YES they had tools for online learning since they had cellphones and laptop because they came from financially well families. Four (4) participants said NO since they did not have the gadgets to use.(fig 4.1)

From the questionnaire survey the researcher noted that learners who did not have tools to use had negative attitude towards online teaching and learning. Most of them said that they did not enjoy learning online because they did not have enough tools to use during the period. Students also noted that they get bored especially when the teacher could not show up for the lesson. One of the students" responded that

*My cellphone does not have enough space for the Google class application*

Furthermore, some students gave the same sentiments. They mentioned that they had tools that did not suit the amount of work they were given. This showed that students were failing to cope up with online learning hence failing to meet the demands in Physics. The researcher noted that students are interested in some other business on tools.

From the focus group discussion that was carried out, learners were of the opinion that some teachers had a negative attitude towards online teaching. One student had this to say

*Some teachers were born before computers so they found it difficult to use online teaching tools.*

Ten learners participated in the focus group discussion and very few of them showed that they had tools for online learning.(fig 4.2)

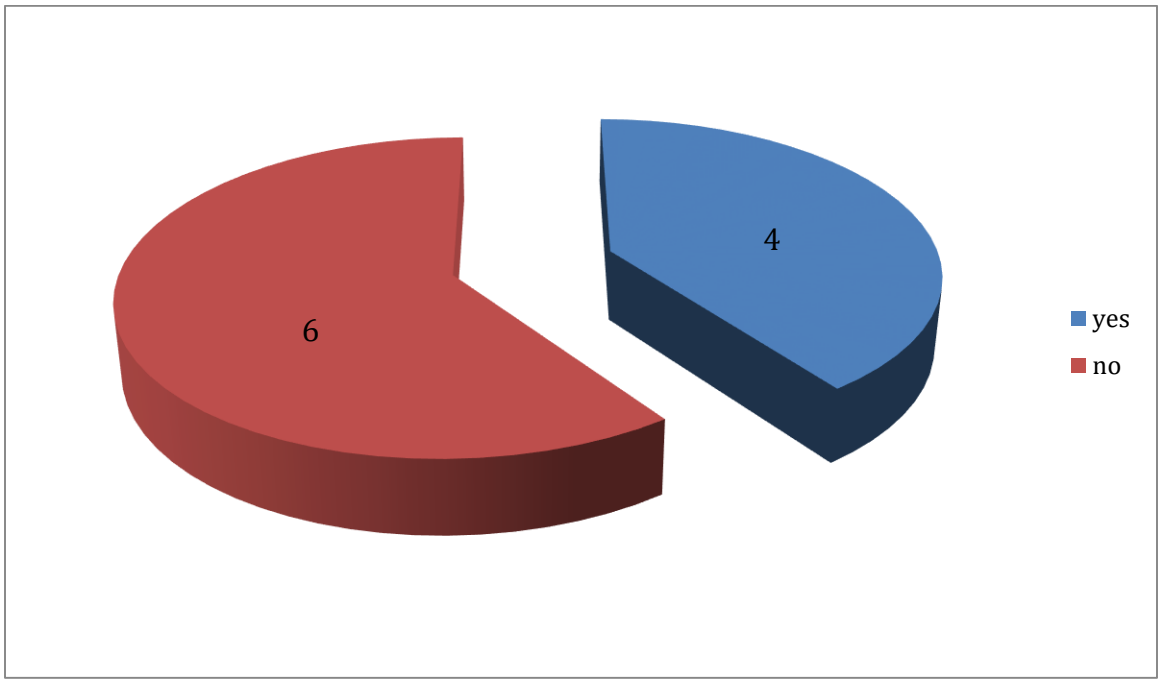


***fig 4.2: Leaners who had enough tools for online learning.***

60% of the students did not have enough tools to use during online teaching and learning.

The teachers who were interviewed had to bring in the same reason that also applied to students. They found it difficult to use Google classroom especially that part of sharing the screen to everyone so that one will show up everything that they will be explaining especially calculations.

Participants were also asked 3 questions relating to their Information Technology (IT) skills and experience using-learning tools. Each question had three ratings, which are: No knowledge, average and good. Responses demonstrated that the majority of users in this section indicated that their skills lay between intermediate and advanced levels (Figure 4.3).

