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BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN BIOLOGY

INVESTIGATING THE EFFECTS OF BIOLOGY PRACTICAL ACTIVITIES ON ACADEMIC ACHIEVEMENT OF STUDENTS AT GUMBONZVANDA HIGH SCHOOL IN WEDZA DISTRICT

A DISSERTATION SUBMITTED TO BINDURA UNIVERSITY OF SCIENCE EDUCATION IN FULFILMENT OF REQUIREMENTS FOR HONOURS BACHELOR OF SCIENCE EDUCATION IN BIOLOGY

By

MAFORO CATHERINE N B225834A

and

MANENJI-JINGA PAULINE B225838B

Supervisor: MR MUNAKANDAFA

2024

APPROVAL FORM

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF SCIENCE EDUCATION

Approval form

I Mr W Munakandafa undersigned certify that l read this project titled Investigating the effects of Biology practical activities on achievement of students at Gumbonzvanda High School in Wedza District conducted by Maforo Catherine B225834A and Manenji-Jinga Pauline B225838B in partial fulfillment of the Bachelor of Science Education Honours Degree in Biology. I further approve its submission and recommend Bindura University of Science Education to be examined.

_____

Name of supervisor

_____

Signature of supervisor

_____

Date signed

DECLARATION

We Maforo Catherine N registration number B225834A and Manenji-Jinga Pauline registration number B225838B declare that this project titled “Investigating the effects of Biology practical activities on academic achievement of students at Gumbonzvanda High School in Hwedza District “, is our original work and has not been submitted elsewhere for any academic purpose. We confirm that the study was conducted in accordance with the principles of academic integrity and honesty.

We do hereby declare that this research project is our work and we are fully responsible for this content.

Signatures……..

…….

Date:……

ACKNOWLEDGEMENT

We wish to acknowledge the valuable assistance we got from our tutor Mr. Munakandafa. He gave us a lot of guidance as we waded through the project. We are grateful to the school head, teachers and students who responded to our questionnaires and accorded us the opportunity to interview them. We would like to thank our family members for their unfailing support and encouragement.

DEDICATION

Maforo Catherine N and Manenji-Jinga Pauline, would like to dedicate this project to our collective efforts, teamwork, and perseverance. We are proud to have worked together to bring this project to life, and we hope that it will make a positive impact on our community and beyond. This project is also dedicated to our families and friends, whose unwavering support and encouragement have inspired us every step of the way. We also dedicate this work to our mentors and educators, who have guided us with their wisdom and passion. Thank you for believing in us and for your invaluable contributions to our journey.

ABSTRACT

This research aims to explore the effects of Biology practical activities on academic achievement at Gumbonzvanda High School in Hwedza .Utilizing a mixed –methods approach, data will be collected through surveys, interviews and analysis of academic records. The study will assess students" understanding of biological concepts and their performance in assessments, examining the correlation between practical engagement and academic success. Findings are expected to highlight the significance of practical activities in enhancing educational outcomes in Biology, ultimately contributing to improved teaching.

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CHAPTER 1: INTRODUCTION

1.0 INTRODUCTION

Biology education plays a crucial role in developing scientist's literacy and critical thinking skills among students. Practical activities in Biology, such as laboratory experiments and fieldworks are essential for reinforcing theoretical knowledge and enhancing students' engagement. (Hofstein and Lunneta 2004). At Gumbonzvanda High School in Wedza the implementation of practical biology activities is inconsistent, raising questions about their impact on students' academic performance. This study seeks to investigate how these activities influence academic achievement in Biology providing insights for educators and policymakers.

1.1 BACKGROUND OF THE RESEARCH STUDY

Biology practical activities are a crucial component of science education as they provide students with hands-on experience and enhance their understanding of complex concepts (Abdul et al 2019). Research has consistently shown that practical activities enhance students' academic achievement, motivation and interest in Biology (Hofstein and Lunneta 2004). In addition practical activities help students develop essential skills such as critical thinking skills, problem-solving and scientific inquiry. (Chikoko et al 2011). In Zimbabwe where Gumbonzvanda High School is located the education system has faced challenges in providing quality science education, including inadequate resources and trained teachers. (Felder and Brent 2009). The education system has undergone significant changes since independence in 1980, with an increased focus science and technology education (Abrahams and Miller 2008). However challenges persist , including limited resources, outdated curricula and inadequate teacher training (Stoker, 2024).

Despite these challenges, research has shown that practical activities can be effective in improving students' outcomes in Zimbabwean schools (Braun and Clarke 2006). A study by Mkumbo 2017

found that students who participated in practical activities showed significant improvement in their understanding of biological concepts compared to those who did not participate.

However, there is limited research on the specific impact on Biology practical activities on academic achievement at high school level in Zimbabwe. In Zimbabwe, practical activities in biology provide opportunities for student to actually do science as opposed to learning about science. In the past teachers were much more concerned with loading students with theoretical facts and terminologies in Biology, but today it has become a matter of investigation, science process skills and inquiry. More emphasis is placed on the relevant of Biology to life, (Ude & Onah 2017). The secondary school science laboratories serve as a conducive environment for practical activities, a source of teaching and learning in science where students are able to carry out science process skills, practical activities in school laboratories give students appreciation of the spirit of method of problem solving, analytical and generalization ability, practical work foster students positive attitudes toward science and maintains their interest in the learning of science subjects.

Practical activities in teaching Biology are necessary and are learned gradually in the course of repeated experience. Students understand better when they are involved in practical experiment during practical lessons and obtain their results. Such students will not only remember the procedure involved but also feel proud for obtaining the correct results, thus stressing the need to match theory with practical lessons (Kilder & Okoro, 2017). This study aims to address this gap by investigating the effects of Biology practical activities on academic achievement at Gumbonzvanda High School in Hwedza.

1.2 STATEMENT OF THE PROBLEM

Biology which serves as a prerequisite at O-level for studying some disciplines such as Medicine, Pharmacy, Agriculture and Food Technology equips individuals with diverse information about the basic principles of life and natural laws influencing living things. The teaching of Biology in secondary schools need to be more practical oriented in order to enhance students' achievement in the subject but the irony is that the practical lessons have suffered neglects in the subject in Hwedza district at Gumbonzvanda High School as it was observed by the researcher due to inadequate materials and facilities, inadequacy of qualified teachers and the class size to carry out practical, thus, affecting the overall achievement of students in Biology. Several researchers established that teaching Biology involves more practical activities than talking all the time. Resources such as diagrams, field works and real objects when effectively used to explain the subject matter very well is better than mere lecture. The proper place for effective practical activities is the laboratory. Biology being one of the science subjects cannot be taught or learnt effectively in the absence of practical activities. Practical activities help students to understand and assimilate what is being taught which by extension improve their achievement in the subject. Despite the recognized importance of practical activities in Biology education, there is lack of empirical evidence regarding their impact on academic achievement at Gumbonzvanda High School. This absence of data raises concerns about the effectiveness of current teaching methods and the overall quality of Biology instructions. Identifying how practical activities influence student performance is essential for improving educational strategies and outcomes in Biology. Moreover, understanding how practical activities influence students' performance could also inform curriculum development and teaching strategies. To this end, this study seeks to determine the effect of Biology practical on the achievement of senior secondary school students in Biology in Wedza district at Gumbonzvanda High School.

1.3 PURPOSE OF THE STUDY

The purpose of this project is to investigate the effects of biology practical activities on students' academic achievement in biology. As practical activities are a fundamental component of science education, understanding their impact on learning outcomes is essential for educators and curriculum developers. This study aims to explore how hands-on experiences in biology influence students' comprehension of biological concepts, retention of knowledge, and overall academic performance. By analysing the relationship between practical activities and academic achievement, the project seeks to provide insights that can enhance biology teaching methods and improve student engagement and success.

1.4 OBJECTIVES OF THE STUDY

- To assess the impact of biology practical activities on students' understanding of biological concepts
- To analyze the relationship between practical activities and students' academic performance
- To evaluate student engagement and motivation in biology through practical activities
- To explore teachers' perceptions of the role of practical activities in biology education
- To develop recommendations for enhancing biology education through practical activities

1.5.1 RESEARCH QUESTIONS

1. What is the current level of academic achievement in Biology among students at Gumbonzvanda High School?

2. How do Biology practical activities influence students' understanding of Biological concepts?
3. What is the relationship between participation in practical activities and students' academic achievement?

1.5.2 SUB-PROBLEMS

- **I**nvestigating the current state of biology at Gumbonzvanda High School.
- Examining the impact of practical activities on students' understanding and retention of Biology concepts.

1.5.3 HYPOTHESIS

H1. Practical activities will improve students' understanding and retention of Biology concepts.

H2. Students who participate in practical activities will perform better academically than those who do not.

1.6 ASSUMPTIONS OF THE STUDY

Researcher makes assumptions when conducting research to create conditions that yield valid results (Padgett, 2016). The statements made or assumptions are presumed to be true, even just for a short time, in order to create the standards and guidelines for comparison.

- The study assumes that the participants will be free to answer all the questions in the study research instruments.
- The researcher assumes that the study participants would be willing to participate in the interview sessions.

- The learning environment of the sampled school is similar to the other schools found in the same district.
- The students at the selected school are more or less the same as learners from any other school in the district
- Resources available for teaching and learning are more or less the same as in other schools elsewhere in Zimbabwe.
- [7]Students who perform in practical Biology activities will have a better understanding of Biology concepts
- Teachers possess the necessary skills and resources to implement practical activities effectively.
- Academic achievement can be measured through students' grades and assessments.

1.7 SIGNIFICANCE OF THE STUDY

The study is significant as it will provide insights into the effectiveness of practical activities in Biology education at Gumbonzvanda High School. The findings may inform educators best practices for teaching Biology and high-light the importance of hands-on learning experiences in order to arouse and maintain interests of Biology learners. Moreover , it could serve as a basis for curriculum development and resource allocation aimed at enhancing student engagement and performance. The study will create an opportunity to the Ministry of Primary and Secondary Education and other related stakeholders of education to know challenges pertaining to the teaching and learning of Biology practical lessons in secondary schools. This will help them in organizing staff workshops to teachers and HODs at secondary school level. It should also benefit other researchers that may conduct similar research.

The findings of the study will be helpful to school administrators leading to improved teaching and learning of Biology. The study will also provide solutions on teaching and learning Biology in secondary school and proffer recommendations to Ministry of Primary and Secondary Education.

1.8 LIMITATIONS OF THE STUDY

The study is limited to Gumbonzvanda High School. The study is limited to a small sample due to time constraints. Potential biases in self-reported data from students and teachers. Variability in teaching methods and resources available across different classes. The study does not consider other factors influencing students' academic achievement. The findings may not be generalizable to all high schools in Wedza district.

1.9DELIMITATIONS OF THE STUDY

The study will focus only on Biology practical activities within Gumbonzvanda High School excluding other subjects or extra-curricular activities. It will involve form 3 and 4 students enrolled in Biology courses during the academic year 2023-2024. The study is conducted over a single academic term. The study participants will be Biology teachers, Head of department and Biology learners.

