

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN BIOLOGY



**THE CHALLENGES AND OPPORTUNITIES THAT ORDINARY LEVEL
BIOLOGY LEARNERS IN FIVE SELECTED SECONDARY SCHOOLS IN GOKWE
NORTH DISTRICT ENCOUNTER DURING PRACTICAL WORK AND THE
IMPACT ON ACADEMIC ACHIEVEMENT.**

By

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**Research Project submitted to Bindura University of Science Education in partial
fulfilment of the requirements of the Bachelor of Science Education Honours Degree in**

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RELEASE FORM

THE CHALLENGES AND OPPORTUNITIES THAT ORDINARY LEVEL BIOLOGY LEARNERS IN FIVE SELECTED SECONDARY SCHOOLS IN GOKWE NORTH DISTRICT ENCOUNTER DURING PRACTICAL WORK AND THE IMPACT ON ACADEMIC ACHIEVEMENT.

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



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Degree Tittle - Bachelor of Science Honours Degree in Biology

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Dedication

This research project is dedicated to my family and friends who have been my source of inspiration and support throughout this journey.

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- My supervisor Ms. S. Bwanya, for total support, expertise and guidance throughout this research project.
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- The Ministry of Primary and Secondary Education and administrators of schools in this study for granting me permission to carry out this research project.
- Almighty God, for guiding me throughout this research journey.

Abstract

The researcher conducted a study to investigate the challenges and opportunities that Ordinary level Biology learners in five selected secondary schools in Gokwe North district encounter during practical work and the impact on academic achievement. This study adopted a qualitative descriptive case study on the challenges and opportunities encountered by these learners and the impact on academic achievement. The data collection instruments used in this study are interviews, focus group discussions and observations. Interviews were conducted with thirty learners and five biology teachers from the five schools. A group of six learners per each school participated in focus group discussions with the research. Observations were held from these schools from the infrastructure to the teaching and learning process. The findings of this study are that learners are facing numerous challenges during practical work. These challenges include lack of science laboratories in some schools, laboratories that require electricity, running water and overall rehabilitation in some schools, inadequate equipment and materials for conducting practical work, poor working space and ventilation, safety concerns, lack of support from administration and limited understanding of instructions by learners. These challenges are negatively affecting academic achievement of learners. Availability of qualified teachers who are well motivated and value teamwork as well as appreciating the role of practical work and ZIMSEC Biology Paper 3 on practical work that is helping schools purchase equipment and materials that can be used by other classes are among the opportunities in these schools. Science levies being paid by learners must be used to improve the teaching and learning of science. This study recommends the schools to prioritize seeking and allocation of financial resources to provide necessary facilities, equipment and materials for Biology practical work. Teachers also need regular professional development opportunities for them to be effective. The Ministry of Primary and Secondary Education can also assist rural schools with resources so that they are not left behind.

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CHAPTER 1.

1.1 Introduction

Every child, that is to say every boy and girl under the age of eighteen has the right to education among other rights according to the Constitution of Zimbabwe Amendment (No. 20) Act 2013. The constitution stresses that children must have access appropriate education and training. The Government of Zimbabwe highly values education and has adopted education 5.0 like other countries in the world. Education 5.0 is highly innovative method which can develop teaching staff, students and administration to the next level of technology adoption in the learning environment according to Alharbi (2023). Alharbi (2023) further stresses that with Education 5.0, learning process is established by the learner and driven and controlled by the learner such that the learner is seen as a whole person of whose values, beliefs, thoughts, knowledge and skills are not seen as separate fundamentals to be natured and trained. Therefore Education 5.0 is for holistic child development.

The Heritage Based Curriculum Framework for Primary and Primary and Secondary Education 2024-2030 indicates that in Forms 1 to 4 all pupils study three (3) compulsory learning areas which are Mathematics/Functional Mathematics, Combined Science and Heritage studies and in addition pupils also study six necessary electives from the specified pathways. The choice of the learning area at lower secondary school level is informed by preceding profiling records with also learning areas in Forms 3 and preparing pupils for options as tertiary and university education as well as for a vocation according to the Heritage Based Curriculum Framework for Primary and Primary and Secondary Education 2024-2030. The Framework also states that pupils can choose learning area combinations across pathways in line with their career aspirations with electives for sciences depicted on the table below.

