

BINDURA UNIVERSITY OF SCIENCE EDUCATION



**AN ASSESSMENT OF EFFECTIVENESS OF MICRO SCIENCE KITS TO
BIOLOGY STUDENTS WITH REFERENCE TO MUGABE SECONDARY SCHOOL
IN UZUMBA DISTRICT: A CASE OF MUGABE SECONDARY SCHOOL,
MUREHWA, ZIMBABWE**

BY

THUBELIHLE NORUFURE (B1646710)

*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 Biology*

BINDURA, ZIMBABWE

SEPTEMBER 2022

DECLARATION

This research project report is my original work and it has not been submitted to any other examination body. No part of this research project should be reproduced without my consent or that of Bindura University of Science Education.

Signature: NORUFURE T.

Date: 30 September 2022

(B1646710)

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RELEASE FORM

NAME OF STUDENT: Thubelihle Norufure (B1646710)

DISSERTATION TITLE: AN ASSESSMENT OF EFFECTIVENESS OF MICRO
SCIENCE KITS TO BIOLOGY STUDENTS WITH
REFERENCE TO MUGABE SECONDARY SCHOOL IN
UZUMBA DISTRICT: A CASE OF MUGABE
SECONDARY SCHOOL, MUREHWA, ZIMBABWE

DEGREE TITLE: Bachelor of Science Education Honours Degree in
Biology

YEAR GRANTED: 2022

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SIGNED: T. NORUFURE

DATE: 30/09/22

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APPROVAL FORM

The undersigned certify that they have read and recommend to Bindura University of Science Education for acceptance, a dissertation entitled; *“An Assessment Of Effectiveness Of Micro Science Kits To Biology Students With Reference To Mugabe Secondary School In Uzumba District: A Case Of Mugabe Secondary School, Murehwa, Zimbabwe”* submitted by **Thubelihle Norufure (B1646710)** in partial fulfilment of the requirements for Bachelor of Science Education Honours Degree in Biology.

STUDENT

DATE

Thubelihle Norufure

30/09/22

SUPERVISOR

DATE

.....

.....

ABSTRACT

The purpose of the study was to assess the effectiveness of micro science kits to biology students with reference to Mugabe Secondary School in Uzumba district: a case Of Mugabe Secondary School, Murehwa, Zimbabwe. The objectives of the study were to compare the overall practical skills acquisition of Biology students at Mugabe Secondary School taught practical work using micro science kits with those taught without using the micro science kits, to determine whether Micro Science kits are of any significance in the skills acquisition process of Biology students taught practical work using micro science kits with those taught without using them, to identify challenges faced on the use of micro science kits at secondary school level and to recommend the solution to enhance the performance of Biology students at Mugabe School. The researcher used a qualitative approach. A qualitative case study design was used. From a population of 45 O-Level Biology students and 8 teachers a sample size of 20 respondents was selected. To obtain data the researcher used interviews for teachers and administrators and observation for students. Data collected was analysed using descriptive method to report commonly held view. Qualitative data was analysed using document analysis. The researcher found out that the majority of teachers who participated in this study believed that micro science kits were useful in skill acquisition of students as this can aid the practical aspect which is essential to this subject and in the long run the performance of the Biology students and any other Science subjects can be positively enhanced. Since the school does not have a proper laboratory the kits are essential. The researcher recommends that the school should focus on seeking alternative funds to ensure the availability of the micro science kits to enhance teaching and learning of Biology. If the kits are sourced there can be a positive change in the performance of students at O level.

DEDICATION

My special dedication goes to my family due to their endurance in for my absence during the course of my study studies. My brother, Memory M. Norufure, this is a challenge to you to work very hard and achieve the best in life.

ACKNOWLEDGEMENTS

My outmost gratitude goes to the Almighty God for granting me the opportunity, strength and wisdom to carry out this project. I am grateful to my supervisor Mr W. Mnakandafa for his wisdom, intelligent guidance, direction, quality and effective research endeavours otherwise it would not have been not so well without his expect analysis and guidance. Greatly appreciated is also Mugabe Secondary School.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

The study of Biology by students is a great enterprise upon which nations depend. Biology as a Science subject has the potential of developing citizens in an overall and integrated manner, such that they are scientifically and technologically literate and competent in scientific skills. Science education also leads to practice of good moral values, scientific and technological advances. It makes individuals to manage nature with wisdom and responsibility for the betterment of mankind (Kenya Institute of Curriculum Development, 2018). In Zimbabwe, Biology is a subject in the school curriculum for students in secondary schools. The study of Biology is designed to produce students who are literate in science, innovative and able to apply scientific knowledge and process skills in decision making and problem solving in everyday life. Biology prepare students who are more scientifically inclined to pursue the study of science careers at the post-secondary level like nursing, veterinary doctors and medical doctors.

It gives you a better understanding of various living beings, be it human beings, animals or plants. The study of Biology cannot be emphasised as it explains the changes of the human and animal bodies, shape different careers, provides answers to large-scale problems, teaches concepts on basic living and paves way for scientific investigations. Recent studies have shown that unique learning environment and resources among other things are effective in helping students construct their knowledge, develop logical and inquiry type skills and develop psychomotor skills (Millar, 2004).

Practical work may be considered as engaging the learner in observing or manipulating real or virtual objects and materials (Millar, 2004). Appropriate practical work enhances learners experience, understanding, skills and enjoyment of science. Practical work enables the students to think and act in a scientific manner. The scientific method is thus emphasized. Practical work can induce scientific attitudes, improve conceptual understanding and enable learners to develop science process skills.

One solution to overcome problems associated with Biology practical work would be through the implementation of micro science kits. The use of micro science kits is a laboratory based, environmentally safe, pollution-prevention approach which is accomplished by using miniature glassware and significantly reduced amounts of chemicals (Singh, Szafran & Pike, 1999). Micro science kits can be used even in absence of laboratory buildings.

1.2 Background of the study

The issue of poor achievement in secondary school science has been a subject of debate in Zimbabwe. Attempts have been made to argue and explain without making a critical analysis of possible factors. In Zimbabwe and possibly the world over, Science and for the sake of this study Biology is viewed as an essential tool for solving everyday problems, for example as a tool for employment, attainment of further studies, vehicle for critical thinking, and also as a language of communication (Chirume & Chikasha, 2014). Despite its usefulness, importance and high esteem, many people consider or find it to be difficult to comprehend. Statistics show that many students fail and drop Science subjects in their course of study. Some researchers have shown that anxiety over and negative attitude to Biology as a subject are common among most students and even among some of the teachers.

The Ministry of Primary and Secondary Education (2019) reports that about 40% of the secondary schools in Zimbabwe who do science subjects with Biology included have failed to attain any passes in the subject in recent years. According to MOPSE (2019) the impact of high rate of failure in schools has serious consequences not only for the students but also for the country as there will be a knowledge gap.

According to a study by the UNESCO (2016), only ten percent of schools offering sciences at secondary school level are well resourced with fully equipped science laboratories. The high rate of lack of failure in science subjects in schools can be attributed to lack of resources that is science lab laboratories, chemicals, equipment and qualified teachers.

Looking at the statistics, Zimbabwe has several schools which offer science subjects and such statistics have made the researcher want to look at why there are high rates in failure. This is also, why the focus of this study was to assess the effectiveness of micro science kits as a way

of reducing the effects of lack of resources in schools by focussing on Mugabe Secondary School. Mugabe Secondary School is in Mashonaland East Province of Zimbabwe which offers science subjects and has been witnessing a low percentage of pass rate that is 5% in Biology at Ordinary level.

1.3 Statement of the problem

As a field of science, Biology helps people to understand the living world and the ways it's many species who include humans function, evolve, and interact. Advances in medicine, agriculture, biotechnology, and many other areas of biology have brought improvements in the quality of life. Fields such as genetics and evolution give insight into the past and can help shape the future, and research in ecology and conservation inform how we can protect the planet's precious biodiversity (Immo, 2021). So the study of Biology is essential as it can provide an in-depth, scientific understanding of how all living and non-living organisms interact with each other.