1.10 DEFINITION OF TERMS

Biology

Biology is the scientific study of life and living organisms, including their structure, function, growth, evolution, distribution and taxonomy Campbell and Reece 2008). According to Krogh,

D. (2009), biology examines the diversity of life from molecules and cell to ecosystems and biospheres and explore the interactions and interdependence between living things and their environment.

Practical activities

Practical activities refer to hands-on experiences that allow learners to apply theoretical knowledge in a concrete and tangible way (Fenwick 2001). Therefore, biology practical activities refer to hands-on experiences that allow students to explore, investigate and understand biological concepts and processes through direct observation, experimentation and manipulation of living things and their environment (BSCS, 2010).

Academic achievement

Academic achievement refers to the extent which students have attained their educational goals, demonstrated mastery of subject matter and developed intellectual skills (Anderson and Krathwohl, 2001). Horta and Santos, (2016) also define academic achievement refers to a student's or scholar's performance and success in their academic endeavours, typically measured by their grades, test scores, and other academic accomplishments.

1.11 SUMMARY

The study focused on investigating the effects of biology practical activities on academic achievement of Gumbonzvanda High School in Wedza. The study outlined introduction,abstract ,background of the study, statement of the problem, significance of the study, research questions, assumptions of the study, delimitations, limitations and definition of terms. By exploring the relationship between hands-on experiences and student performance, this study seeks to provide

valuable insights for educators and policymakers. Through a comprehensive analysis of surveys, interviews and academic records the research will contribute to a better understanding of effective teaching strategies in Biology education.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter aims to explore the existing literature on the effects of biology practical activities on academic achievement, specifically within the context of Gumbonzvanda High School. The significance of practical activities in enhancing students' understanding of biological concepts is well-documented, as these activities often bridge the gap between theoretical knowledge and realworld application. This review will synthesize relevant studies, highlight gaps in the current

body of knowledge, and contextualize the findings to the specific educational environment of Gumbonzvanda High School. The previous section covered the background to the study, the statement of the problem and the objectives of the study. The literature review in this study is organized under the following subheadings, theoretical framework, followed by the study objectives and it concludes with a chapter summary.

2.2 THEORETICAL FRAMEWORK

This study is guided by Brunner's Theory of Discovery Learning (1966) and Kolb's Theory of Experiential Learning (1984). Brunner's theory of discovery learning emphasizes the value of the discovery method of instruction. He maintained that learning is promoted and memory is strengthened when an individual can figure things out on their own. He advocated for a learning situation in which learners become detectives. One can accomplish this either because his cognitive structure is already tuned to absorb new information in which there is familiarity and the new information is simply assimilated or if the new learning must take place. Brunner contended that there are two types of discovery. Brunner contended that there are two forms of discovery learning namely; assimilation and accommodation. For Brunner, the sequence in learning is in a reverse manner, that is, learning starts with the complex and plans to learn the simple components is in the context of working with the complex.

Aba (2000) shared the same view with Brunner on learning by discovery when he states that one obtains knowledge for himself by the use of one's mental processes. He emphasized that the learner's memory is kept alert and enhanced by learning aids.

Brunner called his theory a theory of instruction. This is because as he puts it, a theory of instruction tells the educator how and what he wishes to teach can be best learned with improvement rather than describing learning. The biology teacher can apply this theory to classroom situation by

providing learners with tasks or problems of great variety to solve and providing sufficient guidelines on instrument/apparatus so that students can play an active part in learning process (Ukpong 2000). David Kolb's Experiential Learning Theory is also highly relevant in teaching biology, as it emphasizes the importance of experience in the learning process.

Here's how Kolb's model can be effectively applied in a biology classroom. Kolb's model consists of four stages which are Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation. These stages can be integrated into biology lessons as follows:

Concrete Experience: Engage students in hands-on activities, such as lab experiments, field trips, or ecological surveys. For example, students could collect soil samples and analyse their composition.

Reflective Observation: After the experience, encourage students to reflect on what they observed. This can be done through discussions, journals, or presentations where they share their findings and insights.

Abstract Conceptualization: Help students connect their experiences to biological concepts. For instance, after observing plant growth under different light conditions, guide them to understand the principles of photosynthesis and plant physiology.

Active Experimentation: Encourage students to apply what they've learned by designing their own experiments or projects. For example, they might investigate how varying water levels affect plant growth.

Kolb's model fosters critical thinking by requiring students to analyse their experiences and draw conclusions. In biology, this could involve evaluating experimental results or discussing case studies related to environmental issues. Kolb's theory also recognizes different learning styles

(converging, diverging, assimilating, accommodating). By incorporating various activities like hands-on labs for active learners or group discussions for reflective learners, teachers can address the diverse needs of students. Research indicates that practical activities in biology significantly ºenhance student engagement and comprehension. For instance, a study by Hattie (2009) found that experiential learning activities, including laboratory experiments, positively correlate with improved academic performance. Practical activities enable students to apply theoretical concepts, fostering deeper understanding and retention (Kolb, 1984). Experiential learning connects biology to real-world issues, making the subject more relevant. For instance, students could study local ecosystems and explore conservation efforts, helping them understand the impact of human activity on biodiversity. Encouraging Collaboration Kolb's approach often involves collaborative learning experiences. Group projects in biology such as researching a specific ecosystem or conducting a joint experiment promote teamwork and communication skills.

By engaging in experiential learning, students develop skills that are essential for lifelong learning such as problem-solving, adaptability, and self-directed learning which are crucial in scientific fields. Furthermore, a meta-analysis by Freeman et al. (2014) demonstrated that active learning strategies, including hands-on experiments, can lead to a 6% increase in exam scores compared to traditional lectures. This finding suggests that incorporating practical activities into the curriculum can substantially benefit students' academic outcomes.

In the context of high school education, research by Zohar and Nemet (2002) emphasizes the importance of inquiry-based learning in biology. Their study indicated that students engaged in inquiry-based practical work exhibited higher levels of critical thinking and problem-solving skills,

which are essential for academic success. In addition incorporating Kolb's experiential learning theory into biology education not only enhances student engagement but also deepens understanding of complex biological concepts. By emphasizing hands-on experiences and reflection, educators can create a dynamic learning environment that prepares students for future scientific endeavours. Therefore, this study will be used to the effects of biology practical activities on academic achievement of Gumbonzvanda high school in Wedza However, while numerous studies support the positive impact of practical activities on academic achievement, there remains a lack of specific research focused on high school settings in developing regions like Zimbabwe. This gap highlights the need for localized studies that consider cultural and contextual factors influencing educational practices.

2.3 HOW BIOLOGY CURRICULUM IS TAUGHT IN SECONDARY SCHOOLS

Based on the data regarding low achievement in Biology, science educators are constantly exploring ways to alleviate the ugly situation of under achievement in the subject as noted by Jumoke and Oludipe (2012). This is by ensuring that the pedagogical approach which is the function of students' achievement in a subject, that is employed in the teaching and learning process should be the type that guarantee creative thinking and optimal learning outcomes. Awolola (2012) states that there exist gaps between curriculum planners' intention and what goes on in the science classroom concerning the recommended teaching methods.

Umoru (2017) who earlier pointed out that, the non-impressive achievement of students in Biology indicates that the methods of teaching employed by most Biology teachers in the classroom are not adequate and interesting. In the same light, Lisene and Jita, (2018) reiterates that the main cause of students' low achievement is traceable to improper teaching methods employed by subject

teachers' which centres mainly on excessive talking, copying of notes, rote learning of textbook and memorization of concepts.

In spite of the consensual efforts of science educators to alleviate the ugly situation of low achievement of students in Biology, Umoru, (2017), maintain that the problem is connected to ineffective teaching strategies employed by teachers. The authors also stated that teachers are more inclined to traditional teaching method which appears to be the most dominant teaching method employed by many science teachers. Low achievement in Biology could be inability to remember or recall what has been taught during the instruction partly due to infective teaching methods. Umoru and Itodo (2018) in a study stated that the persistent use of traditional teaching method makes students passive rather than active learners. This does not promote insightful learning and long-term retention of some concepts in Biology.

According to Ugwu and Nzewi (2015) in the past, the traditional teaching approach used to impact knowledge was successful, but the minds of current generation vary from those of the previous generation, meaning that the current students of today are highly scientific literate and flow with the new trends in science and technology such as accessing the internet in order to enhance their knowledge. Hence the progression of education and educational technology should follow the progression of time, therefore these calls for new innovative teaching method such as field trip and discovery that could address the needs of the present-day students.

The traditional teaching method (lecture) can hinder the development of individual students' active and creative abilities and as such, students who are exposed to only this model of education may no longer be considered sufficient for the needs of the future educated citizenry. In the same vein, Danjuma (2015) posits that, activity based instructional strategy such as; discovery method,

inquiry, demonstration and problem-solving could enhance academic achievement, selfconfidence and creative thinking in learners. In the opinion of Kurumeh (2016), involvement of students in the teaching and learning process signifies a paradigm shift from the traditional method of teaching to the contemporary approach which is another means of ensuring active learning in science.

2.4 BENEFITS ENCOUNTERED IN TEACHING AND LEARNING OF BIOLOGY USING PRACTICAL ACTIVITIES IN SECONDARY SCHOOLS

Education in general and science particularly are believed to promote the country's development. In, to this end, the government and its stakeholders in education have put in place efforts expected to improve the teaching and learning process of science and performance as well. Some of these efforts include among others the adoption of a Competence-Based Curriculum. This section of the study highlights the benefits encountered in teaching and learning using practical activities in secondary schools.

2.4.1 COGNITIVE BENEFITS:

2.4.1.1 Improved understanding

According to Harlen, 2010 practical activities enhance students' comprehension of biological concepts by providing concrete experiences, illustrating complex processes and allowing exploration and discovery. For example dissecting a frog to understand its anatomy.

2.4.1.2 Better Retention:

Briggs 2005 postulates that hands-on experiences aid in long-term retention of knowledge by reinforcing learning through repetition, creating memorable experiences and encouraging active recall. For example conducting a photosynthesis experiment to understand plant growth.

2.4.1.3 Development of critical thinking

Practical activities encourage critical thinking, analysis, and problem-solving by presenting realworld scenarios, requiring data analysis and interpretation and fostering inquiry-based learning (Lederman 1992). For example designing an experiment to test the effects of pH on plant growths.

2.4.2 AFFECTIVE BENEFITS

2.4.2.1. Increased Motivation

Practical activities boost students' interest and motivation in biology, making learning enjoyable and engaging (Kirschner, 2013). Practical work has been able to promote students' positive attitudes and enhance motivation for effective learning in science as described by Okam and Zakari (2017). Consequently, a positive attitude toward the importance of practical work meaningfully affects students' achievement in science (Hinneh, 2017). For example creating a model of the human body systems.