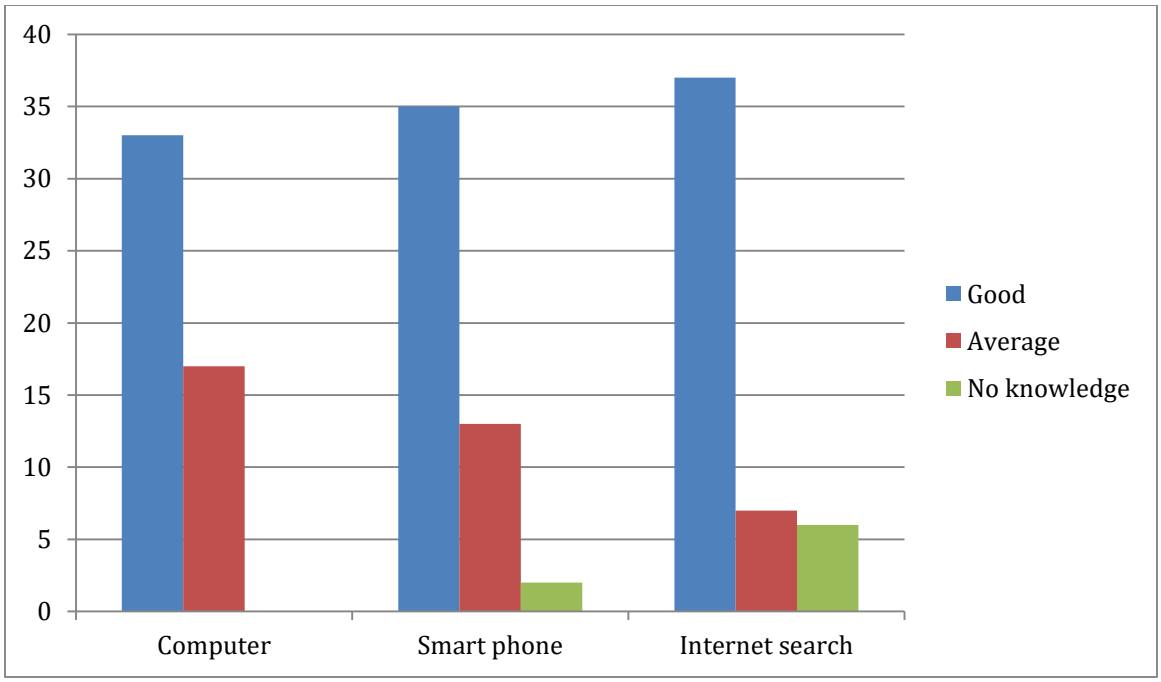


***fig 4.3: IT skills on the selected e-learning tools.***

Another teacher had to say this

"*I don't have a laptop or smartphone to teach these students when I am at home"*

One of the male teachers had this to say

*"My cellphone does not support email to receive assignments"*.

This meant the same with what the students said before. The issue of incompatible gadgets applied to both pupils and teachers. The assessment showed that they both had tools for online learning and teaching but some of them were not able to save the purpose.