Biology is considered to be one of the key subjects in any school curriculum for which the study of it cannot be over emphasised as it can address various key factors and health concerns. Student performance in Biology has continued to challenge concerned stakeholders in Zimbabwean education for a long time now. Some have pointed this to lack of resources in schools. It is against this background that this research sought to assess the effectiveness of Micro Science kits towards the teaching and learning of Biology as a way of covering up this gap. As a result, there was a need to investigate if micro science kits can enhance the performance of Biology students at Ordinary Level.

1.4 Aim of the study

The research aims were to assess the effectiveness of micro science kits to Biology students at Mugabe Secondary school in Uzumba district.

1.5 Research objectives

The objectives of this study were

- i. To compare the overall practical skills acquisition of Biology students at Mugabe Secondary School taught practical work using micro science kits with those taught without using the micro science kits
- ii. To determine whether Micro Science kits are of any significance in the skills acquisition process of Biology students taught practical work using micro science kits with those taught without using them.
- iii. To identify challenges faced on the use of micro science kits at secondary school level.
- iv. To recommend the solution to enhance the performance of Biology students at Mugabe School.

1.6 Research questions

- i. Is there any difference in performance and skill acquisition in Biology students at Mugabe Secondary School taught using micro science kit and those who do not use them?
- ii. Are Micro Science kits of any significance in the performance and skills acquisition of Biology students at the school?
- iii. What are the challenges of using Science Kits at secondary school level?
- iv. How can performance of Biology students at Mugabe School be enhanced?

1.7 Assumption of the study

The study was of the assumption that all the targeted participants that is the teachers, students and the administrators fully attribute to the success of this research through fulfilling the objectives of this study. Another assumption was that the participants will cooperate by giving their honest opinion which gives the research authentic information.

1.8 Justification of the study

The results from this study is of great significant to the major stakeholders of education who are the Ministry of Primary and Secondary Education, the students, the teachers, the parents and the Non-Governmental Organisations. This is because they can address such challenges as poor performance and skill acquisition of Biology students by bringing a less expensive way to practical lessons.

This study is of great significance to various stakeholders -:

1.8.1 Government

In as much as the government is trying to assist people socially and economically, performance of students in education has not been given much attention with the relevant ministry which is the Ministry of Primary and Secondary Education only concentrating on implementation and introduction of science subjects at secondary schools. This is because mostly those who are in authority do not have much time to reflect on the requirements for introduction of science subjects in schools. Interaction is necessary as the way to go since it is the only way they can be able to hear what the students and teachers are encountering in terms of resources hence the need for this research. This research seeks to compliment other researchers in Zimbabwe and beyond to assist policy makers in coming up with relevant policies which help schools in terms of resources which can be used in schools to enhance performance of students. Therefore, the causes of poor performance at Ordinary Level Biology are going to be highlighted in the study with the provision of first-hand information

1.8.2 School administrators

This study is of paramount importance to school administrators and development players as it provides a platform for possible solutions in the planning and resourcefulness of schools. This study will provide a baseline for planning and programming of the administrators.

1.8.3 Other Researchers

The study is also important in that it is providing other researchers, students, and the Bindura University Science Education as an institution of higher learning with information that can be used by other students doing researches focusing on the effects of resources on performance of students at any level of education in Zimbabwe and beyond.

1.8.4 Mugabe Secondary School

Mugabe Secondary School is aiming to be one of the schools with high pass rate in sciences in the near future. Studies have shown that resources are essential in enhancing the passrate of student. Therefore, with the right support and resources students can perform just as well as other students in well resourced schools. This research will work as a guideline for what the school is to do to enhance the performance of their students.

1.8.5 Parents and the community

To eliminate some of the challenges affecting the performance of the students the parents and the community at large's support is essential. The community can indirectly benefit from the success of their children in education. This study can therefore inform the parents and community on what they need to do so as to improve the performance of their children. This study can therefore assist the parents and the community with first hand information on what is needed to do for example the local business community can chip in with some donations.

1.9 Limitations of the study

One of the major challenges encountered is that of resistance from participants in fear of the COVID-19 pandemic and some may not volunteer to give information essential for the study. For example, some teachers refuse to divulge information on shortage of resources and facilities due to the Ministry of Primary and Secondary Education's policies on issuing out the organisation's information. This could have not bring out perceived results, as desired answers

may have not come. To counter such a challenge an agreement had to be signed with the Ministry of Primary and Secondary Education (MOPSE) district offices and schools' authorities that the information shall be kept in privacy.

The researcher is also a full time employee and is sometimes required to work outside normal working hours hence time constraints were faced in preparing this research. The research was to be completed in two months but the researcher required more time to collect the information. There was every need to give the students one or two more activities but time did not allow that. Enough resources to use throughout the study were not be available due to financial constraints. For some information like pass rates and usefulness of micro science kits internet, school records, newspapers, publications and journals were used.

1.10 Delimitation of the study

The study was limited to Mugabe Secondary School only. Science teachers, school administrators and Ordinary level Biology students were the only participants in the study. This was because Biology is a practical based subject where experiments are done. It was ideal to include the science teachers in the study as they facilitate in the teaching and learning of science and Biology subject in particular. As for the administrators they were key in this study as the ones responsible for acquiring of learning materials from the fees paid by the students. The choice of Ordinary level Biology learners was key as they are the main stakeholders in the learning of Biology at Mugabe school. They were also key to the study as they are the ones who use the micro science kits in their studies to enhance their skill acquisition.

1.11 Definition of key terms

Micro science kit – It is a portable science laboratory in a box where learners experience hands-on practical activities for themselves in a classroom setting which gives them excellent insight into and better understanding of science concepts (RADMASTE MICROSCIENCE, 2021).

Biology – The study of living organisms, divided into many specialized fields that cover their morphology, physiology, anatomy, behavior, origin, and distribution (Merriam Webster dictionary, 2022).

MOPSE - The Ministry of Primary and Secondary Education which is the relevant ministry responsible for the primary and secondary schools in Zimbabwe headed by the Minister of Primary and Secondary education and cascades to provinces and districts.

Science - The use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process (The National Academy of Sciences, 2020).

Ordinary level - is a subject-based qualification conferred as part of the General Certificate of Education and is an internationally recognised qualification designed for 14-16 year olds for which it is equivalent to Cambridge IGCSE and the UK GCSE (MOPSE, 2015).

1.12 Chapter Summary

This chapter identified the problem and its setting, with focus on the background of the study, statement of the problem, major research aim, objectives, research questions, justification of the study, delimitations, limitations and definition of key terms. The next chapter focuses on the conceptual framework that informs the study and review of literature related to the area under study.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The previous part introduced the research problem and gave the background to the study, the guiding research questions, significance of the study and research were also discussed. To find solutions to the posed research questions, international, regional, and Zimbabwean literature related to this study are reviewed. The importance of this exercise is that it scopes out knowledge gaps. Specific focus of this part is to examine literature on the effectiveness of micro science kits on Biology students.

2.2 Conceptual framework

A conceptual framework is defined as a written or visual representation of an expected relationship between variables (Swaen, 2015). Camp (2001) further defined a conceptual framework is a structure which the researcher believes can best explain the natural progression of the phenomenon to be studied (Camp, 2001). The conceptual framework can be linked with the concepts, empirical research and important theories used in promoting and systemising the knowledge espoused by the researcher. It is the researcher's explanation of how the research problem would be explored.

In this instance, the researcher is of the opinion that regardless of the intelligence of students' lack of resources to use in practical subjects can be a hindrance to their success. Such matters which can affect the students can range from lack of adequate resources to use and attitude

towards the subject. Even though school may try to equip schools with text books they cannot be enough for science subjects as they are a practical subject.

2.3 Theoretical framework

The theoretical framework articulates the theoretical views expressed by experts in the field into which you plan to research (Scott & Usher, 2005). A theoretical framework is important as it consist of concepts together with their definitions and reference to relevant scholarly literature and existing theory that is used for the particular study. Theoretical framework has also been defined as an element of a conceptual framework that situates the relationships explored in the study into the context of developing or testing formal theories (Ravitch & Riggan, 2017). In this study, the researcher is guided by Dewey's 1859 theory of Progressive Education.

The theory is being used in this research as it is famous in the progressive learning that is learning by doing. The theory of Progressive Learning emphasises on hands on approach to learning. The theory in this study intend to explain or emphasise on child centred learning whereby children learn by experimenting. If we are to look at the Zimbabwean education curriculum the students learn by doing for which Biology is a practical subject whereby students can learn by experimenting on their own and come up with their own conclusion.