2.4.2.2. Enhanced Engagement

Hands-on experiences promote active participation and engagement, reducing classroom passivity (Hmelo-Silver, 2004). For example conducting a biology scavenger hunt. . In addition to this, practical work encourages and increases students' interest in science and promotes it as an engaging subject. As an example, when students practice chemical reactions, they see that science is an applied science and not just theories and rules.

.2.4.2.3. Builds Confidence

Practical activities help students develop confidence in their scientific abilities, fostering a sense of accomplishment (Bandura, 1997). For example successfully culturing microorganisms in a lab. .Multiple studies showed that practical work confers many advantages, including developing laboratory skills and scientific knowledge, as well as understanding science concepts and theories

(Fadzil and Saat, 2013). Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe to be discovered.

2.4.3 PSYCHOMOTOR BENEFITS

2.4.3.1 Development of Motor Skills:

Practical activities refine students' motor skills, hand-eye coordination, and dexterity (Galligan, 2010). Practical activities in biology develop psychomotor skills through hands-on experiences that integrate cognitive, motor, and affective processes. . For example handling slides, focusing lenses, and adjusting stage controls, injecting substances into cells or tissues using microinjection equipment and grafting, pruning, and transplanting plants.

2.4.3.2. Improved Observation Skills

Hands-on experiences enhance students' observation and measurement skills (Lock, 2010). For example measuring the effect of light on plant growth. Practical teaching is one of the means of making the subject real to the pupils (Mamman, 2020). Theory and practical must go hand in hand so that what is taught in theory must be applied and demonstrated practically to enable learners to acquire knowledge, skills and develop the right attitude

2.4.3.3 Enhanced Scientific Literacy

Practical activities promote scientific literacy and numeracy, essential for biology students (Bybee, 2010). For example analyzing data from an ecology field study. Laboratory work plays a significant role in science education (Hofstein & Mamlok-Naaman, 2017). In the educational process, laboratories can be used to develop scientific notations and create models to test hypotheses. Laboratory work also helps in understanding the difference between observation and

presentation of data (Lawson, 2015). In support of this fact, it is documented that "Laboratory activities appeal as a way of allowing students to learn with understanding and, at the same time, engage in a process of constructing knowledge by doing science" (Tobin, 2020). Laboratory experiments have vital importance in the study of all scientific subjects (chemistry, physics, and biology)

2.4.4 SOCIAL BENEFITS

2.4.4.1. Collaboration and Teamwork

Practical activities foster collaboration, communication, and teamwork, essential life skill

(Johnson, 2007). For example, group projects on environmental issues. Practical work has also been shown in some studies to help improve the communication skills of students in order to solve problems in science and thus become more motivated in science (Woolnough, 2019)

2.4.4.2. Development of Social Skills

Hands-on experiences promote social skills, such as leadership and conflict resolution (Wiggins, 2011). For example debating bioethical issues. A well planned and effectively implemented practical lesson has the potential of engaging students both mentally and physically due to their direct involvement of practical activities where they use both hands and brains to perform a

particular task especially during field work, science laboratory experiments and simulation experiences (Lunetta *et al*., 2017). There is evidence that practical lessons in agriculture does not only make lesson interesting but also makes learning enjoyable (Otekunrin, Oni LO and Otekunrin, 2017).

2.4.4.3 Promotes discovery learning

Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe to be discovered.

2.4.4.4. Improvement of communication skills

Practical work has also been shown in some studies to help improve the communication skills of students in order to solve problems in science and thus become more motivated in science (Woolnough, 2019). In addition to this, practical work encourages and increases students' interest in science and promotes it as an engaging subject. As an example, when students practice chemical reactions, they see that science is an applied science and not just theories and rules.

2.4.4.5. Development of laboratory skills

Laboratory work plays a significant role in science education (Hofstein & Mamlok-Naaman, 2017). In the educational process, laboratories can be used to develop scientific notations and create models to test hypotheses. Laboratory work also helps in understanding the difference between observation and presentation of data (Lawson, 2015). In support of this fact, it is documented that "Laboratory activities appeal as a way of allowing students to learn with

understanding and, at the same time, engage in a process of constructing knowledge by doing science" (Tobin, 2020). Laboratory experiments have vital importance in the study of all scientific subjects (chemistry, physics, and biology).

The goals of practical work are to improve students' understanding, develop their skills in solving problems and understanding the nature of science, by replicating the actions of scientists. Sotiriou, Bybee and Bogner (2017) state that: "While solving a scientific problem, students should act like a scientist and follow scientific processes." According to Hodson (2019), practical work can motivate students, stimulate their interest in teaching and learning, enhance the learning of scientific knowledge, give them experience in using scientific knowledge and widen their way of thinking.

2.5 Constraints experienced in the teaching and learning of Biology using practical activities and howitzer affects the academic achievement of learners

This section of the study indicates that there are various constraints experienced in teaching and learning Biology practical activities and how it affects the academic achievement of learners.

These challenges include lack of use of technology, inadequate funds,lack of critical thinking in Biology, lack of motivation, lack of Biology teaching and learning resources and shortage of professionally trained teachers in Biology.

2.5.1 Lack of use of technology

Today, there is a need to train individuals who can acquire increasingly complex knowledge and skills and keep up with the rapid change of this information. In addition to the rapid increase in knowledge, since 21st century skills are technology-oriented, the question of how information technologies can be used to support and enrich education, has led studies in the field of education and educational technology in recent years, (Somyürek, 2014).

Printed materials, which make learning more tangible and permanent, but have controversial dimensions in terms of cost, portability, usability and accessibility, have begun to move to digital media in recent years (Smaldino et al., 2019). Now, it has become inevitable to use digital tools and materials as materials in addition to teaching lessons with more than one teaching method (Seferoğlu, 2016). Integrating education with new technologies has allowed teachers to transform learning materials consisting of fixed text and graphics into more interactive multimedia materials (Huang et al., 2016)

2.5.2 Lack of motivation

Science, including biology, usually contains abstract and complex topics. It is easy to understand when it is embodied through examples and daily life (Üstün, Yıldırgan, & Çegiç, 2021). Since the subjects that are not related to daily life are out of context, they are generally studied by students until the exam and then forgotten. Today, theories developed using the experience gained in the teaching process and their practical applications have been integrated into the teaching process. One of these applications is context-based learning with a constructivist learning approach (Acar & Yaman, 2011).

Education is a multi-stakeholder activity. In the triangle of students, teachers, and knowledge, many auxiliary materials, techniques, and methods are important for the permanence of learning. Strong interaction between students and teachers ensures that the learning environment is healthy. The fact that this point of interaction is connected with life is important for permanence and easy understanding of the information. One of the biggest obstacles in the educational process is the

lack of motivation of the student and/or teacher during the learning process. One approach developed to remove this barrier is the context-based approach (Bülbül & Matthews, 2012).

2.5.3 Lack of Biology teaching and learning resources

Asikina (2010) states that field trip method of teaching and learning, experience is an expensive verdure. The resources and fund required to run it are expensive and not easy to acquire. Most school administrators have lukewarm attitudes toward releasing funds for field. Schools often lack essential laboratory equipment, reagents, and materials necessary for conducting practical experiments. Insufficient resources can lead to a reliance on theoretical instruction rather than hands-on experiences, which are crucial for understanding complex biological concepts. This can result in lower student engagement and retention of knowledge. Ogunniyi, M. B. (2007).

According to Kisirikoi and Malusu (2020) teaching and learning resources are all materials and equipment used to enhance effective learning. A teacher selects, develops and reorganizes teaching-learning resources for effective teaching and the teacher therefore is the most important teaching-learning resource (Waithera, 2018). Learning resources play a key role as far as learning is concerned. Waithera (2018) argues that good teachers as they teach keep in mind both what they teach and what they teach with and the quality and adequacy of resources such as physical facilities, equipment will establish whether this is the case. In Mozambique, poor teacher training, insufficient materials and lack of pedagogical support has meant that most teachers rely on teacher centered didactic methods, emphasizing repetition and memorization over learner-centered approaches that encourage creative thinking and skills-based learning. Teachers are poorly equipped to deal with some of the challenges that the system poses such as the reality of large class sizes, unavailability of didactic materials and gender disparities (Waithera, 2018).

Seawell (2019) confirms that without adequate pieces of apparatus and thorough preparation on the part of every teacher, Science and Science lesson would become rigid, boring, dull and unrealistic. The uniqueness of the subject therefore results from the variety of materials and experiment necessary for its effective teaching and learning. Nacino-Brown, Oke, and Brown (2017) also have it that the mere use of these materials however does not guarantee effective teaching and communication. It is their careful selection and skillful handling by the teacher that renders them useful in facilitating learning (Bremner, 2020). It is therefore necessary for teachers to have working knowledge of the criteria to use in selecting and evaluating them and principle underlying their effective use.

2.5.4 Shortage of professionally trained teachers

Teachers did not have any training in the subject itself or the teaching of the subject. As Chenevey et.al (2018) postulate, before the introduction of any course it is necessary to assess the skills of the available staff and determine whether they tally with the requirements of the course. Teaching of Biology requires a sound background in theory and practical aspects by the teachers of the subject. As Naqvi, (2018), states, the delivery of practical Biology at school level should not be handled as a science per se, but rather as a curriculum for acquisition of practical Biology skills for meaningful living, which means that the skills pupils acquire from Biology should make them functional and productive citizens. Many teachers lack adequate training or professional development opportunities related to conducting practical biology activities. Teachers' inability to effectively facilitate practical work can lead to poorly conducted experiments that fail to engage students or foster deep understanding. (Abrahams, I., Millar, R. 2008). In most African countries,

the greatest problem facing Biology education is attitudinal factors such as cultural traditions, early childhood socialization, parental expectations, the reward that go with it, the behavior and attitude of teachers, influence the attitude the pupils require (Lisene, & Jita, 2018). Darko, *et al*, (2016) that practical teaching of Biology in Ghana is greatly impeded by inadequate or ill-equipped school laboratories and poor funding of Biology practice. Therefore, the study seeks to unveil whether shortage of professionally trained teachers in Biology is a challenge being faced in Gumbonzvanda High school in Hwedza

2.5.5 Large class size

The smaller the class size, the easier it is for the teacher learner interaction, consequently improving the academic performance since the teacher will be able to give the learner individual attention. Biology is a science subject which needs teachers to effectively concentrate on the needs of the learners. Large class size impacts negatively to the teaching learning process since the teacher is not even able to move freely to assess the pupils work as they do their exercises, (Smith, 2022).