### 4.4 Challenges faced by teachers and students during online teaching and learning

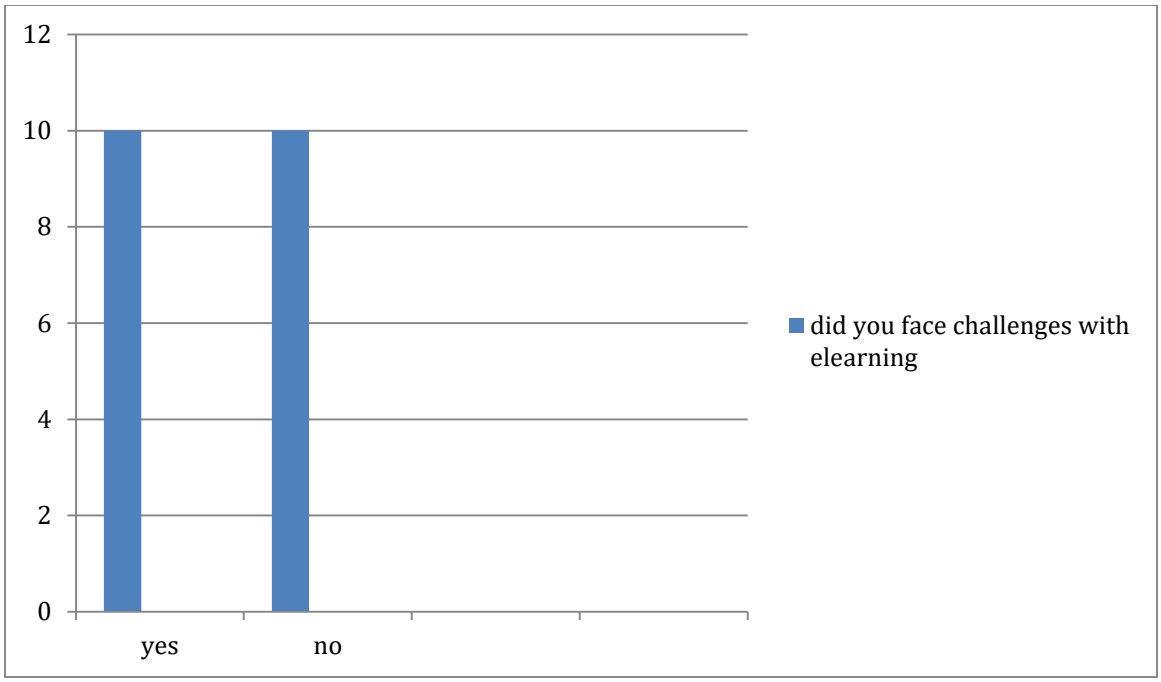


***fig 4.4 challenges of e-learning***

Ten (10) students mentioned that they faced a lot of challenges during online teaching and learning whilst the rest showed that they never faced any challenge

Students' responses were,

*Teachers posted the learning materials when they were almost due for submission*.

This was caused by teachers being computer illiterate in some cases. It took time for teachers and students to communicate with each other. Some of the teachers and students could not fulfill their online meetings sometimes due to poor network connectivity and due to data costs too. Some said some teachers were born before technology so they had challenges using the online learning platforms especially Google classroom that would require one to upload material and forward.

During the interview, one of the teachers responded that:

*Both teachers and students did not manage to connect online because of connectivity challenges and lack of effective gadgets*

Another teacher stated that:

'*Students with low socio-economic background definitely found it difficult to migrate as early as expected to online learning since they did not move around due to the pandemic*.

One of the respondents from the focus group discussion mentioned about human and pets' intrusion. Pets disrupted a lot of pupils during video presentation or when recording a voice not.in the middle of the lesson a dog would bark outside or by the road and the sound will be heard in the background during lessons. Human as well would make noise during lessons which would disturb others.

### 4.3 Addressing challenges on online teaching and learning

The participants in the questionnaire stated that the school should hold trainings on how to use online platforms before giving work or inviting students to use the e-learning since some students and teachers are not well informed with technology. Another student had to say this

"*All students needs to be taught general computer skills in order to do online learning without a hustle"*

The hustle that was being explained was that of moving around asking others how they were doing it in terms of online submission of assignments.

During the interviews teachers also said that if there could be a way to talk to service providers the school would liaise with them to subsidies e-learning data which is far too expensive for students and teachers.

A female teacher said:

"*the school should buy data for teachers since parents are paying school fees for the eLearning facility".*

Teachers also raised another point on the government to intervene in such situations so that they provide online working tools to educators. They said they would prefer tablets than desktop computers so that they do the lessons in the comfort of their homes.

Some students during the focus group discussion alluded that the school would consider the use of text message or sending teachers using hard copies by post since some areas have network connectivity problems.

During the focus group discussion, one of the respondents had this to say:

"*It is better not to use online teaching and learning since it has a lot of problems like network challenge"*.

They suggested that going back to physical face to face lessons was far much better.

Some students also mentioned that the school should raise awareness to the parents so that they understand the importance of online teaching and learning. Parents should be aware so that they support their children with all the support they can give in order for the online teaching and learning to be successful.

**4.4 Discussion**

The researcher noted that the findings on an assessment of online teaching and learning of Physics at Ordinary level are related to the findings of many related literature. Rashid and Yadiv (2017) wrote about tools used by teachers for online teaching and learning. They went on to mention the tools such as Google class and zoom. The tools were also mentioned in the current study. Teachers suggested the use of such tools but at the same time found difficulties in using them. The use of WhatsApp for online teaching and learning was also mentioned as a way of accommodating many students. This was supported by Sakariyau *et al* (2016) who also mention the use of WhatsApp for online teaching and learning since it is user friendly. A lot of teachers and students are very familiar with the WhatsApp platform. He also mentioned that its way much cheaper to use than other online teaching and learning tools.