The theory applies to the study in that the Biology as a subject has much content which emphasise on practical. In this instance the students have to experiment in such a way that if they are now in the field of study they have to apply the knowledge they acquired from their practical sessions.

2.4 Empirical Evidence

2.4.1 Differences in performance and skill acquisition of Biology students

From previous researches, micro science kit has been regarded as an alternative approach in science practical work. A research by Rachmawati (2005) emphasised on what brought about the micro science kits. According to the study the kits were developed as teaching materials in

South Africa by the UNESCO associated Centre for Micro science Experiments. The initial development of the micro science kit approach by cooperation UNESCO and IUPAC (International Union of Pure and Applied Chemistry), focused on secondary school needs such as a practical approach to the subject, particularly in chemistry and not any other subjects. In doing so there was not major focus on performance of students which is the thrust of this study.

Micro science kit developed for chemistry lab named Microchem (Akoobai & Bradley, 2005). About 400,000 packages have been distributed to all district in South Africa and the socialization of the utilization this tool has spread outside of Africa, such as Bangladesh, Hong Kong, Brazil and Ireland (Akoobai & Bradley, 2005). Bradley found that the chemistry lab using micro science kit for chemistry can be used as an alternative implementation of chemistry experiment in a condition of funding, laboratory, equipment and materials.

2.4.2 The significance of micro science kits

In relation to this study, regionally there was a study which investigated the effect of integrated micro science kits on student's achievement in Physics practical work among form two students in Kakamega Central sub-county in Kenya. In the study Micro science approach is a new and highly innovative practical science concept that uses very small scale or micro scale apparatus and chemicals (Musasia & Mukhuyu, 2016). According to the study the approach has several of advantages over the tradition approach like that it is cheap, easy to store, and easy to clean, as well as saves on hazardous waste disposal.

If we are to look at the related study there are relations in that the focus is on Micro science kit but there are some differences on the focus and their context. The studies looked at such benefits derived from using the kits such as the cost implications and usability were as the focus of this study is on effectiveness on teaching and learning of Chemistry and Physics. The studies also had an emphasis on the use of micro kits on Chemistry and Physics were, as this study will emphasise on Biology as a subject.

2.4.3 Benefits of using micro science kits

As an emphasis of the Zimbabwean Curriculum 2015 – 2022 learning has to be child centred (MOPSE, 2015). For this to be successful studies identified that the use of such resources as micro science kits can be an answer to this as a safe and practical way to child centred education. In this capacity, most studies have also overlooked the element of performance and skill acquisition of students concentrating on secondary benefits such as overcoming the problems of costs, lack of facilities and time. In relation to performance and skill acquisition of students, studies have also shown that the micro science kits also have a benefit of making learning fun (Bradely, 2010).

2.4.4 Lack of resources and infrastructure

Availability of resources and infrastructure are critical for learning Biology and without which challenges can arise. It is a known fact that most developing countries face many challenges and the most important among them are lack of resources such as experimenting equipment or infrastructure such as state of art Science laboratories (Babu & Bhanu, 2015). The challenge is even worse at schools in a rural setting were as the subject is practical based.

2.4.5 Other factors which affect performance of students

Previous studies has also pointed on some other factors which affect performance of Science students at Ordinary level such as attitudes of both learners and teachers determine how each individual will think and do. Olatunde (2009) argue that attitudes can be positive (values) or negative (prejudice). Equal to student's attitude, teachers' attitudes play a significant role in shaping the classroom environment which has an impact on a student's self efficacy which in turn influences a student's behaviour. The argument was that attitude can be a contributing factor to performance of Biology students without pointing out on the issue of resources in enhancing the performance of Biology students at Ordinary level as Biology is a practical based subject.

2.5 Chapter Summary

This chapter discussed the international and local literature related to the effects of resources on performance of Biology students at Ordinary Level. Most researchers have been dealing

much with what really affects the students' performance in various subjects without dwelling on what can be done to improve the performance of students in practical subjects' especially disadvantaged schools who do not afford to build well equipped science laboratories. This research come with another dimension on recommending the use of science kits on influencing the performance of biology students as a way of bringing the practical aspect in the subject. The next chapter focuses on the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Research methodology can be defined as the path through which researchers need to conduct their research (Sileyew, 2019). Research methodology can also be defined as plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation (Creswell, 2014). To address the key research objectives the research used the qualitative research method.

3.2 Research paradigm

Research paradigm is a term used in educational research to describe a researcher's point of view (Mackenzie and Knipe, 2006). This can pertain to the methodology used by the researcher to interpret data. To make a convincing analysis of the matter at hand there is need for a comprehensive analysis and therefore the study is guided by qualitative research paradigm.

Qualitative research is a research which produces findings not arrived at by means of statistical procedures; a systematic interactive and subjective approach used to describe life experiences and give them meaning (Straus and Corbin, 2000; Creswell, 2009). Thus, qualitative research entails an approach that generates, interprets and describe information by means of words, without incorporating numerical analysis.

3.3 Research design

In this study, Qualitative research method was adopted. Interviews, document analysis and observations were used as an instrument. As indicated by Harwell (2011), subjective exploration approach essentially centers on finding and understanding the encounters, viewpoints and considerations of members.

Qualitative research is an approach for exploring and understanding the meaning of individuals or groups ascribed to a social or human problem (Priya, 2016). In the research, qualitative research method was used. This was done by making use of interview, document analysis and observation as research instruments.

After recording the interviews, observing the students doing practical and looking at the class and school records of biology students an analysis of the data gathered from the respondents was made. The researcher took into consideration the emotions and beliefs of people the data was collected from which made qualitative a better method to use in this scenario. For instance the morale of students doing practical was observed so as to see how motivated they were to do practical unlike when they are just given books to read.

Descriptive research design was used. By using interviews, observations and document analysis as research instruments and consultations from other researches and daily newspapers there was a deeper understanding of the matter in the hand, which was the effectiveness of micro science kits to Biology students.

3.3.1 Justification of qualitative research method

Qualitative research method was chosen because of the benefits derived from it. Qualitative approach has advantages such as:

Some answers and opinion cannot be derived from quantitative method because of the sensitivity and nature of the problem at hand. In this instance, the researcher wanted to see the emotional aspect from the respondents and this was made possible by having conversations with the respondents who were the teachers and the administrators and then have analysis drawn from interviews.

The close relationship that was established between targeted population of science teachers, school administrators and the researcher made it easy for the participants to contribute to shape the research. The study focused on a small number of science teachers that was three, two school administrators and fifteen students to make a total of twenty participants which was easier to construct a meaning from their data than from large groups of people say all the teachers and students which is time consuming.

3.3.2 Weaknesses of qualitative research method

The use of qualitative research approach in this study had an influence on the results because of the following drawbacks:

The approach was time consuming and labour intensive from data gathering to data analysis as the whole process took more time of the limited time of the study due to Bindura University of Science Education's institutional regulations on time of submission. Another drawback was that the interpretation of data which was limited as participants' personal experience and knowledge influenced the interviews and conclusions.

3.4 Target population

Population is the entire pool from which a statistical sample is drawn (Kenton, 2020). In this research, the students, school administrators and teachers from the chosen school are referred to as the population from which data is to be drawn from.

3.5 Sample and sampling technique

A sample is a specific group of people that you will collect data from (McCombes, 2020). In this instance, the data was drawn from Biology students, school administrators and science teachers from the Mugabe Secondary school which a school is offering Biology as a subject. This made the school ideal for the research.

Table 3.1: Sampling procedure

The table below shows the sampling procedure and size of the population of teachers, administrators and students.

Population	Sampling procedure	Size
Teachers and administrators	Purposive	5
Students	Purposive	15

Teachers and school administrators were purposively selected for the interviews as the custodians of students under study. The Biology students were randomly selected so as to give them equal chances for the study.

3.5.1 Sampling Technique

Sampling technique is a process or techniques of choosing a sub-group from a population to participate in the study. It can also be referred to as a process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected (Ogula, 2005).

For the sake of the research, purposive sampling procedure was used where a targeted group of participants who are 3 science teachers, 15 biology students and 2 school administrators were chosen. Purposive sampling technique was chosen as it allowed the researcher to gather qualitative responses, which led to better insights. The technique was also chosen because the researcher wanted to collect information from the best-fit participants who were the science

teachers, biology students and school administrators to make the results relevant to the research context.