In addition, observed that overcrowding in classrooms make it difficult for learners to write, the teacher is also unable to move around the class to assist needy learners during practical lessons and this affects the teaching-learning process, which in the end affects academic performance, (Mege, 2020). Crowded classroom conditions not only make it difficult for learners to concentrate but inevitably limit the amount of time teachers can spend on innovative teaching methods such as practical lessons. Therefore, this research seeks to find out if the above literature is in sync or disagree with the case of Gumbonzvanda high school in Hwedza

2.6 STRATEGIES FOR IMPROVING THE ACADEMIC ACHIEVEMENT OF STUDENTS AT GUMBONZVANDA HIGH SCHOOL

2.6.1 Adopting ICT In The Teaching Of Biology

Like cognitive factors, affective factors also play an important role in students' achievement (Tuan et al., 2005). Motivation, which is among these affective factors, is defined as the initiation of the necessary process to meet a need (Waterman, 2005). It is known that motivation is a factor that plays an important role in the learning process and that highly motivated students participate more in the lesson (Dede & Yaman, 2008; Wolters & Rosenthal, 2000). In this context, AR may contribute to the positive development of students' attitudes and motivations towards learning with its features. Today, the use of technology to increase the desire to learn has become a very popular research topic (Di Serio et al., 2013).

Scholars argue that learner performance picks up when ICT is applied and precedence is given to learner-centeredness, (Juanda, Shidiq, & Nasrudin, 2021). This is probably because ICT affords quality instruction that complies with constructivism. Few empirical studies have confirmed that ICTs bolster efforts to better the quality of pedagogy implemented in classrooms; actually, they believe that, use of ICTs in classrooms would ensure academic excellence in instruction, (Francisca & Samsudin, 2018). Thus, countries with disparate economic positions encourage the use of contemporary technologies as instructional instruments in different subjects, (Naqvi, 2018). Therefore, this paper examines biology teachers‟ practical use of ICTs to teach in Gumbonzvanda High school in Hwedza.

2.6.2 Use of field trips

Field trip is an enjoyable instructional method, which allows teachers of science to take their students out of classroom to the field, external laboratories, factory, farm and scientific places of interest to learn. A study conducted in Nigeria on the study investigated the Effects of Field Trip and Discovery Methods on Senior Secondary School Students' Achievement in Biology, by

Adejoh, Ochu, Egbe-Okpenge & Uroko, (2021) revealed that Field Trip and Discovery methods enhanced students' achievement in Biology. There was no significant difference between male and female students' achievement and retention in Biology. Based on the findings of the study, secondary school Biology teachers were recommended to adopt these methods in teaching. Suggestions were also made that the methods should be used for other topics that students may find difficulties in the senior secondary schools.

2.6.3 Changing of teaching methods

It is also known that Science is taught in the classroom theoretically without practical work and the use of relevant instructional materials (Saah, 2017). As a result of the poor method of teaching, students see the subject as difficult, and develop a negative attitude towards it. Therefore, this study seeks to reveal the situation at Gumbonzvanda High school in terms of how Biology is taught.

Adesina (2021) advised that educators should constantly seek new ways to improve instruction, so as to facilitate learning and to hold the attention of their students. Dooley, Stuessy, Magill, and Vasudevan (2020) suggested the need for educational systems to meet the challenge of a changing and increasingly technological society, teaching and assessing large class sizes, with chalk board and multiple-choice examinations which made it difficult to challenge learners at higher cognitive level. Generally, Biology education facilitators have varying tools, audio-visual aids evaluation techniques, teaching methods based on the varying teaching environment and available students than teachers in any other discipline (Dooley *et al,* 2019). Therefore, this study seeks to reveal if the situation at Gumbonzvanda High school agrees or is not in sync with such literature.

2.6.4 Stakeholder engagement

Support of teachers can take a variety of forms, including access to resources, in-service courses, and peer groups, (Fry, 2018). A key form of teacher support missing in many school systems is the ongoing opportunity to talk with other professional regarding personal challenges and experiences in the classroom. Such practice has been successful with principals and other promoted staff in monitoring new teachers at the induction stage so that they improve their teaching and classroom management abilities in the first years of teaching (Fry, 2018).

In Zimbabwe, a study in Uzumba by (Mawarire, 2021), revealed that on methodologies used in the teaching and learning it was found that the teachers of Biology used teacher-centered methods which did not promote students' participation in the teaching and learning which focused on passing examination. The possible solutions identified were awareness campaigns, re-training of the teachers in service, provision of funding and development of specialized infrastructure for the teaching and learning of Biology, (Mawarire, 2021). It was concluded that lack of preparedness by Government, non-involvement of stakeholders, lack of qualified by teachers and material resources and use of inappropriate teaching strategies were the major challenges of teaching and learning Biology.

2.6.5 Monitoring and assessment of Biology classes

In another research which was carried out by Acharya and Joshi (2019) discovered that monitoring and assessment would be effective only if each of the stakeholders finds value in it. Learners, instructors, government and other educational players are identified as the primary stakeholders. Learners have an interest in monitoring and assessing their learning and should be full participants in the assessment process. Inspectors have an interest in a system that facilitates teaching and learning and informs instruction and program development. Government has an interest in seeing

the learning enhanced and requires reliable ways to measure changes in literacy rates. Monitoring of educational programmes is a vital ingredient for successful implementation and should be integrated in the programme plan. Unfortunately, most of the time, this is hardly the case. Adequate funds are not provided and required information about status of programmes is not readily available

2.7 SUMMARY

This chapter has explored relevant literature regarding the effects of biology practical activities on academic achievement. It has contextualized these findings within the framework of Gumbonzvanda High School and identified gaps in existing research. By proposing a localized study, this research aims to contribute to a deeper understanding of how practical activities influence student performance highlighting:

- Theoretical framework
- How Biology curriculum is taught in secondary schools
- Benefits encountered in teaching and learning of Biology using practical activities in secondary schools.
- Constraints experienced in teaching and learning of Biology using practical activities and how it affects the academic achievement of learners.
- Strategies for improving academic achievement of learners at Gumbonzvanda High School.

The next chapter will look at research methodology.

CHAPTER 3: RESEARCH METHODOLOGY 3.1 INTRODUCTION

This chapter outlines the research methodology employed to investigate the effects of biology practical activities on academic achievement at Gumbonzvanda High School. Understanding how practical activities influence student learning is essential for educators and policymakers. This study aims to provide insights into the relationship between hands-on biology activities and students' academic performance, utilizing a systematic approach to data collection and analysis.

3.2 RESEARCH DESIGN

This study utilized a qualitative approach in the form of a descriptive survey research design. A research design is a blueprint or plan for the collection, measurement and analysis of data created to answer research questions (Sekaran & Bougie, 2016). Edmonds and Kennedy (2017) support

the above view by saying the purpose of research design is to provide a conceptual framework that allows the researcher to answer specific research questions while using sound principles of scientific inquiry. Another important aspect during this qualitative research is that the quality of reflexivity where the researchers' beliefs, judgements, and practices and the way these have influenced the research (Hammond, 2017). Sutton and Austin (2015) add that qualitative work requires reflection on the part of researchers. Both before and during the research process, this helps in providing context and understanding for the readers. This research design was chosen in order to describe the characteristics of events and acquire the required information on the effects of biology practical activities on academic achievement of Gumbonzvanda high school in Wedza. The research employed a mixed-methods design, combining quantitative and qualitative approaches to provide a comprehensive understanding of the topic. The quantitative aspect involved the use of surveys and academic performance metrics, while qualitative data was gathered through interviews and observations. This triangulation of data sources enhances the validity of the findings (Creswell, 2014).

The quantitative approach involved a correlational study to examine the relationship between participation in practical biology activities and students' academic scores. The qualitative component included interviews with biology teachers and focus groups with students to gather insights into their perceptions of practical activities.

3.3 RESEARCH INSTRUMENTS

3.3.1 Questionnaires:

Questionnaires are structured tools used to collect data from respondents. They consist of a series of questions designed to gather information on specific topics, opinions, behaviors, or

experiences. Questionnaires can be administered in various formats, including paper-based surveys, online forms, or interviews. Structured questionnaires were developed to collect quantitative data on students' participation in practical activities and their perceived impact on learning and from Biology teachers. Questionnaires consisted of Likert scale items assessing frequency of participation, enjoyment, and perceived effectiveness of practical activities.

3.3.1.1 Advantages of Questionnaires

1 **Cost-Effective**: Questionnaires can be relatively inexpensive to administer, especially when conducted online or in large groups.

2. **Time-Efficient**: They can be distributed to many respondents simultaneously, allowing for quick data collection and analysis.

3. **Standardization**: The structured nature of questionnaires ensures that each respondent is asked the same questions, which can lead to more consistent and comparable data.

4. **Anonymity**: Respondents may feel more comfortable providing honest answers when their responses are anonymous, leading to more candid feedback.

5. **Versatility**: Questionnaires can be used in various fields, including market research, social science, healthcare, and education, making them a flexible tool for data collection.

6. **Easy Analysis**: Closed-ended questions (e.g., multiple choice, Likert scales) facilitate straightforward statistical analysis.

7. **Wide Reach**: Online questionnaires can reach a global audience, allowing researchers to gather diverse perspectives.

3.3 2.2 Disadvantages of Questionnaires

1. **Limited Depth**: Questionnaires may not capture the complexity of respondents' thoughts or feelings, particularly with closed-ended questions: Respondents may misinterpret questions or answer them differently than intended, leading to unreliable data.

3. **Low Response Rates**: Especially in online formats, questionnaires may suffer from low participation rates, which can bias results.

4. **Lack of Flexibility**: Once a questionnaire is distributed, it is challenging to modify questions based on initial responses or emerging themes.

5. **Self-Reporting Bias**: Respondents may provide socially desirable answers rather than their true feelings or behaviours, leading to skewed results.

6. **No Follow-Up**: Unlike interviews, questionnaires do not allow for follow-up questions or clarification, which can limit the depth of understanding.

7. **Sampling Issues**: If the sample is not representative of the larger population, the findings may not be generalizable.

Appendices I and II show questionnaires for student and Biology teachers

3 3.2 INTERVIEW GUIDES

Semi-structured interviews with biology teachers provided qualitative insights into their views on the effectiveness of practical activities in enhancing student learning. Interviews were used because of the need to control the direction of the interview, by guiding the target group towards the main subject of the research. In depth interviews makes it easy for the researcher to probe the interviewee more intensely during information gathering and allow the participants to freely discuss their thoughts and experiences (Cooper & Schindler, 2014). Appendix 3 the interview guide for Biology teachers

3.3.3 FOCUS GROUPS:

Student groups explored their experiences and attitudes towards biology practical allowing for an in-depth understanding of their perspectives. According to Cresswell (2014), the advantages of a focus group discussion is that it is relatively easy to assemble, inexpensive and flexible inters of format and the types of questions are desired outcomes. Focus group discussion also help people build new connections, provide rich data through direct interactions between researchers. More so, a focus group discussion is cheaper and is a quicker way of obtaining valuable data, and open recording allow participants to confirm their contributions. Therefore, this study will utilize focus group discussions with learners. The researcher does not dispute the fact that there are disadvantages of using focus group discussion as affirmed by Saunders et al (2016) and these are that it is quite difficult to do random sampling for focus groups and this means findings may not be generalized. People also influence one another either to say something or to keep quiet about something.