LEARNING AREA	FORM
Computer Science	1 to 4
Computer Science	1 to 4
Geography	3 to 4
Physics	3 to 4
Chemistry	3 to 4
Biology	3 to 4
Additional Mathematics	3 to 4
Statistics	3 to 4
Agriculture	1 to 4

Table 1: Electives for Sciences.

Therefore Biology at Ordinary level is optional and not compulsory like combined Science. Biology Syllabus Forms 3-4 2015-2022 aims to help learners to help learners develop practical skills such as accuracy, objectivity, integrity and enquiry so that they will be able to demonstrate knowledge of biological terms, laws, facts, concepts, principles, theories and phenomena. The syllabus is based upon interactive, multisensory, learner centered and practical approaches where learners should be able to apply their experience, knowledge, skills and attitudes to the learning of the subject. Experimentation, demonstration, discovery, discussion, problem solving, simulations and observations are among the suggested methods by the syllabus. The syllabus has topics including chemicals of life, cells and molecular activities, enzymes, plant science, animal science, microbiology and biotechnology, genetics, biodiversity and ecosystems that can be taught well with the use of practical work.

Joshi and Green (2024) defines biology as a branch of science that deals with living organisms and their vital processes. According to Comunale, Robb and Gonzalez (2023), science is the

study of the universe around us and within us, natural phenomena and solutions to problems with scientists wanting to observe natural phenomena or events to understand the mechanisms that cause them and explains how or why those natural events occur.

Practical work has taken a leading role in science education particularly in the 1960s with its goals mainly oriented towards the development of sensitivity and taste for the study of physical and natural phenomena bringing students closer to closer to the daily reality experienced by researchers working in these areas of knowledge while promoting educational success according Oliveira and Bonito (2023). Oliveira and Bonito (2023) postulate that the reflection on the teaching of science more specifically over the development of the practical work took special importance in the early 1960s in the United State of America during Cold War from the moment the Union of Soviet Socialist republic launched the first satellite to orbit the Earth. Mayer in Oliveira and Bonito (2023) states that the impact of this grape-fruit sized object on the American ego was several orders of magnitude greater than any event of the century with the missing step taken that triggered a profound revolution both the curricula as well as methodologies applied in the teaching of sciences with echoes quickly made themselves felt a bit all over the globe.

Programs such the Biological Sciences Curriculum Study (BSCS) and the Earth Science Curriculum Project (ESCP) establish that in addition to their content, the Biological Sciences and Geosciences programs respectively should reflect from that moment on the science enterprise in its broadest scope, adopting a more investigative spirit contrary to its teaching as a mere observational sciences. To reach this goal practical, investigative, laboratory and field activities in the programs of these areas of knowledge would have to be included. Simultaneously, the need to create new materials that allow proper development of new strategies that allow proper development of new strategies than approaches of teaching should

also be include giving emphasis to the use of multimedia resources. Therefore the impact of practical work in teaching and learning Biology cannot be underestimated.

At the end of the 20th century, practical work continues to enjoy a privileged status been the science teaching, Hodson in Oliveira and Bonito (2023) argues that paradoxically, practical is simultaneously overused and underused. Overused in the sense that teachers develop it with the expectation of reaching all the science learning objectives. And underused where its real potential is rarely fully explored. In a way to get out of this confusing educationally unproductive situation, the author proposes a reconceptualization of practical working on the following three associated purposes which would contribute to helping students.

- (a) Learn science
- (b) Learn about science, developing an understanding about the nature and scientific methods, as well as the awareness regarding the complex interactions between science, technology, society and the environment, and
- (c) Make them capable of doing science, including them and developing their experiences in scientific research and problem solving.