Vishnu(2020) studies the online teaching and learning and its advantages. He noted that it saves time at the same time it happens in the comfort of homes. The respondents gave out challenges they faced during online teaching and learning. Akiri and Nkech( 2009) also noted those challenges of online teaching and learning. Poor network connectivity was mention in the current study, this was also mentioned by Fishbane in his study. Fishbane, L. & Tomer, A. (2020) researched on what students with no internet access were to do during the Covid-19 pandemic and their results showed that as the level of poverty increases in the community, the rate of internet

accessibilities declined rapidly and by implications, students with no or low socio-economic power to afford broadband connection were most vulnerable to fall behind or encounter additional challenges to meet up with others in online learning. Brown (2019) wrote about human and pets intrusion. It is the unexpected appearance or interruption of family members, friends and or pets that may cause disruption or diversion of online learning participants' attention during the online teaching and learning process. Malcolm Brown, the Director of Learning Initiatives at EDUCAUSE also cited pets' intrusions, through situations where online learning are in progress via videoconference and someone's pet such dogs will be barking, or cat will walk across the table said Manfuso, L. G. (2020) Omotayo, F. O, & Haliru, A. (2020) wrote about online tools that can be associated with e-learning. He cited that Google class is the mostly used online tool worldwide. The ways of addressing online teaching and learning that were mentioned by respondents in the study were also mentioned by other authors who wrote about learning during the Covid 19 era. Anderman (2012) suggested that schools should bring into action more training on e-learning. Teachers also mentioned such. There is need for teachers to improvise the few computers that the school has in their laboratory. Dokora (2017) in his new curriculum urges that the Ministry of Primary and Secondary Education should organize seminars and workshops more often for teachers and parents in order to update them on change of curriculum which needs more of online business.

### 4.5 Chapter Summary

The previous chapter looked at the methodology used in the research which guided this research. In this chapter data was collected from the respondents and presented in the form of pie charts, tables and graphs. The data includes respondents' demographics, their responses and a detailed analysis of the results. The findings were extracted from responses of the respondents from interviews, questionnaires and focus group discussions. The next chapter will look at the general conclusion, summary of findings and recommendations to the study.

# CHAPTER FIVE
# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Introduction

In this chapter, the statement of the problem was stated and matched with the results of the research findings, discussion of the findings of the study and final judgment reached on how the assessment was resolved.

In this chapter the study looked into the conclusions made from findings with regards to assessment of online teaching and learning of Physics at ordinary level and the sentiments given by the respondents in respect with the way forward on how they would want to continue teaching and learning online even after Covid 19. After these, conclusions were made, the chapter went on to make recommendations on what needs to be done to ease the challenges of online learning if students and teachers are to effectively learn online and produce better results.

## 5.2 Summary of the study

The researcher sought to assess the level to which online lessons are integrated in the teaching and learning of physics. The research objectives of the study were as follows:

1. To determine the tools used by teachers and students for online teaching and learning of physics at Ordinary level?

2. To identify the challenges faced by teachers and students during online teaching and learning?

3. To suggest ways in which these challenges can be addressed?

The study was important as it was to enlighten educational institutions to understand the nature of administering online learning both in the event of natural catastrophes which hinder physical learning and also as a way of adopting the developing trends in technology so as to suit the demands of the 21$^{st}$ century teaching and learning. The research revealed some of the challenges that are encountered in administering online teaching and learning. These challenges helped the researcher to come up with recommendations that can be used by academic institutions to help the alleviate these challenges. The review of literature was done so as to determine what other scholars established with the regards to the topic under research. This provided much input to the research under study.

The research employed a qualitative case study design because it allowed the researcher to collect reliable data basing on the participants' experiences. The study was centered on a secondary school in Mberengwa District, Midlands Province, Zimbabwe and 50 participants were selected to take part in the study. Interviews, Focus Group discussions and questionnaires were used to gather data from research participants at the school.