These instruments are designed to ensure reliability and validity, with pilot testing conducted prior to the main data collection phase (Dillman et al., 2014). Appendix 4 shows focus group discussion guide for students

3.4 POPULATION

A study population also known as the general population can be defined by Creswell and Creswell (2018) as a whole group of people, elements, and units that the researcher is interested in and have the same characterizes. Asiamah and Oteng-Abayie (2017) are more elaborate about the general population as they say a general population is an entire group about which some information is required to be ascertained and participants in the general population must share at least a single attribute of interest. However, in any study situation the researcher is generally not interested in

the general population as the “general population is probably what is universally known and specified by researchers, though it makes little sense without being specified alongside target and accessible population (Asiamah, et al., 2017). Thus, in this study the target population are all Biology learner, Biology teachers and school administrators at Gumbonzvanda High school in Hwedza. The population for this study includes all students enrolled in biology classes at Gumbonzvanda High School during the academic year 2024

3.5 SAMPLE AND SAMPLING TECHNIQUES

Sekaran and Bougie (2016) highlight that a sample size is one element of research design that investigators need to consider as they plan their study. The sample comprise twenty-four (24) Biology learners, four (4) Biology teachers and two (4) school administrators at Gumbonzvanda High school in Hwedza as shown in the below

Table 3.5.1 SAMPLES TABLES

CATEGORY	SAMPLE SIZE	RESEARCH INSTRUMENT
Biology Learners	24	Focus group discussion and Questionnaires
Biology Teachers	4	Interview guides
Heads of department	2	Interview guides
TOTAL	30	

Sampling is often dependent on the form of study being conducted, such as a qualitative or quantitative method, (Sekaran, 2009). Moore and McCabe, (2015) defined sampling as the process

of selecting units from a population of interest so that by studying the sample one may fairly generalize the results back to the population from which they were chosen. For qualitative research purposive sampling is always perfect. Since the research approach is qualitative, participants were chosen based on their willingness to participate. According Cresswell (2014), purposive sampling refers to a group of non-probability sampling techniques in which units are selected because they have characteristics that a researcher needs in their sample in this case being Biology learner, teacher and the administration. In simpler terms, units will be selected on purpose in purposive sampling. Purposive sampling technique used include participants in a focal discussion group sand a homogeneous group (Biology learner or teacher) that brings together people of similar backgrounds and experiences.

3.5.1 Purposive sampling

Purposive sampling is when subjects are chosen to be part of a sample with a specific purpose in mind; the technique entails that participants are selected for a study because of some desirable characteristics (Blakstad, 2008; Beins & McCarthy, 2012). Therefore, in this research 4 teachers of Science, 2 Heads of Science department, 24 learners.

3.5.2 Stratified random sampling

A stratified random sampling technique was employed to select a representative sample from different forms 3 and 4 to ensure diversity in academic performance levels and experiences with practical activities.

3.6. PROCEDURES OF COLLECTING DATA

The researcher firstly, applied for permission to carry out the research study to the Ministry of Primary and Secondary Education. When the permission was granted, the researcher then contacted Gumbonzvanda High School authorities, briefed them on the subject matter and booked them for the interviews and focus group discussion. This was followed by the actual interviews and focus group which the researcher personally administered. In all cases, the researcher sought for written consent from the respondents before the data collection process began so that they could acknowledge their participation. All the data provided by the respondents was accurately recorded.

3.6.1 Distribution of Questionnaires:

The researcher administered questionnaires to selected students during biology classes, providing clear instructions for completion. In consultation with school Heads, the researcher made appointments for interviews with teachers and learners, and Focus Group Discussions as well. The researcher designed interview and Focus Group Discussions schedules. Interview schedules were flexible and catered for the interviewee's convenience and availability. The researcher visited the school to conduct the face to face interviews with learners, teachers of Science and administrators. The researcher took some notes, recorded audios during interviews and FGDs. In conducting interviews, the researcher was flexible in her guide in tailoring questions to meet her needs as outlined in the objectives. Thus, focus was on the forms of the practical activities used by teachers and their learners. The sessions involved a lot of probing by the researcher.

3.6.2 Conducting Interviews and Focus Groups:

The researcher scheduled interviews with teachers and focus group discussions with students outside regular class hours to minimize disruptions. Interviews were used because of the need to control the direction of the interview, by guiding the target group towards the main subject of the

research. In depth interviews makes it easy for the researcher to probe the interviewee more intensely during information gathering and allow the participants to freely discuss their thoughts and experiences (Cooper & Schindler, 2014). According to Cresswell (2014), the advantages of a focus group discussion is that it is relatively easy to assemble, inexpensive and flexible inters of format and the types of questions are desired outcomes. Focus group discussion also help people build new connections, provide rich data through direct interactions between researchers. More so, a focus group discussion is cheaper and is a quicker way of obtaining valuable data, and open recording allow participants to confirm their contributions. Therefore, this study will utilize focus group discussions with learners. The researcher does not dispute the fact that there are disadvantages of using focus group discussion as affirmed by Saunders et al (2016) and these are that it is quite difficult to do random sampling for focus groups and this means findings may not be generalized. People also influence one another either to say something or to keep quiet about something.

3.6.3 Academic Record Review:

The researcher collaborated with school administration to access students' academic records while ensuring confidentiality. The academic scores before the practical activities of 24 students were recorded. After that the students were then divided into two groups the experimental group with 12 students and the control group with 12 students

3.6.5 Data Entry:

The researcher compiled quantitative data into statistical software for analysis, while qualitative data from interviews and focus groups was transcribed for thematic analysis.

3.6 Validity and reliability

Validity and reliability issues are critical for research findings. Kothari (2004), Best and Kahn (2006) concur that dependability, consistency and stability point to reliability of research tools. Brewer (2012:9) avers that "validity refers to the extent to which the data accurately reflect the phenomena under study (also sometimes called internal validity." In an effort to meet validity and reliability, the researcher will do triangulation of the research tools. Triangulation entails the use of multiple methods in one study so that the weaknesses of one method are compensated other methods (Cohen, Manion & Morrison, 2010). Thus, unstructured in-depth interviews, FGDs and participant observation were blended in order to come up with authentic data in as far as practical activities affect the academic achievement of learners.

3.8 ETHICAL CONSIDERATIONS

Research ethics principles of right and wrong that govern the operation of the researchers during the process (Punch, 2011). Therefore, since ethics entails codes of conduct that define and regulate the behavior that is acceptable and unacceptable during the process of data collection, the study observed the following ethics:

3.8.1 Informed consent

In this study, the researcher sought informed consent from the research. Mungenda (2003) avers that informed consent means that the research participants understand the research process and willingly agree to it. Participants were made aware that the purpose of the research is academic,

and as such, their participation is voluntary. Thus, participation in the study was voluntary (Neuman, 2007)

3.8.2 Anonymity and confidentiality

While Makore (2001) posits that the researcher has to protect the anonymity of the research participants and the confidentiality of their disclosure unless they consent to the release of personal information, Tuckman and Monette (2011) postulate that anonymity requires that names or identities of the respondents should not be divulged. Therefore, the researcher conformed to these ethical considerations by assuring respondents that their names would not be published in the write-up but rather, pseudonyms were used.

3.9 DATA PRESENTATION AND ANALYSIS

Quantitative data was analysed using statistical methods, including descriptive statistics (mean, median, mode) and inferential statistics (correlation analysis) to determine relationships between practical activity participation and academic achievement. Qualitative data from interviews and focus groups undergo thematic analysis, allowing for the identification of common themes related to students' experiences with practical activities. This dual approach ensures that both numerical data and personal experiences contribute to the overall findings of the study (Braun and Clarke, 2006). The University of Pretoria (2021) says data analysis summarizes collected data through the interpretation of data gathered through the use of analytical and logical reasoning to determine patterns, relationship and trends. Data presentation and analysis highlights the overall procedures in organizing, describing and analysing data to be collected pertaining to this subject under study. After collection, the raw research data needs to be analysed and interpreted to give it meaning. This includes transcribing the verbal interview into

text, synthesizing, categorizing and summarizing the coded data, verifying the data is reliable and valid and finally, reporting the results.

A process of thematic analysis will be used, in which key themes and sub-themes relevant to the research questions of the study will be derived inductively from the interview data. These were used to structure the presentation of results, with verbatim quotes from the interviews to be used to preserve the real-life experiences of the research participants. The volume of data will be reduced to a manageable size to allow for summarization and the comparison with a view of evaluating and interpreting the results in relation to the research problem (Cresswell, 2018).

The following steps were followed in data management plan, steps for carrying out Thematic Analysis (Braun and Clarke, 2016).

3.9.1 Familiarization with data

The first step involved reading data several times to familiarize oneself with the contents. It includes re-writing it and to look for basic patterns and meaning. In this phase, the researcher will be immersed with the data and searched for meanings and patterns.

3.9.2 Generating initial codes

This phase entails identifying extensive ideas, views, behaviours and generating labels or codes for all of them. Coding reduced massive data into small pieces of information. This will then be used at later phases of the analysis process. The researcher identified important sections of text and attached labels to index them as they relate to a theme or issue in the date (King, 2004).

3.9.3 Searching for themes

This is a stage for identifying common patterns from responses of participants to the all the questions, then identifying significant patterns that are themes that pronounce something

connected to the research question. The phase is about sorting and collating all the potentially relevant coded data extracts into themes (Braun and Clarke, 2006).

3.9.4 Reviewing themes

In this phase the themes drawn out earlier in stage three are reviewed and developed to check if they are relevant. The themes can be modified and refined to which may mean combining closely related ones, separating some and disposing of some new codes were inserted, some themes collapsed into each other, some broke into separate themes, some deleted and selected themes were refined (Braun & Clarke 2006; King, 2004).

3.9.5 Defining and naming themes

This is a phase where themes are refined. A detailed analysis of all the themes was carried out. It also checked how the themes relate to each other if there are some that are over-arching emanating from other themes. According to Krajcik (themes were read through and coding scrutiny.

3.9.6 Writing-up the report.

This phase is mopping up the results of the findings. It involves coming up with a comprehensive analysis of all the themes which involves describing what they mean, drawing up depth, weight, and emphasis of each theme. Literature will be used to ascertain the research findings and provide an opportunity to challenge and add to the literature as according to . For a meaningful study all, relevant result will be discussed. Therefore, the patterns observed from qualitative data analysis will be discussed upon with a close reference to secondary data embedded in extant literature. It is during such a discussion that discrete findings with respect to the underlying research questions will be established.

3.10 SUMMARY

This chapter has outlined the research methodology for investigating the effects of biology practical activities on academic achievement at Gumbonzvanda High School. By employing a mixed-methods design, utilizing various data collection instruments, and ensuring a representative sample, this study aims to yield robust findings that can inform educational practices in biology. The following chapters will present the results and discuss their implications for teaching and learning in the biological sciences.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1. INTRODUCTION

This chapter presents the findings of the investigation into the effects of Biology practical activities on the academic achievement of learners at Gumbonzvanda High School. The study aimed to evaluate how engaging students in hands-on practical work influences their understanding of biological concepts and overall academic performance. The analysis is structured to provide a comprehensive overview of the data collected, followed by a discussion that links the findings to existing literature, identifies gaps in knowledge, and interprets the implications of the results. This chapter adheres to academic standards, drawing on relevant sources to support claims and interpretations.