3.5.2 Purposive sampling procedure for selecting science teachers, Biology learners and school administrators

This type of sampling involves using judgement to select a sample that is most useful to the purpose of the research (McCombes S. , 2020). This procedure was used for the science teachers, Biology students and school administrators to gain detailed knowledge about a specific phenomenon which was getting the knowledge on the effectiveness of Science kit by citing the performance of their students. It was ideal that the researcher purposely chose this group to get desired feedback. The same applies to the school administrators and science teachers who are responsible for the school's statistical data and also acquiring the needed resources.

To do the selection the researcher specifically asked for the Biology students after approaching the administrator and explain the focus of the study. The same was also applied to the teachers as only those who teach at least a science subject were chosen.

3.6 Research instruments

A research instrument is a tool used to collect measure and analyse data related to your research interest (Institutional Review Board, 2020). As mentioned above interview guide, observation guide and document analysis guide were used as research instruments.

3.6.1 Interview Guide

3.6.1.1 Interviews

This research employed interviews as a research instrument. The administrators and teachers of the chosen schools were interviewed. Interviews were used to gain insights into the participants' subjective experiences, opinions and motivations. For the interviews, there were

semi structured interview questions to guide the researcher. The semi-structured interviews were used as they offered a considerable amount of leeway to probe the respondents along with maintaining basic interview structure. This also created some form of flexibility to the respondent and the researcher because of the nature of the issue which was being studied. After gathering of data, an analysis was done using as the recorded interviews.

Forty minutes were spent to interview each teacher and the only administrator meaning that almost three hours were spent doing the interviews. During the forty minutes of interviews the participants showed maximum excitement on the interview questions and they were willing to discuss a lot about the topic and the administrator even suggested that a Science levy will be charged on the students' school fees so that some affordable laboratory equipment can be readily available for the teacher and the learners.

3.6.1.2 Interview guide for science teachers and administrators

A separate interview guide was used to probe question to the 3 teachers and 1 administrators who was interviewed. This worked as a guidance to make sure that important facts were responded to. Questions like, Do you have any knowledge about micro science kits?, Do you think is well resourced in terms of staff and biology equipment?, and what do you think can be done to improve the performance of students in Biology? Were asked to administrators and teachers. The interview guides can be referred to in Appendix A and B.

3.6.1.3 Strengths of interviews

Interviews as conversations were structured. Strengths that were derived from interviews are that detailed information was obtained from the respondents who were 14 students, 3 teachers and 1 administrators at Mugabe Secondary School and since the interview questions were semi-structured, oversimplifying complex issues was avoided. The researcher was friendly to the respondents as this encouraged openness in answers, as the answers had a bearing on the overall results of the study.

The method also provides insight into complex models of human thought and language use since the interviewer opened a free platform during the interviews to get the exact language from the affected people.

3.6.1.4 Limitations of interviews

Since the interviews involved only the researcher and a single person at a time because of the rules of COVID-19 pandemic, which does not allow crowds the interviews were time consuming, as every single person participating in the interviews had a different slot. So given the number of participants in the research was it took almost five hours to complete the participants selected for this study.

3.6.1.5 Ways of overcoming weaknesses of interviews

As a way of overcoming the weaknesses of interviews above, a research assistance was appointed who helped in quickening the interview process. It quickened the process as two respondents were interviewed at the same time and interference with teachers was minimised as they were on duty.

3.6.2 Observation Guide for Students

3.6.2.1 Observation

Participant observation is the process of immersing yourself in the study of people you are not too different from; enabling researchers to learn about the activities of the people under study in the natural setting through observing and participating in their activities (O'Connor, 2005 as cited in Qaddo, 2019; DeWalt & DeWalt, 2002). In this research there were two groups of Biology students under study. That is the ones who were using Science kits to do their practical and those using textbooks to learn.

To do the given task and writing the test, students were given a maximum of 1 hour. At the end of 1 hour 13 students except for 1 who was slow had finished. During the test the researcher

was observing behaviour, general mood, conversation and context to students who were using Science kits and those using a text book and results were noted.

For the observation refer to the observation guide in Appendix C.

3.6.2.2 Strengths of observation

One of the advantages which was derived from the use of observation was that less cooperation of the respondent was needed as the learners could just be observed carrying out their activities. Another advantage is that the students were observed in their natural surroundings thus avoiding artificiality.

3.6.2.3 Limitations of observation

One major challenge on use of observation was that not everything was observed as there are various personal behaviours and secrets which the researcher did not observe like information of the students' personal opinion.

3.6.2.4 Ways of overcoming weaknesses of observation

To overcome some of the challenges faced through use of observation some other instrument to gather information such as interviews and document analysis were used. So the information gathered through interviews and documents complimented the information gathered from observation.

3.6.3 Document Analysis

3.6.3.1 Document analysis

Printed and electronic documents were systematically reviewed and evaluated like the records from the school, education district offices, the Ministry of Primary and Secondary Education and non-governmental organisations like UNESCO to gather some of the data useful for the study. The data from such documents was examined and interpreted to elicit meaning, gain

understanding and develop empirical knowledge useful to this study. It took three full days to search for the documents used after which two days were used to analyse the information from the documents such as pass rates.

3.6.3.2 Advantages of Document Analysis

As a research design the method provides room for historical insight. For example records like pass rate from previous years. This is an advantage because the researcher made use of historical information to come up with a convincing conclusion.

In addition to the interviews, document analysis can add credibility to the study as the findings across data sets reduced the impact of potential biases that can exist in a single study. From document analysis there is flexibility in that it can be used as a primary method of data collection or as a compliment to other methods.

3.6.3.3 Disadvantages of Content Analysis

A disadvantage of using this method is that it was not easily automated since there was use of words and text only.

3.6.3.4 Ways of overcoming weaknesses of observation

To complement the information gathered from documents analysis observation and interviews were employed.

For the document analysis guide Refer to Appendix D

3.7 Pilot study

A pilot study asks whether something can be done, should the researchers proceed with it, and if so, how (Janghorban, 2014). However, a pilot study also has a specific design feature; it is conducted on a smaller scale than the main or full-scale study.

To determine the feasibility of this research a pilot study was done so as to help in defining the research question. One teacher and one Head of Department who is an administrator were interviewed. The time taken to interview both was 15 minutes which meant the actual interviewing process could take more or less time which was quite reasonable. The participants in the pilot study were also able to answer the questions posed to them.

3.8 Data collection procedures

As a way to formalise the research, the school authorities were approached. This was done by first approaching the MOPSE officials to seek authority. This is because it is the ministry's policy that for anything to be done on their schools permission should be granted first from provincial or district offices. If clearance is granted then a research can now be carried out.

In this instance the researcher obtained a letter of permission to conduct research from the University and the MOPSE office. Upon obtaining the consent, the study was undertaken in two phases that is the researcher being introduced to the participants and the second phase being to carry out the research.

As for the students they were grouped into two with one being given textbooks and the other group being given micro science kits. They were given the same task that was to explain the occurrence of bacteria on the skin, the wall, the air and the students were observed them carrying out the task. At the end they were given a scientific write up test and after they completed, their tests were marked and the marks of the students were compared.

3.9 Validity and Reliability

Reliability of data is defined as the degree to which an assessment tool produces stable and constant results (Oshovele, 2018). The idea behind reliability is that any significant results must be more than a one off finding and be inherently repeatable. According to Moskal et al (2000) other researchers must be able to perform exactly the same experiment under the same conditions and generate the same results. Where reliability is necessary it is not sufficient on its own as there is also need for it to be valid. Validity of data refers to how well a test measures what it is purported to measure (Oshovele, 2018). Validity encompasses the entire experimental

concept and establishes whether the results obtained meet all the requirements of the scientific research method. To test the reliability and validity of the data, the same interview guide can be used to all selected teachers and administrators. After administering the interview questions the results were then compared for consistency.

3.10 Research ethics and legal implication

Research ethics are considerations that provide guidelines for the responsible conduct of a research (Smith, 2003). It should also be known that the participants have some rights that should not be infringed, as the researcher shall discuss below. These are inclusive of right to privacy, right to confidentiality, respect to intellectual property and intellectual property.