### 5.2.1 Student attitude towards online learning.

Research findings indicate that students had a negative attitude towards online learning. This was instigated by teachers' lack of preparedness to carry out online teaching. Most teachers lacked innovation in delivering attractive lessons on the e-learning platforms. Some learners enjoyed the comfort of being at home sleeping, playing or watching movies when lessons were being conducted. Hence they had negative attitude towards the online learning.

### 5.2.2 Impact of student and teacher IT skills in online teaching and learning.

The covid-19 pandemic pounced at a time when no one was prepared for it. Introduction of e-learning was a nightmare to both learners and teachers who were not prepared for it. Mberengwa being a rural marginalized area, most students from the school under study come from backgrounds where they are not exposed to emerging trends in technology. Most of the learners were novice to the demands of technology yet teachers wanted to cover syllabi ignoring the fact that their recipients could not cope up with the teacher's pace. Therefore lack of IT skills by the learners posed a challenge to them in taking part in the online teaching and learning. Some teachers were also not well versed with IT skills which made it very difficult to deliver the lessons to learners through the online platforms. Therefore lack of IT skills by the parties concerned posed a great challenge for meaningful online teaching and learning to take place.

### 5.2.3 Impact of availability of the tools needed for online teaching and learning.

Due to poor socio-economic status of the participants under study, most of them did not poses the basic tools needed for meaningful and varied online teaching and learning to take place. E-learning platforms like G-meet G-suit and ZOOM requires large quantities of internet data bundles of which it is very expensive to most learners and teachers in Zimbabwe. The gadgets themselves like smartphones, tablets and laptops which are needed for e-learning are very expensive according to

the socio-economic status of the research participants. Those not in possession of such gadgets could not afford to attend the online lessons hence they were left behind. Any e-learning platform is supported by availability of electricity. All the gadgets and availability of network depends on the availability of electricity. With erratic power outages experienced in Zimbabwe most of the lessons were disrupted because the e-learning gadgets ran out of power or network could be down because of load shedding.

### 5.3 Conclusions

From the research findings there were several challenges faced by both teachers and students. The major challenges discovered were poor network connectivity, no network in some areas, expense of data bundles such that some students could not afford to go online for e-learning, some students did not have gadgets that can connect to the internet and lack of knowledge on how to use the virtual learning platforms. The researcher concluded that students had a negative attitude towards learning Physics online. Parental guidance is also lacking with some parents influencing students to concentrate only on Combined Science. Teachers did not attend to individual differences during online teaching and learning. They also lacked motivation

### 5.4 Recommendations

#### 5.4.1Recommendations for practice

The present study recommends a sustained monitoring and updating of the e-learning resources and availability of sufficient number of information technology personnel in schools. Multiple training workshops are needed in order to increase the student and teacher awareness of online teaching and assessment .This can be done by improving the current teaching development program. Furthermore, the adoption of teaching through complete and partially online teaching, and a total shift from physical attendance to online ones are encouraged in the future so as to move with the demands of the $21^{st}$ century technology despite the emergence of Covid-19. Teachers need financial help in the form of loans to improvise equipment that are difficult to get and not wait for the institution to provide everything. Teachers need to be trained in order for them to be capable of using modern technology in the teaching and learning process. There is need for supervision to ensure that teachers plan and prepare well before the online lessons commence .

Teachers need to be trained in order for them to be capable of using modern technology in the teaching and learning process.

### 5.4.2 Recommendations for further research

From the research findings the researcher would recommend that researchers look at whether online learning give equal learning opportunities for students living in remote areas with students where there is network connectivity. Another research could be carried out to find ways of mitigating students' challenges on using virtual learning in secondary schools especially those that live in areas where there is no network connectivity or when students cannot afford data and gadgets for use.

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## APPENDIX A: RESEARCH QUESTIONNAIRE FOR STUDENTS

Dear esteemed respondent,

My name is **Nyembezi Esther Zviuya registration number B1646265. I am** a final year student currently studying towards Bachelor of Science Education Honours Degree in Physics at Bindura University of Science Education. I am carrying out a study on "*AN ASSESSMENT OF ONLINE TEACHING AND LEARNING OF PHYSICS AT ORDINARY LEVEL"*. This is in partial fulfillment of my degree program.