4.2 DATA PRESENTATION

The data for this study were collected through a mixed-methods approach, including quantitative assessments of students' grades before and after participating in Biology practical activities and qualitative interviews with both students and teachers. The sample consisted of 24 learners from Gumbonzvanda High School, divided into two groups: those who participated in practical activities (experimental group) and those who did not (control group).

4.2.1 Quantitative Data

Table 4.2.1.1 presents the average grades of students in the experimental and control groups before and after the implementation of Biology practical activities

Table 4.2.1.1 AVERAGE GRADES OF STUDENTS

GROUP	PRE-PRACTICAL AVERAGE GRADE	POSTPRACTICAL AVERAGE GRADE
Experimental group	65%	78%
Control group	66%	67%

Figure 1 illustrates the change in average grades for both groups. The experimental group shows a significant improvement in their academic performance, with an increase of 13 percentage points after engaging in practical activities. In contrast, the control group exhibited minimal change, suggesting that practical activities may have a positive impact on learning outcomes.

4.2.2 Qualitative Data

Qualitative data were gathered through semi-structured interviews with 12 students from the experimental group and 2 teachers. Thematic analysis revealed several key themes:

1. **Enhanced Understanding**: Many students reported that practical activities helped them grasp complex biological concepts more effectively than traditional classroom methods.

2. **Increased Engagement**: Students expressed greater interest in Biology when involved in hands-on experiments, which they found more enjoyable and relevant.

3. **Collaboration and Communication**: Practical activities fostered teamwork and improved communication skills among peers.

TABLE 4.2.2.1 RESPONSE RATE FOR STUDENTS AND TEACHERS

Participants	**Turn-Up**
Heads of department	2
Biology teachers	4

Biology learners	24
Total	30
Total Percentage	100
Apologies/Absenteeism	None

4.3 CODES USED TO REPRESENT PARTICIPANTS

The codes that were used in the study are HODs for Heads of departments, BT for Biology teacher and BL for Biology learner.

TABLE 4.4 THEMES AND SUB THEMES

Themes	**Description**	**Sub-themes**
Theme 1:	Current level of academic achievement in Biology	• General Achievement Levels • Influence of Curriculum on Achievement
	among students at Gumbonzvanda High School	Teacher Influence

Theme 2:	Influence of Biology practical activities students' understanding of Biological concepts	Enhanced Conceptual Understanding Application of Knowledge Motivation and Engagement
Theme 3:	Relationship between participation in practical activities and students' academic achievement	Positive Correlation Skill Development Engagement and Retention

4.5 THEMATIC PRESENTATION OF DATA

4.5 1 Current level of academic achievement in Biology among students at Gumbonzvanda High School

4.5.1.1General Achievement Levels

Biology teachers, learners and the heads of department's views on current level of academic achievement in Biology among Students at Gumbonzvanda High School varied significantly. Some teachers at Gumbonzvanda High School revealed their general achievement levels witnessed so far. Some of the participants had this to say:

HODs: "National assessments indicate that high school students' performance in biology varies significantly across regions." The average biology scores in high schools suggest that a significant number of students are not prepared for advanced scientific study."

BLs: "Many students struggle to achieve proficiency in biology, with only 30% meeting the standardized benchmarks and a significant achievement gap exists in biology, influenced by various socioeconomic factors."

BTs: "High school biology represents a critical point where foundational concepts are established, yet many students fail to grasp key principles."

4.5.1.2 Influence of Curriculum on Achievement

BL3: "Curriculum design directly impacts student achievement in biology, with inquiry-based approaches yielding better outcomes.

Some students said students exposed to a rigorous biology curriculum demonstrate higher performance metrics. The integration of technology in biology education often correlates with improved student understanding and achievement. Revisions in high school biology curricula have shown promising results in student performance. Curricular alignment with state standards is crucial for enhancing student achievement in biology.

4.5.1.3 Teacher Influence

BT2: "Teacher expertise in biology significantly influences student academic performance."

Some of the teachers reiterated that effective biology teaching strategies can lead to marked improvements in student test scores. They also said professional development for biology teachers is essential for enhancing student outcomes. Teachers who engage students in active learning strategies contribute to higher achievement levels. The quality of instruction in biology is a key determinant of student success."

However, the issues raised by participants in this study concurs with the literature in the sense that the problem is connected to ineffective teaching strategies employed by teachers. The authors also stated that teachers are more inclined to traditional teaching method which appears to be the most dominant teaching method employed by many science teachers. Low achievement in Biology could be inability to remember or recall what has been taught during the instruction partly due to infective teaching methods. Umoru and Itodo (2018) in a study stated that the persistent use of traditional teaching method makes students passive rather than active learners. This does not promote insightful learning and long-term retention of some concepts in Biology (Smith & Johnson, 2021).

4.5.2 Influence of Biology practical activities on understanding biological concepts

4.5.2.1 Enhanced conceptual understanding

The participants had this say:

BL10: "Practical activities in biology facilitate deeper understanding of complex biological concepts."

Some of the Biology learners said that hands-on experiments allow students to connect theoretical knowledge with real-world applications. Students who participate in lab activities show a marked improvement in concept retention. Experiential learning in biology enhances cognitive engagement among students. Laboratory work is essential for developing critical thinking skills in biology.

4.5.2.2 Motivation and Engagement

The participants said that:

BL3: Engagement in practical activities increases student motivation to learn biology." BL4:

Active participation in labs fosters a positive attitude towards bio fosters.

Some students said that they are more likely to develop a passion for biology when involved in hands-on learning. They also said practical experiences in biology labs create a stimulating learning environment motivated students tend to perform better academically in biology."

4.5.2.3 Application of Knowledge

Some of the Biology learners had this to say:

BL8: "Practical activities enable students to apply theoretical knowledge to real-life situations."

Some of the students who engage in practical biology activities show greater proficiency in applying concepts. Laboratory activities are critical for the application of scientific methods."

4.5.2. 4 Increased Engagement:

BL11: Students expressed greater interest in Biology when involved in hands-on experiments, which they found more enjoyable and relevant. "Real-world applications of biological concepts enhance student learning experiences."

BL12: "Experiential learning through practical activities solidifies understanding of core biological principles."

However, the findings in this study corresponds with the data gathered in the literature. For instance, according to Harlen, 2010 practical activities enhance students' comprehension of

biological concepts by providing concrete experiences, illustrating complex processes and allowing exploration and discovery. For example dissecting a frog to understand its anatomy. Also, Briggs 2005 postulates that hands-on experiences aid in long-term retention of knowledge by reinforcing learning through repetition, creating memorable experiences and encouraging active recall. For example conducting a photosynthesis experiment to understand plant growth. Moreover, Practical activities encourage critical thinking, analysis, and problem-solving by presenting real-world scenarios, requiring data analysis and interpretation and fostering inquirybased learning (Lederman 1992). For example designing an experiment to test the effects of pH on plant growths.

4.5.3 Relationship between participation in practical activities and academic achievement

4.5.3.1 Positive Correlation

A number of learners argued that:

BL1: "A direct correlation exists between participation in practical activities and improved academic performance in biology."

Students who regularly engage in lab work tend to achieve higher grades. Research shows that students involved in hands-on experiments score significantly better on assessments. The frequency of practical engagement is positively associated with student achievement in biology. Students participating in lab activities demonstrate enhanced understanding reflected in their academic performance.

4.5.3.2 Skill Development

Participants said that:

BL6: "Practical activities help develop essential scientific skills necessary for academic achievement. Skills gained through lab work contribute significantly to student success in exams. Scientific inquiry skills acquired during practical sessions are linked to higher achievement levels. Laboratory experiences enhance problem-solving abilities in biology students. Practical skills are foundational for success in biology and related fields."

4.5.3.3 Engagement and Retention

The participants noted that:

BL11: ″Higher student engagement in practical activities correlates with improved retention of biological concepts."

BL12: "Students actively participating in labs show greater long-term retention of course material."

However, it is important to note that the sentiments by the participants correlates with the information in the literature. For example, practical activities boost students' interest and motivation in biology, making learning enjoyable and engaging (Kirschner, 2013). Practical work has been able to promote students' positive attitudes and enhance motivation for effective learning in science as described by Okam and Zakari (2017). Consequently, a positive attitude toward the importance of practical work meaningfully affects students' achievement in science (Hinneh, 2017). For example creating a model of the human body systems. It is also believed that hands-on experiences promote active participation and engagement, reducing classroom passivity (HmeloSilver, 2004). For example conducting a biology scavenger hunt. . In addition to this, practical work encourages and increases students' interest in science and promotes it as an

engaging subject. As an example, when students practice chemical reactions, they see that science is an applied science and not just theories and rules.

Finally, practical activities help students develop confidence in their scientific abilities, fostering a sense of accomplishment (Bandura, 1997). For example, successfully culturing microorganisms in a lab. .Multiple studies showed that practical work confers many advantages, including developing laboratory skills and scientific knowledge, as well as understanding science concepts and theories (Fadzil and Saat, 2013). Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe to be discovered.

4.6 LINKING LITERATURE REVIEW WITH NEW FINDINGS

The findings of this study align with previous research that emphasizes the importance of practical activities in enhancing students' academic performance. For instance, studies by Krajcik et al. (2013) and Hattie (2009) indicate that experiential learning approaches can lead to deeper understanding and retention of knowledge. The current research builds on these findings by providing empirical evidence from Gumbonzvanda High School, demonstrating that practical activities not only improve grades but also enhance student engagement and motivation. Moreover, this study addresses gaps identified in earlier literature regarding the specific context of secondary education in Zimbabwe. While previous studies have predominantly focused on Western educational settings, this research contributes to the understanding of how localized factors, such as resource availability and teaching methodologies, influence learning outcomes in a developing country context. Finally, practical activities help students develop confidence in their scientific abilities, fostering a sense of accomplishment (Bandura, 1997). For example,

successfully culturing microorganisms in a lab. .Multiple studies showed that practical work confers many advantages, including developing laboratory skills and scientific knowledge, as well as understanding science concepts and theories (Fadzil and Saat, 2013). Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe to be discovered. However, it is important to note that the sentiments by the participants correlates with the information in the literature. For example, practical activities boost students' interest and motivation in biology, making learning enjoyable and engaging (Kirschner, 2013). Practical work has been able to promote students' positive attitudes and enhance motivation for effective learning in science as described by Okam and Zakari (2017). Consequently, a positive attitude toward the importance of practical work meaningfully affects students' achievement in science (Hinneh, 2017). For example creating a model of the human body systems. It is also believed that hands-on experiences promote active participation and engagement, reducing classroom passivity (Hmelo-Silver, 2004). For example conducting a biology scavenger hunt. . In addition to this, practical work encourages and increases students' interest in science and promotes it as an engaging subject. As an example, when students practice chemical reactions, they see that science is an applied science and not just theories and rules.