3.10.1 Right to privacy

The data collected from the teachers and students of Mugabe Secondary School shall be kept in privacy, as this should not infringe the rights of the participants. The researcher is to ensure safety on keeping the documents like audios from the interviews to avoid unauthorized access.

3.10.2 Right to integrity

As the researcher carried out the research, promises and agreements shall be kept. One of the agreements will be not to reveal the names of the participants who are the students and teachers and that should be done as agreed.

3.10.3 Right to confidentiality

The information collected from the participants who are the teachers is confidential and the information should be handled as like so as not to infringe their rights.

3.10.4 Respect for intellectual Property

During the research, various sources of data like school records and other researches for guidance were used. In doing so the researcher asked for permission were they wanted to use such information and in writing, the sources will have to be cited and referenced to avoid plagiarism.

3.10.5 Non discrimination

The researcher avoided discrimination against some students based on their performance in class. There were equal chances for students and teachers to be selected regardless of who they were at the school.

3.11 Data Presentation and Analysis

In organising the data, the researcher had to classify the data into three that is the students, administrators and teachers. The graphical data was used for analysis that is by thoroughly looking at the response from different participants.

For this research, qualitative data analysis was used. This was done by doing a content analysis of the information that was gathered through interviews, observation and document analysis from the participants. The data was classified after collection so as to discover useful information for decision making with the purpose being to extract useful information. To manage data for this research the researcher organised the data and presented it in a structure by tabulating the data in accordance with the responses.

In organising the data as mentioned earlier, the researcher had to classify the data into three that is the students, administrators and teachers. The classified data was used for analysis by thoroughly looking at the response from different respondents.

3.12 Chapter Summary

The purpose of this chapter was to look into the research methodology and framework used to gather the information. It discussed the population, sample and sampling procedures to be used

in the study, instruments used to collect data and the advantages and disadvantages of the instrument. There was also a discussion of the population under study, reliability and validity of interviews and the ethical issues of this research. Data analysis and collection procedures were also discussed and the data management procedure was outlined. After gathering the data it will now pave a way for presentation of data in the next chapter.

CHAPTER IV: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

The study sought to assess the effectiveness of micro science kits to Biology students at Mugabe Secondary school in Uzumba district. This chapter present data collected from 20 respondents. 3 teachers and 2 administrators were purposively sampled and 15 science students were randomly selected. Of the targeted 15 students 14 were observed. Only 1 administrator out of 2 in the form of the Deputy Head was interviewed with one left because of tight work schedule. Figure 4.1 below shows rate of response for the study.

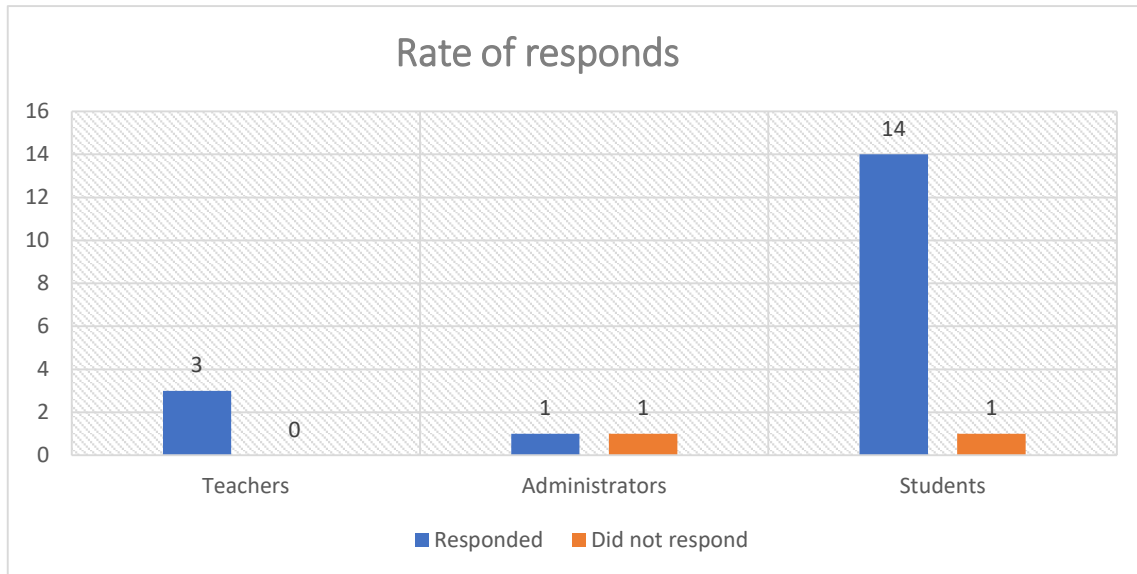


Figure 4.1 Response rate for the study

The rate of response was remarkable with 18 responses out of 20 responding. This was a welcome development towards achievement of the study's objectives.

For the teachers and administrator available interviews were done with all of them being face to face interviews except for one teacher who was interviewed on telephone. The teacher was not at the school but had cited his interest to be interviewed. The first set of respondents who are the teachers consisted of 2 male and 1 female teacher. The administrator was male. For the science students there were both male and female with 9 boys and 6 girls.

The pie chart on Figure 4.2 below represents gender status with 67% male and 33% female.

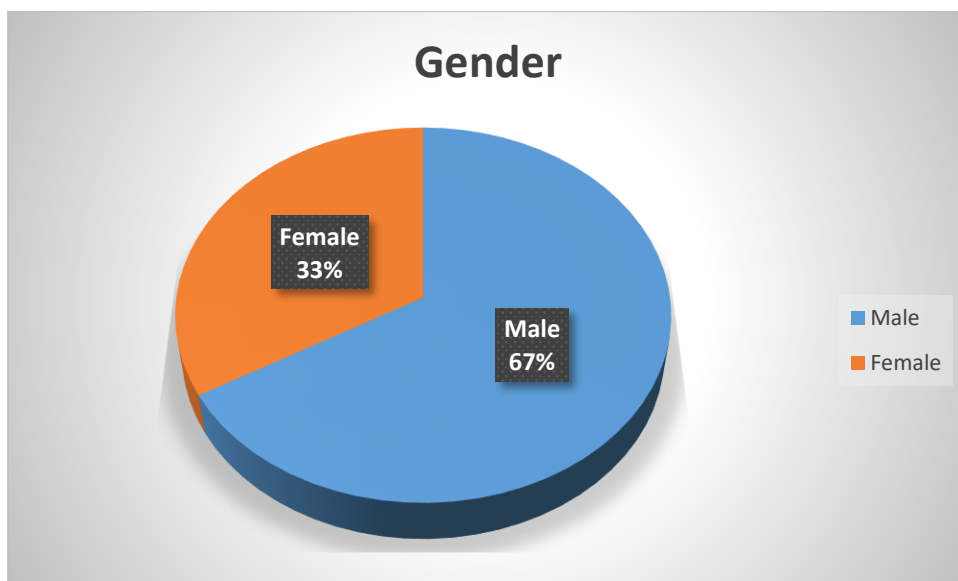


Figure 4.2 Gender status

In overall there was an imbalance between the genders with male participants dominating the respondents. This can be cited by the ratio of 67% of male as to 33% female respondents.

Data was generated using both face-to-face and telephone interviews, observation and document analysis. In presenting the data the researcher began by profiles of the respondents who were selected. Some of the data present the participant's demographics in terms of gender as shown by the diagram above. This is followed by a segment which present analysed and discussed findings under the thematic segments derived from the research objectives. The research therefore provide detailed accounts which reveal the expressions of the participants from the interaction the researcher had with them. Critical issues surrounding the factors that influence the performance of Biology underpinning the effectiveness of micro science kits are discussed. To wrap up the chapter the researcher then give personal reflection on the presented data.

4.2 Profiles of respondents

4.2.1 School administrators

School administrators are people designated by the governing body of a school as ultimately responsible for the ordinary operations of a school (Breuns, 2020). For the purpose of the study, 2 school administrators from Mugabe Secondary School were chosen though only one

responded on the basis of convenience to the researcher who works and live in the same locality. The administrators were sampled with the intention of finding out how the Biology students have been performing with the available resources at the school and to possibly weigh their performance with schools in the same cluster. The administrators are useful as they can easily access results from other schools at the district or provincial level.