Kindly note that your privacy is guaranteed and your responses will be used only for academic purposes. The researcher will appreciate your assistance as far as this research is concerned. Your participation in this survey is voluntary. If you wish not to participate there will be no penalty for that. There are no benefits which will be attached if you participate in this survey. Some of the questions may be sensitive and some may require you to divulge confidential information about the organizations under review.

For any concerns you are free to contact me on **+263 78 2171 332**

By ticking the agree box below it shows that:

- you have read and understood the information above
- you voluntarily agree to fully participate in the survey objectively

Agree ☐ Disagree ☐

Thank you

**SECTION A: INTERVIEWEE BACKGROUND INFORMATION**

(Tick in the box appropriate √)

1. What is your sex ?

Male ☐ Female ☐

2. What is your age group ?

10 -15 yrs ☐ 16-18yrs ☐ 19 and above yrs ☐

**SECTION B: QUESTIONNAIRE FOR STUDENTS**

My name is Zviuya Nyembezi E studying towards the Bachelor of Science Education Honours Degree (Physics). The research topic under study is an assessment of online teaching and learning of Physics at Ordinary level. The purpose of the questionnaire is to assess the use of online learning and its challenges.

- How was online learning received by both learners and teachers during COVID 19?

  1 when did your school begin online learning?

  ☐ Before the emergence of Covid 19

  ☐ During the emergence of Covid 19

  ☐ Never

  2 Did you have tools to use during online lessons?

  ☐ Yes

  ☐ No

  3 Were students and facilitators prepared for online learning?

  ☐ Yes ☐ No

  If yes, give a brief explanation on how they were prepared.

  ……

  ……..

4 Did you face any challenges with online learning?

☐ Yes ☐ No

If Yes, state any three challenges faced

i……

……

ii……

……..

5 State any three challenges faced by teachers in using online tools to deliver their lessons

i……

……

ii……

……

6 Will learners and teachers embrace online learning after Covid 19?

☐ Yes ☐ No

Give two reasons for your answer.

i……

……..

ii……

……..

7. How best can you address the challenges that you faced.

i. ……

……

## APPENDIX B : INTERVIEW SCHEDULE FOR TEACHERS

1. Were you prepared to do online learning when Covid 19 emerged?
2. Did you have enough tools/gadgets to use for online learning?
3. Was it easy or difficult to communicate using online methods? Give a brief explanation.
4. Was everyone in your class able to be online during lessons
5. What challenges did you face during online teaching and learning
6. How best do you think some of the challenges can be dealt with?

## APPENDIX C: FOCUS GROUP DISCUSSION SCHEDULE WITH STUDENTS.

1. What was your reaction when online learning was introduced?
2. Did you have tools for online teaching and learning
3. What challenges did you face during online teaching and learning
4. How can we solve the challenges?

# APPENDIX D: INTERVIEW CONSENT FORM

My name **is Nyembezi Esther Zviuya registration number B1646265** a student at Bindura University of Science Education. I am currently conducting a research study titled: "*An assessment of online teaching and learning of Physics at Ordinary level"* in partial fulfillment of my Bachelor of Science Education Honours Degree in Physics. I do hereby request for your consent to take part in this study.

The study seeks to explore the tools which are used by teachers and students for online teaching and learning of physics at Ordinary level, the challenges faced by teachers and students during online teaching and learning and how can these challenges can be addressed. The study will help you to understand if online lessons are effective in teaching Physics. Thus enabling you to adopt measures necessary to address the challenges.

In conducting this study, the investigator was cleared by Bindura University of Science Education. Permission to conduct this study was also granted by the selected school where the research is being done. Kindly take note that the investigator will not share information obtained from this study except with Bindura University of Science Education and for academic purposes only. All the collected data will be kept under lock and key.

**Please take note of the following conditions which you need to know before you give consent to participate in this study:**

Your participation in this research is voluntary and you will not receive any payment for participating in this interview. On the same context you do have the right to refuse to answer any

question or to end the interview. Important to note is that your identity will remain secure and the investigator will not mention you by name when compiling the research findings. The interview will last from 10-20 minutes.

If you have any question which may need clarification as far as this study is concerned you are free to contact me on +263 782 171 332

By signing this document, it shows your agreement to the terms indicated above and that **y**ou have read and understood the information given to you. You will be given a copy of the consent form.

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I have read and understood the explanations given to me and I am giving my permission voluntarily

Participant's signature Date signed

…… ……

Investigator's Signature Date signed

…… ……