4.7 FILLING GAPS IDENTIFIED EARLIER

Prior research has often highlighted the benefits of practical activities but has not thoroughly examined their impact within specific educational environments like those found in Zimbabwe. By focusing on Gumbonzvanda High School, this study provides insights into how cultural and institutional factors may shape students' experiences with practical Biology activities. For

example, the availability of resources such as laboratory equipment and materials directly influences the effectiveness of practical lessons (Baker Leary, 2015). This study also identifies the need for teacher training in facilitating practical work effectively, an area that has been underexplored in existing literature. By highlighting these aspects, this study aims to inform policy recommendations for improving Biology education at both local and national levels.

4.8 DISCURSIVE, ANALYTICAL, AND INTERPRETIVE SKILLS

The analysis reveals that practical activities serve as a catalyst for improved academic performance among learners at Gumbonzvanda High School. The significant increase in average grades for the experimental group suggests that hands-on learning experiences deepen students' comprehension of biological concepts. This finding is consistent with constructivist theories posited by Piaget (1976) and Vygotsky (1978), which advocate for active learning environments where students can construct knowledge through experience. Furthermore, the qualitative data underscores the transformative potential of practical activities beyond mere academic achievement. Students reported increased motivation and interest in Biology, which aligns with Deci and Ryan's (2000) Self-Determination Theory, emphasizing the role of intrinsic motivation in learning. The collaborative nature of practical work also suggests that social interaction enhances learning outcomes, supporting Vygotsky's emphasis on social context in cognitive development.

However, it is crucial to recognize potential limitations within this study. The reliance on selfreported data from students may introduce bias, as participants might overstate their engagement or understanding. Future research could incorporate more objective measures, such as observational studies or standardized assessments, to validate these findings further.

4.9 SUMMARY

In summary, this chapter has presented a detailed analysis of the data collected regarding the effects of Biology practical activities on academic achievement at Gumbonzvanda High School. The quantitative results indicate a significant improvement in grades among students who engaged in practical work, while qualitative insights reveal enhanced understanding and increased student engagement. By linking these findings to existing literature and addressing previously identified gaps, this research contributes valuable knowledge to the field of biology education in Zimbabwe. The implications for teaching practice and policy are significant, suggesting that incorporating practical activities into the curriculum could lead to improved educational outcomes for learners.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides a comprehensive summary of the research conducted on the effects of Biology practical activities on the academic achievement of learners at Gumbonzvanda High School. This chapter synthesizes the key findings, discusses the conclusions drawn from the study, and offers recommendations for educators, policymakers, and future research. It aims to encapsulate the essence of the investigation while acknowledging the constraints encountered during the study.

5.2 SUMMARY OF THE PROJECT

The primary objective of this research was to assess how engaging students in practical Biology activities influences their academic performance. The study employed a mixed-methods approach, combining quantitative assessments of students' grades with qualitative interviews from both students and teachers. A sample of 24 learners was divided into an experimental group, which participated in practical activities, and a control group that followed traditional teaching methods.

5.3KEY FINDINGS

5.3.1 Improvement in Academic Performance:

The quantitative results indicated a significant increase in average grades for the experimental group (from 65% to 78%) compared to minimal change in the control group (from 66% to 67%). This suggests that practical activities positively impact students' understanding and retention of biological concepts.

5.3.2 Enhanced Engagement and Motivation:

Qualitative data revealed that students found practical activities more engaging and enjoyable, leading to increased interest in Biology. Many students articulated that hands-on experiences helped them understand complex topics better.

5.3.3 Collaboration and Social Skills Development:

The study highlighted that practical work encouraged teamwork and improved communication skills among peers, which are essential competencies in both academic and real-world contexts.

5.4 CONSTRAINTS OF THE STUDY

Despite the valuable insights gained, several constraints were encountered during the research:

5 4.1 Sample Size:

The study was limited to one school, which may affect the generalizability of the findings to other educational contexts.

5.4.2 Resource Limitations:

Limited access to laboratory equipment and materials may have constrained the scope of practical activities implemented.

5.4.3 Self-Reported Data:

The reliance on self-reported data from students may introduce bias, as participants might present their experiences more favourably.

5.5CONCLUSIONS

The investigation has provided answers to the research problem regarding the effects of Biology practical activities on academic achievement at Gumbonzvanda High School. The study

concluded that engaging students in hands-on Biology experiments significantly improves their academic performance compared to traditional methods. Practical activities foster greater interest and motivation in Biology, leading to a more positive attitude toward Participating in practical work promotes collaboration and communication skills among students, contributing to their overall personal development. These conclusions align with existing literature that advocates for experiential learning as a means to enhance educational outcomes (Krajcik et al., 2013; Hattie, 2009).

5.6 RECOMMENDATIONS

Based on the findings and conclusions drawn from this study, several recommendations are proposed:

5.6.1. Incorporation of Practical Activities in Curriculum:

Schools should prioritize integrating practical Biology activities into the curriculum to enhance student engagement and academic performance. This could involve developing a structured program that outlines specific practical experiments relevant to the syllabus.

5.6.2. Teacher Training and Professional Development:

Educators should receive training on effectively facilitating practical activities. Professional development workshops could focus on innovative teaching strategies that incorporate hands-on learning experiences.

5.6.3. Resource Allocation:

Educational authorities should ensure that schools are adequately equipped with laboratory materials and resources necessary for conducting practical Biology lessons. This may involve partnerships with local organizations or government initiatives aimed at improving science

education infrastructure.

5.6.4. Further Research

Future studies should explore the long-term effects of practical activities on student learning outcomes across different educational contexts. Expanding the sample size to include multiple schools could enhance the generalizability of findings.

5.6.5. Parental Involvement:

Schools should encourage parental involvement in supporting practical learning at home, such as through science fairs or biology-related projects, which can reinforce classroom learning.

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APPENNDICES

APPENDIX 1

QUESTIONNAIRES FOR STUDENTS

TO THE RESPONDENT

We are Maforo Catherine N and Manenji-Jinga Pauline, students at Bindura University of

Science Education studying Honors'-Bachelor of Science Education Degree in Biology. We are carrying out a research on the topic: Investigating the effects of Biology practical activities on student academic achievement. You are requested to truthfully answer all the questions below to the best level you can.

Instruction on questionnaire completion

a) Please answer all questions

b) Do not write names on questionnaires

1. Demographic Information

• Age: ----------

• Gender: Male [ ] Female [ ]

• Academic Level: ----------

2. How often do you participate in biology practical activities? (tick)

• Never [ ]

• Rarely [ ]

• Sometimes [ ]

• Often [ ]
• Always [ ]

• What type of practical activities do you enjoy most? Experiments [ ]

field trips dissections [ ]

3. How do you think practical activities impact your understanding of biology? (Tick)

• Not at all [ ]

• A little [ ]

• Moderately [ ]

• Very much [ ]

• Extremely [ ]

4. What was your average score in biology before participating in practical activities? [ ]

• What is your average score now? [ ]

5. What challenges do you face during biology practicals (Select all that apply)

• Lack of resources [ ]

• Time constraints [ ]

• Difficulty understanding instructions [ ]

• Other (please specify):----------

5. Suggestions for Improvement

• What suggestions do you have for improving the effectiveness of practical activities in biology?

APPENDIX 2

QUESTIONNAIRES FOR BIOLOGY TEACHERS

TO THE RESPONDENT

We are Maforo Catherine N and Manenji-Jinga Pauline, students at Bindura University of Science Education studying Honors'-Bachelor of Science Education Degree in Biology. We are carrying out a research on the topic: Investigating the effects of Biology practical activities on student academic achievement. You are requested to truthfully answer all the questions below to the best level you can. Note that all your responses will only be used for the purpose of this research work and your identity will be protected from the public, revealed to this research only. We thank you for participating. The purpose of this interview is to explore your perspectives on how biology practical activities impact student learning and academic performance. Your responses will help us understand the effects of practical activities on biology students' academic achievement.

Demographic Information

- Name : (optional) _____
- Years of Teaching Experience: _____
- Grade Levels Taught: _____

1. Teaching Practices

- How often do you incorporate practical activities into your biology lessons?
- Never [ ]
- Rarely [ ]

• Sometimes [ ]

• Often [ ]

• What types of practical activities do you use most frequently? Dissections [ ] labs [ ] fieldwork [ ]

2. Impact on Student Learning

• In your opinion, how do practical activities affect student engagement in biology?

• Not at all [ ]

• A little [ ]

• Moderately [ ]

• Very much [ ]

• Extremely [ ]

4. Challenges Faced

What challenges do you encounter when conducting practical activities? (Select all that apply)

• Limited resources [ ]

• Lack of time [ ]

• Student behavior issues [ ]

• Other (please specify):_____

5. Suggestions for Improvement

• What suggestions do you have for improving the effectiveness of practical activities in biology?

_____

APPENDIX 3: INTERVIEW GUIDE FOR BIOLOGY TEACHERS

TO THE RESPONDENT

We are Maforo Catherine N and Manenji-Jinga Pauline, students at Bindura University of Science Education studying Honors'-Bachelor of Science Education Degree in Biology. We are carrying out a research on the topic: Investigating the effects of Biology practical activities on student academic achievement. You are requested to truthfully answer all the questions below to the best level you can. Note that all your responses will only be used for the purpose of this research work and your identity will be protected from the public, revealed to this research only. We thank you for participating. The purpose of this interview is to explore your perspectives on how biology practical activities impact student learning and academic performance. Your responses will help us understand the effects of practical activities on biology students' academic achievement.

Interview Questions

Background Information

1. How long have you been teaching Biology?
2. Which levels do you currently teach?
3. Do you incorporate practical activities into your biology curriculum?
4. What types of practical activities do you typically use?
5. Do practical activities influence students' understanding of biological concepts?
6. Can you provide an example of a specific practical activity that significantly enhanced student learning?
7. Have you observed any correlation between students' participation in practical activities and their academic performance in biology? If so, could you elaborate on this?
8. How do you assess students' understanding following practical activities?
9. In your opinion, how do practical activities affect student engagement and motivation in biology classes?
10. Do you notice a difference in student enthusiasm for biology when they participate in hands-on learning versus traditional lectures?

11. What challenges do you face when implementing practical activities in your biology classes?
12. How do these challenges impact your teaching and your students' learning experiences? 13. Based on your experience, what improvements would you suggest for enhancing the effectiveness of practical activities in biology education?

14. Are there any specific resources or support systems that could help facilitate more effective practical learning?

15. Reflecting on your overall experience, do you believe practical activities are important student learning in biology?

16. Would you advocate for an increased emphasis on practical work in the biology curriculum? Why or why not?

We thank you for your time and valuable insights. This interview aimed to facilitate a comprehensive discussion about the impact of practical activities on student learning and academic achievement. We encourage you to reach out if you have any further thoughts or questions after this interview.