4.2.2 Biology ‘O’ Level students

According to Zimbabwe Schools Examination Council (ZIMSEC), Ordinary Level students are students in waiting to write Ordinary Level exams and are known as form 3 and 4s. Ordinary Level is a subject-based qualification conferred as part of the General Certificate of Education. For the study 9 boys and 5 girls at Ordinary level were observed with 7 given kits to use and 7 without kits or any materials.

4.2.3 Teachers

These are the custodians of students at schools who have the first hand information on what transpires at schools in terms of students’ performance. For the teachers there was almost a balance with 2 male and 1 female teacher.

4.3 Data presentation and analysis

The collection of data in this study was surrounded by the research objectives which were spelt out in chapter one. This therefore means that the responses which were obtained from the respondents are presented, analysed and discussed in this section. The order of the presentation is therefore guided by the research objectives that were outlined in chapter one. As for the themes they were derived from the research questions that supported the research objectives and were stated in chapter one. The greater part of the analysis is done using some descriptions so as to give a clearer picture of the experiences of the respondents.

4.3.1 Comparison of the overall practical skills acquisition of Biology students

All the 14 participating students were given a topic. 1 set of students was given a textbook and the other set was given both the textbook and a science kit. They were given 30 minutes to work on a task to observe bacteria on skin, wall, and air (for observation refer to observation guide in Appendix D). The researcher had to take note of the expressions and enthusiasm of the students as they carried out the given task. At the end of the lesson a test was administered to explain the effects and behaviour of bacteria. A different teacher from another class was asked to mark the work and record the marks and to also mention those who had a more convincing explanation.

When the marking was done the majority of the students that is almost 87% from the set of those 7 who were given science kits passed the task. Of the 7 students without the kits only about 43% passed the task. The feedback from the teacher who marked, individuals with a more convincing explanation of the process was from those who had used the kits. The results from the 2 groups concurred with the research which was done by Rachmawati in 2005 who mentioned that the micro science kits were made so as to aid the learners with an understanding where the real resources were not available. Rachmawati went on to conclude that where the kits were used there was a significant improvement of students who used them. Also according to a study and recommendations of UNESCO the micro science were highlighted and recommended to be an intervention where schools are not well resourced.

The results of the activities done by students is reflected by the table below which shows the student marks.

Table 4.2 Results of marked assignment

Category (resources)	Students who scored >50%	Students who scored <50%
Science kit	6	1
Textbook	3	4

From the results of a simple task carried out it can be noted that most students were motivated to use science kits in comparison to use of text books. With such motivation then the student's practical acquisition is enhanced as the group of students who used micro science kits had a more convincing explanation of the activity they were given. It is also worth to note that the students were motivated to use the kits as was shown by their expressions in carrying out the given task.

The kits generated the interest of the students as they all wanted to do the activity unlike those who were using only a textbook. On the group of those who were using a textbook most of them were looking dejected and passive as was observed during the activity. This gave an impression that where no proper apparatus are available the micro science kit can be equally used. This also concurred to a study by Akoobai & Bradley (2005) whose research was of the impression that micro science kits can enhance students' skill acquisition.

4.3.1.1 Teachers' responses

For the 3 teachers who responded, they cited that their students were not of good performance in Biology as was shown by a small 30% pass rate. The interview was guided by the interview guide in Appendix A. Two of the teachers attributed this poor performance to lack of resources such as unavailability of proper science laboratories and equipment. One of the teachers attributed the poor performance to attitude of students in Science subjects. The 3 teachers mentioned that in terms of skill acquisition their students were lagging behind as Biology is a practical subject like any other sciences which require the practical aspect.

From the data drawn from the teachers it can be evidenced that resources such as laboratory equipment is essential in skill acquisition as students who do not acquire any skills in sciences find the subject hard which reflect on their performance. So as shown by the results of the activity given to the students, micro science kit can be sourced and used by students where financial resources are scarce and there is need for students to do the practical.

4.3.1.2 Administrators

One administrator in the form of the deputy headmaster responded to interview questions referring to Appendix B. Two administrators could have been ideal for the research but due to the nature of their job it was not possible. For some guidance the researcher had to make use of school documents such as graphs and mark schedules (refer to Appendix C). The administrator pointed out that Ordinary level Biology pass rate for the year 2021 and also as was evidenced by the graphs in the office was at 30%.

Table 4.3: Biology pass rate

The table below shows the Biology percentage pass rate of year 2020 and 2021

Year	Subject	Pass rate
2020	Biology	19%
2021	Biology	30%

The administrator attributed this poor performance to disturbances induced by COVID-19 pandemic. He cited that the students did not have much time for practical. In this it can be highlighted that the aspect of skill acquisition is important to pass sciences as it can aid the students with much needed knowledge to explain concepts. The deputy headmaster also highlighted that parents were not supporting the students with payment of fees on time as there was need to equip their science laboratories with equipment.

4.3.2 The significance of micro science kits in the skills acquisition process

When a task to explain what happens with bacteria on any surface was administered there were different interpretations by the students. All of the students who had science kit apparatus to use convincingly explained to the teacher on what they had observed. Four of the students who did not have the apparatus to use and only a textbook to their disposal failed to explain the process. As observed there is also potential of micro science kits to enthuse students as they

allow each other to have meaningful hands-on experience in the absence of proper science laboratory and apparatus. This was reflected by the excitement exhibited by those who were using the micro science kits. As emphasised in the Zimbabwean Curriculum Framework 2015-2023 it is important that students take charge of learning to improve on their performance hence the use of science kits where there is scarcity of resources answers this.

The failure by students who did not have science kits or materials to explain the process can be attributed to lack of much needed practical. Had the students been given equal opportunities they could have performed equally to their fellow students with science kits to use. This is because in science it is emphasised that the learning should involve seeing, handling and manipulating real objects and materials in a safe way. According to a study by Musasia and Mukhuyu (2016) the kits were recommended as safe and reliable way of undertaking practicals.

Upon interviewing the teachers, three of them agreed that micro science kits were useful and of great significance as they can aid the students with the much needed practical. Two of the teachers pointed out that there were challenges at the school as parents were facing challenges in payment of fees. The fees were essential as the money can be used to equip the Science laboratories. In such a case they were in agreement that in the meantime students can be equipped with less cheap micro science kits as the kits can bring in the practical aspect of the subject.

4.3.3 Challenges faced on the use of micro science kits in schools

From the way students were handling the micro science kit apparatus it was evident that they were not used to them. From the group of those who were using the apparatus there was one student who was comfortable with using the kits suggesting that she had experience in using them. This suggested that she had her personal resources to aid her performance at school. This student also had a more convincing explanation of the activity carried out. The student confirmed that she had several of such apparatus at home.

Besides the kit which the writer sourced for the study, the school had no any other in the science laboratory. The only student who had access to the kit had sourced it for personal use at home.

Regardless the fact that the science kit was of great significance as it brought the practical aspect to the learners the school did not have any in their laboratory. From the administrator's perspective the school did not have the capacity to acquire any as there are perceptions that science laboratory equipment is expensive.

When the administrator was further probed he highlighted that he did not have science background as he had commercial subjects background. The administrator did not have knowledge of science kits. The science teachers who had knowledge of micro science kits explained that they were facing challenges in convincing the administrators to acquire such as they did not see their relevance.

This showed that there was lack of knowledge from the administrators' perspective on the usefulness of the micro science kits which can also cascade to the parents who can play an important role in acquiring them. So from the interviews it can be noted that there are 2 major challenges faced on the use of micro science kits. These challenges are lack of financial resources because of the setup of the school as the school is in the rural areas where there are low income earners. The second challenge is lack of knowledge. The school administrators and the majority of parents still do not find any significance of the micro science kits as they do not have any knowledge on how and what they are used for.

It can also be noted that challenges in performance of science subjects can differ from one school to another, one country to another and from one community to another. From previous studies it can be noted that in developed countries the issue of resources does not have any hindrance to performance of students but it can be some other factors like attitude and teachers' pedagogical skills as concurred by a study which was done by Olatunde in 2009 who argue that one of the challenge which can affect performance of science students even if resources are available is their attitudes which can be positive (values) or negative (prejudice).