APPENDIX 4

ACADEMIC RECORD FOR STUDENTS BEFORE AND AFTER PRACTICAL ACTIVITIES

Academic Record for the experimental group

(Those who did not participate in practical activities)

STUDENT I.D	STUDENT NAME	SCORE BEFORE PRACTICAL	SCORE AFTER PRACTICAL	IMPROVEMENT
001	Chifamba Tsungai	66	79	+13
002	Moyo Catherine	64	78	+14
003	Ncube Kupakwashe	63	76	+13
004	Mhazi Thandie	65	79	+14
005	Murwira Locadia	64	77	+14
006	Sibanda Raziela	66	79	+13
007	Chafa Honest	62	75	+13
008	Gumbo Brian	64	77	+13
009	Hama Welcome	66	78	+12
010	Moyo David	68	80	+12
011	Mpofu Davison	67	79	+12
012	Sengedza Caris	65	78	+13

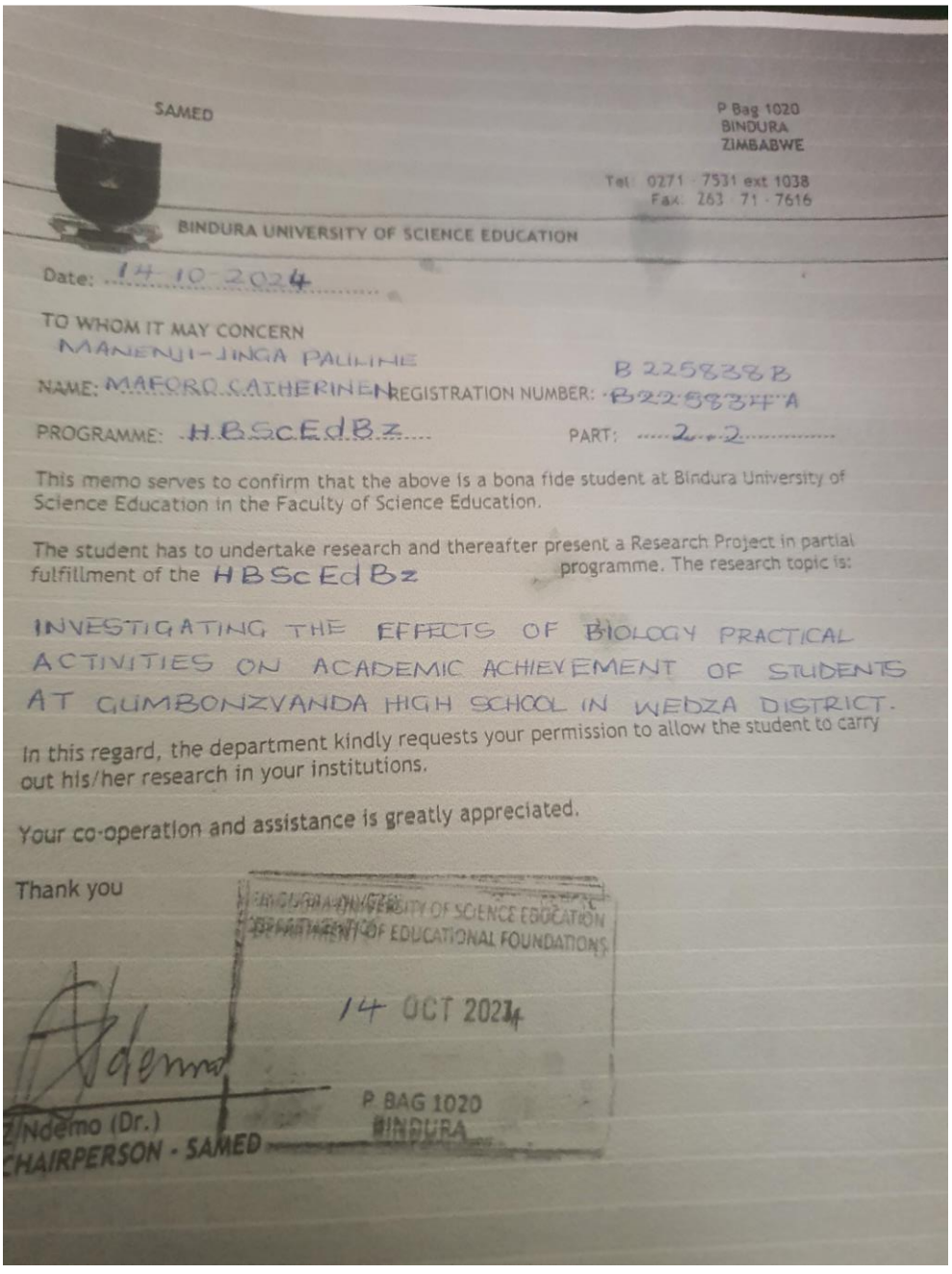
ACADEMIC RECORD FOR STUDENTS BEFORE AND AFTER PRACTICAL ACTIVITIES

Academic Record for the control group

(Those who did not participated in practical activities)

STUDENT I.D	STUDENT NAME	SCORE BEFORE PRACTICAL	SCORE AFTER PRACTICAL	IMPROVEMENT
013	Tivenge Primrose	67	68	+1
014	Pwide Bridget	65	67	+2
015	Chiwera Ricci	64	65	+1
016	Mabugu Mufaro	66	68	+2
017	Manenji Raelyn	65	66	+1
018	Mpofu Kupakwashe	67	68	+1
019	Shava Honoris	63	64	+1
020	Majoni Rhyn	65	66	+1
021	Shumba Revive	67	67	0
022	Ncube Divine	69	69	0
023	Chitamba Armor	68	68	0
024	Mpofu Paul	66	67	+1

APPENDIX 5: RESEARCH LETTER



SAMED

P Bag 1020
BINDURA
ZIMBABWE

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

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 14 10 2024

TO WHOM IT MAY CONCERN

NAME: MANENJI-JINGA PALINE MAFORO CATHERINE REGISTRATION NUMBER: B225838B B225838A

PROGRAMME: HBScEdBz PART: 2.2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the HBScEdBz programme. The research topic is:

INVESTIGATING THE EFFECTS OF BIOLOGY PRACTICAL ACTIVITIES ON ACADEMIC ACHIEVEMENT OF STUDENTS AT GUMBONZVANDA HIGH SCHOOL IN WEDZA DISTRICT.

In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

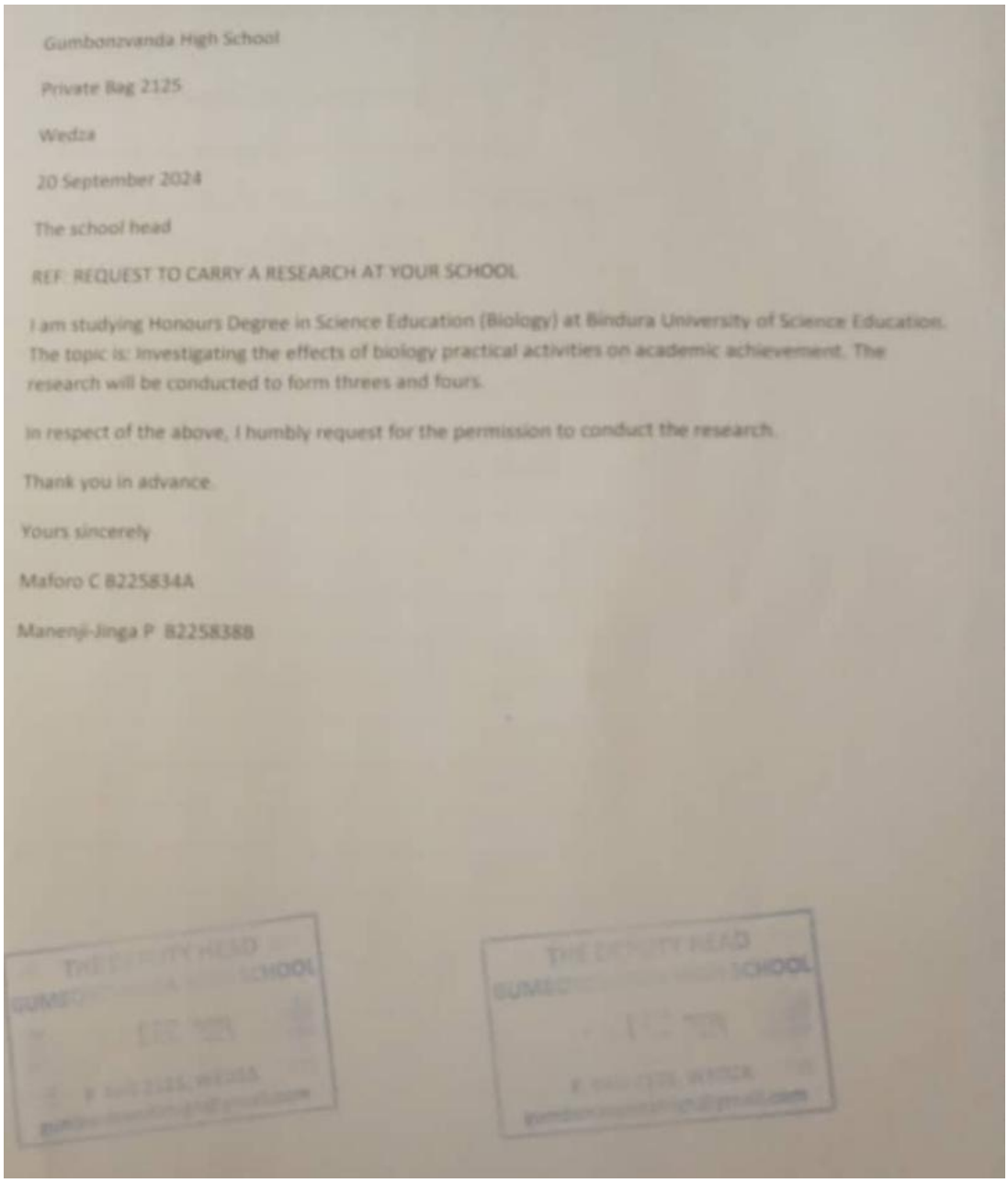
Your co-operation and assistance is greatly appreciated.

Thank you

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
14 OCT 2024
P BAG 1020
BINDURA

Ndemo (Dr.)
CHAIRPERSON - SAMED

APPENDIX 6: PERMISSION LETTER FROM GUMBONZVANDA HIGH SCHOOL



Gumbonzvanda High School

Private Bag 2125

Wedza

20 September 2024

The school head

REF: REQUEST TO CARRY A RESEARCH AT YOUR SCHOOL

I am studying Honours Degree in Science Education (Biology) at Bindura University of Science Education. The topic is: Investigating the effects of biology practical activities on academic achievement. The research will be conducted to form threes and fours.

In respect of the above, I humbly request for the permission to conduct the research.

Thank you in advance.

Yours sincerely

Maforo C B225834A

Manenji-Jinga P B2258388