4.3.4 Enhancing performance of Biology students in schools

Good performance at school is every teacher, student and parent's wish. It takes every stakeholder's input to enhance performance of students. In this scenario the students' performance in the given task highlighted that for better performance in Biology as a subject

the students should be equipped with resources to do practical as Biology and any other sciences are practical based subjects. This is where the micro science kits are of great significance especially where there is scarcity of financial resources.

Mugabe Secondary School can adopt to micro science kits as it is a community of low income earners. As a way to achieve this the three teachers who participated outlined several ways of achieving this. They suggested that it was of paramount importance that they should have a buy in of the administrators to acquire the micro science kits. This should work in such a way that it should be thoroughly explained to them that before the school can have adequate financial resources to equip the laboratories there should invest on simple, user-friendly and less expensive kits so that the students do the much needed practical which enhance their skills and performance.

Parents or guardians of students are important stakeholders in the education system because they provide financial, material and emotional support to the student. Some parents/guardians might also provide limited educational support in terms of checking and correcting homework. Hence one of the teachers was of the opinion that the parents of the students should be engaged. The engagement was important in that it will be highlighted to them on why they should acquire some personal micro science kits for their children to do the much needed practicals than to wait for the school which is already strained by some other commitments. Biology is a practical based subject. Olatunde (2009) also argued that attitudes can be positive (values) or negative (prejudice). Equal to student's attitude, teachers' attitudes play a significant role in shaping the classroom environment which has an impact on a student's self-efficacy which in turn influences a student's performance which means it is not only the materials which can affect student's skill acquisition and performance.

For students to fully comprehend the aspects of science there is need to do experiments. The experiments require laboratory apparatus, chemicals and so on. The teachers highlighted that all the components needed to do experiments were in most cases not available. This also had a great effect of the performance of students as they only learn the theoretical part. The teachers highlighted that if this is done then performance of their students can be enhanced and the students come up with a better understanding of the concepts thereby passing the subject.

Just like the teachers the administrator strongly agreed that involvement of parents in school contributes to the good performance of learners in any other subject unlike the parents who did not seem to know how important their input was towards the performance of their children. The significance of parents was even highlighted by Norlin, (2009) who was of the opinion that in order for the school to achieve good results, people involved including parents should work together.

The administrator at Mugabe Secondary Schools highlighted that the major role of parents in education is to pay schools fees on time and to buy needed resources for their children and not rely on schools only. However, as perceived by the administrator most parents were not playing their role as expected. This therefore had an effect on performances of learners at Ordinary level as some learners are expelled from school for fees and come after a longer period of time. At the selected school there was a continuous decline in pass rate to as low as 30% as shown by the records of the school. From further analysis the administrator highlighted that it is mostly those who are economically disadvantaged whose results are poor as compared to the few fortunate enough students.

4.4 Discussion of findings

The first research question was, is there any difference in performance and skill acquisition in Biology students at Mugabe Secondary School taught using micro science kit and those who do not use them? Judging from the results of the test administered to the students show that there is difference in performance and skill acquisition of students who use micro science kits as the attained about 86% pass mark and those who did not use them and it was evidenced by a less than 60% pass mark that is six out of seven and four out of seven passed and failed the task respectively. As was reflected by their responses and comprehensiveness of their explanation to the task they were given it can be noted that micro science kits are a quick and less expensive way the learners' performance and skills can be enhanced. The same was also concurred by Hart (2018) in the study of the Practical work benefits, challenges and solutions.

At the same time there was one student who did not use the micro science kit and only used a textbook. The student had a convincing explanation. Practical work improve students' understanding, develop their skills in solving problems and understanding the nature of science, by replicating the actions of scientists (Shana & Abulibdeh, 2020). This reflected that the student could have gotten the explanation from someone who did the experiment as Shana & Abulibdeh (2020) indicate that no any other activity can beat the aspect of hands on skill acquisition as Biology is a practical based subject. The poor performance of the students who did not use the science kit can as well be attributed to lack of motivation as students might have felt unwanted after being selected on the side of those not to use the micro science kits.

According to Galeot & Zizzo (2012) learners' performance can be affected if they feel that they have been singled out. Emphasis is on creating a suitable environment in which students can feel empowered to self-advocate, without feeling singled out from their peers. So if all the Biology students are given micro science kits they can equally acquire skills like their peers as the kits were useful as indicated by the differences in explanation between the two groups of learners.

In overall and judging from other studies where there are no proper materials or equipment micro science kits can be used in Biology or any other practical based Science subjects to enhance the performance and skill acquisition. The micro science kits can also be recommended for low income schools as an alternative to real equipment and materials as they are cheaper.

The second research question was, are Micro Science kits of any significance in the performance and skills acquisition of Biology students? Judging from the performance of the two groups of learners the micro science kits are of great significance in the performance and skill acquisition of learners. This was shown by the convincing explanations made by majority students who were given the science kit to use.

The same was also shared by Rachmawati (2013) in micro science experiment. Rachmawati was of the emphasis that micro science kits promote sciences in schools. In the study carried out there were conclusions that the kits can allow teachers and students to easily and successfully carry out a wide range of basic experiments. Looking at the school which is in a

rural setup, Mugabe Secondary School for instance, science kits which are cheaper than the real equipment can be of great significance as the student can equally acquire skills.

The third research question was, what are the challenges of using Science Kits at secondary school level? From the investigations of the study the response by the teachers, students and the administrators indicated that the great challenge being faced on the use of the kits is lack of knowledge. The administrators who are responsible for acquiring the resources do not have the knowledge of such kits. This reflects to the teachers who do not sell the idea of buying the kits as a way to enhance the performance of the students. The teachers should be able to convince the administration of such a noble idea and possibly cascade it to the parents or community leaders.

The fourth and last question was, what are the recommendations to enhance performance of Biology students at Mugabe School? Basing on the response it is necessary that students' performance in Biology can be enhanced with practical as they acquire some necessary skills. With Mugabe school's low budget it is ideal that science kits can be acquired. As an alternative, the kits can enhance the performance and skill acquisition of students as they will be doing the much needed practical. In the long run the micro science kits can improve students' understanding, develop their skills in solving problems and understanding the nature of science.

4.5 Chapter summary

The response rate was satisfactory with the targeted number of respondents almost being met given the work commitments of teachers and administrators, societal and organizational activities. Data was solicited from the research participants through observations, interviews and document analysis.

Concerning the demographic composition there were variations in terms of gender and life experience. The male and female ratio for the responds was not even with a 70% to 30% composition of participants. The results obtained from the respondents were then arranged into sections depending on the respondents and a detailed analysis was done in order to derive facts and make a conclusive evaluation on the research topic.

All the 18 respondents gave their opinion through interviews and observation. For ease of comparison and analysis, the factors affecting performance in Biology as a subject were grouped according to the respondents that is the school administrators, teachers and Biology ‘O’ level students. All the respondents except the administrator who was not very clear in regard to challenges in performance of students in Biology concurred that the resources which include lab equipment for practical were not enough to support teaching and learning.

The findings in this chapter were also compared with researches done previously but in a different context. In the next chapter a summary of the findings will be presented. Recommendations from the study will be laid out.

CHAPTER V: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Chapter introduction

This chapter present the summary of the study as per each given chapter. The conclusions were drawn on each research objective based on the findings of the research that were presented in the previous chapter. The last part of this section outline recommendations made to the key stakeholders and for further researchers in the same field.

5.2 Summary of key findings of the study

The decision to carry out this study was motivated by the desire to assess the effectiveness of micro science kits to Biology students at Mugabe Secondary school in Uzumba district. In this study, attention was also on some other likely factors like finding a solution to enhance the skills acquisition of ‘O’ Level Biology students at the school under study.

The study was guided by the following objectives:

- v. To compare the overall practical skills acquisition of Biology students at Mugabe Secondary School taught practical work using micro science kits with those taught without using the micro science kits
- vi. To determine whether Micro Science kits are of any significance in the skills acquisition process of Biology students taught practical work using micro science kits with those taught without using them.
- vii. To identify challenges faced on the use of micro science kits at secondary school level.
- viii. To recommend the solution to enhance the performance of Biology students at Mugabe School.

This study explored the factors leading to the learners' poor performance in Biology subject and if the micro science kits can be an alternative to poor performance of Biology students. It sought to answer the question "Is there any difference in performance and skill acquisition in Biology students at Mugabe Secondary School taught using micro science kit and those who do not use them?" The investigation was done because Biology is regarded as a subject that is in demand in respect of the health services globally. The poor results at Mugabe Secondary School made the need to discover factors behind poor performance and assess the usefulness of micro science kit as a way of enhancing performance of students. There have been some interventions by several stake holders like buying a few textbooks but there has not been any noticeable changes which shows that the root cause of the learner's poor performance in the Biology has not been addressed.

This research's findings have found out micro science kits to be effective in the teaching and learning process of students. Several factors which affect the performance of Biology students at Mugabe Secondary School have also been taken note of. This is to suggest that if the factors are considered then the school can source the much needed micro science kits for Biology students.

5.2.1 Learning resources

Regardless of advancement in technology the school have poor or no proper facilities for Biology or any other Science subjects. There are ordinary classrooms which have been

allocated to sciences department with wall charts which is not in line with proper environment for sciences where experiments can be done. This is because the Science laboratories should be equipped with experimenting apparatus.

From the findings of this research there is correlation of the findings in that if the students have resources to use in Biology such as apparatus to use then there is guarantee for better performance. If the students do not do practicals they become disengaged, demotivated and in the end fail, because Biology is a practical based subject where experiments carry the day.

5.2.2 Socio-economic factors

Parental involvement is key to the performance of students. If the parents are not involved or appraised on the role they play in the education of their children they can just pay school fees and stay behind the scenes. By paying the school fees they would think they have played their part, in that there is need to take a step further by explaining to them that they need to source some other resources to support their children as the schools can be financially strained at times. If parental involvement is not handled well it can have a negative effect on a learner's education.

5.2.3 Learner factors

The monotonous and old system of learning which the textbook model is can result to absenteeism of many students as was shown by the class register. If the students develop negative attitude it can have a negative impact on their performance. When learners are absent teaching and learning continues and this results in absent learners being left out and they lack the knowledge that was taught during their absence.

5.2.4 Impact of resources in students' performance in Sciences

The learners are deprived of practical investigations which further enhances the learner's interest in science and making the subject relevant. From the research findings the learning equipment in Biology is not enough. The lack of resources means there is no practical work. If the equipment is available the students will be grouped in large groups and surround the teacher

using the limited resources. The findings show that there is an adverse shortage of equipment for students to use during practical.

5.2.5 Possible solution to enhance the performance of students in Biology

The possible solution can be classified depending on the stakeholders. For the teachers there is need for them to improvise by recommending the use micro science kit as they bring in results which are almost equivalent to the real objects.

As for the students motivation is also key. The students can be motivated by availing to them the resources to use. If the resources are available the students can be motivated to do the experiments on their own. As a requirement by the new curriculum and as indicated by the Nziramasanga Commission learners perform well by self-experimenting. They perform well by self-discovery. It is ideal that the students embrace the use of Micro science kits as they can quickly learn the techniques needed to work safely and at small scale. Since the administrators at the school are working on a strained budget there is need for low cost savings on apparatus and chemical costs. This can be achieved by investing on micro science kits.

Parents should also be engaged to do workshops. The workshops should be aimed at educating the parents on how they should help their children. The help should be in the form of paying school fees on time and also sourcing some funds for extra resources such as micro science kit.

5.3 Recommendations

As the analysis of the responses was done it was evident that there are so many factors which influence the performance of Biology students at ‘O’ level. Several factors such as negative attitude, lack of resources, medium of instruction and availability of time from several factors can affect students’ performance. Of all the factors Biology is a practical subject which is hands on. In this regard all other factors can be considered but if there are no resources for practical there is a limitation in students’ skill acquisition which is essential for such subjects like Biology. It is therefore in this regard that Mugabe Secondary School as a school in a rural setup with low income earners should consider use of micro science kits as an alternative to real laboratory apparatus.

From the findings of the study it can be noted through the performance of students that micro science kits can be effective as they enhance the performance of students in Biology as a practical subject. The only challenge the school and students are facing is the unavailability of the science kits being caused by unavailability of financial resources. To acquire the kits at such a school so that performance of students can be enhanced the study recommends the following:

- i. For the fact that Biology is a practical oriented subject, the community with the help of the government should help in equipping disadvantaged schools, so as to make the teaching of Biology and science in general more comprehensive. The teachers should also try to improvise, those equipment that are difficult to get and should not wait for the government or community to provide everything.
- ii. A special levy for science should be introduced in schools to raise funds that can be used to purchase laboratory apparatus starting with the effective micro science kits necessary for teaching and learning sciences.
- iii. The provincial and district offices should carry out constant and frequent supervision visits to schools to ensure that whichever schools offer such subjects as Biology have resources to use for practical work.
- iv. Ministry of Primary and Secondary Education through education district offices should organize seminars and workshops at least twice a year for Science teachers and parents to appraise each other on what is to be done to enhance the performance of learners.

5.4 Recommendations for future study

For the future, the academia should look at the usefulness of micro science kits in different school setups be it in well-resourced schools to disadvantaged school so that Biology students can utilise them to do their experiments as this is a safe way to do the experiments. The studies can also focus on any other practical subjects be it Chemistry, Physics or even Wood work and Metal work. This can be done by researching on the usefulness of micro kits in practical subjects under the research topic analysis and usefulness of micro kits on practical subjects.

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APPENDICES

APPENDIX A: INTERVIEW GUIDE FOR SCHOOL ADMINISTRATORS

Topic: An assessment of effectiveness of micro science kits to Biology students with reference to Mugabe Secondary School in Umzumbe District.

My name is Thubelihle Norufure, Bachelor of Science at Bindura University of Science Education. I am intending to carry out a research on the above-mentioned topic and you have been chosen to participate in this study. Your participation in this study is on voluntary basis. The information you provide in the study will be considered confidential and will be used for research purposes only. I thank you for your assistance.

Demographic information for participant.

Gender Male [] Female []

Position at work:

Work experience: >5 years [] 2-5 years [] <2 years []

1. How do you rate your school in terms of performance in Science subjects Biology to be specific?
2. What do you think is affecting the performance of students?
3. Do you think your school is well resourced in terms of staff and equipment for Biology?
4. What do you think should be done to improve the performance of students in Biology?
5. Have you heard of Micro Science kits?
6. Do you think they are of any significance to the performance of students?
7. How do you think they can be of any significance?

APPENDIX B: INTERVIEW GUIDE FOR TEACHERS

Topic: An assessment of effectiveness of micro science kits to Biology students with reference to Mugabe Secondary School in Uzumba District.

My name is Thubelihle Norufure, Bachelor of Science at Bindura University of Science Education. I am intending to carry out a research on the above-mentioned topic and you have been chosen to participate in this study. Your participation in this study is on voluntary basis. The information you provide in the study will be considered confidential and will be used for research purposes only. I thank you for your assistance.

Demographic information for participant.

Gender Male [] Female []

Position at work:

Work experience: >5 years [] 2-5 years [] <2 years []

1. How do you rate your school in terms of performance in Science subjects Biology to be specific?
2. What do you think is affecting the performance of students?
3. Do you think your school is well resourced in terms of staff and equipment for Biology?
4. What do you think should be done to improve the performance of students in Biology?
5. Do you think micro science kits are of any significance to the performance of students?

6. How do you think they can be of any significance?
7. Looking at the setup of your school what do you think can be done to source the kits?

APPENDIX C: OBSERVATION GUIDE

Site location:	Date:	Start time:	Stop time:
Area of observation	Research issue		
Behaviour			
General mood			
Conversation			
Context			

APPENDIX D: DOCUMENT ANALYSIS CHECKLIST

1.	TYPE OF DOCUMENT CHECKLIST (tick one): Newspaper Report Website Advertisement Census report Other
2.	UNIQUE CHARACTERISTICS OF THE DOCUMENT Letterhead Handwritten Typed Seals Vision/ Mission
3.	DATES OF DOCUMENT
4.	AUTHOR/CREATOR OF THE DOCUMENT: POSITION:
5.	FOR WHAT AUDIENCE WAS THE DOCUMENT WRITTEN?
6.	DOCUMENT INFORMATION i. List 2 things that the author said that you think is important ii. Why do you think this document was written? iii. What evidence in the document helps you know why it was written