Therefore Biology teachers may be overusing or underusing practical work in the teaching and learning of Biology in Gokwe North secondary schools.

Wellington in Hodson in Oliveira and Bonito (2023) states that reflecting on the arguments that justify carrying out practical work can be grouped into three main domains which are the cognitive, the affective and the skills and processes. In the arguments regarding the cognitive domain, Wellington in Oliveira and Bonito (2023) suggests that practical work allows to illustrate, verify and affirm theoretical content helping the students to improve their understanding of science, allowing them to visualize scientific laws and theories which promotes their conceptual development. Regarding the affective arguments, Wellington in

Hodson in Oliveira and Bonito (2023) indicates that because of practical work is motivating and exciting it will contribute to an increased interest in science, consequently helping students to better remember lessons developing their memorization abilities. Lastly about the domain of skills and processes, Wellington in Hodson in Oliveira and Bonito (2023) postulates that practical work has the potential to develop transferable skills of great relevance not only for future scientists but it is also of great use to students with other callings with some examples of these skills being observation, measurement, prediction and inference. Therefore practical work in Biology education is of paramount importance.

1.2 Background to the study

Learners are not performing well in Biology as indicated by pass rates of many secondary schools in Gokwe North District. There are many teaching methods that may assist learners to do well including practical work. At some secondary schools in Gokwe North District science laboratories are now defunct and some schools lack adequate resources, equipment and materials for conducting practical work in biology. Some stakeholders, during these days with internet use as well as artificial intelligence are questioning whether practical work is still necessary in Biology. Public schools near Nembudziya Growth Point are also losing learners to the newly established private schools as they are being said to be offering Sciences better. This study aims to highlight the specific challenges and opportunities faced by Ordinary level Biology learners in Gokwe North District Secondary schools during practical work in Biology and how these challenges and opportunities may impact their academic achievement in the subject. By identifying these obstacles, the study may also seek to identify potential opportunities for improving the learning experience and academic outcomes of these students. Additionally, this study also seeks to explore in five selected secondary schools in Gokwe North district the attitudes and motivation of ordinary level biology learners towards practical

work in biology, as well as any other factors that may impact their engagement with these activities.

1.3 Statement of the problem

Despite the importance of practical work in biology education, many ordinary level Biology learners in Gokwe North District Secondary schools face challenges that hinder their effective participation in practical activities. These challenges may include limited access to laboratory resources, inadequate teacher training in facilitating practical work, lack of motivation and interest, and insufficient time allocated for practical activities. These challenges may impact students' academic achievement by limiting their understanding of biological concepts, reducing their ability to apply theoretical knowledge to practical scenarios, and affecting their overall performance in Biology examinations. Understanding these challenges and identifying potential opportunities for improvement is crucial in enhancing the quality of biology education in Gokwe North District Secondary schools and ensuring that students can fully benefit from practical work experiences.

1.4 Research questions

1. What challenges and opportunities do Ordinary level Biology learners in five selected schools in Gokwe North District encounter during practical work?
2. In what way do these challenges and opportunities encountered during practical work impact academic achievement of Ordinary level Biology learners in five selected schools in Gokwe North District.
3. What opportunities exist for improving the quality of practical work experiences for Biology learners in Gokwe North Secondary schools?

1.5 Aims of the study

The aim of the study is to investigate the challenges and opportunities that ordinary level biology learners in selected schools in Gokwe North District encounter during practical work.

1.6 Objectives of the study

1. To find out challenges and opportunities that Ordinary level Biology learners encounter during practical work.
2. To find out how do these challenges and opportunities affect academic achievement of Biology learners?
3. To find out strategies that can be implemented to address the identified challenges and leverage the opportunities for enhancing student's engagement and academic achievement.

1.7 Purpose of study

The purpose of this study is to identify the specific challenges and opportunities that Biology learners in Gokwe North District secondary schools face during practical work and understand how they impact their academic achievement in the learning area. By carrying out this research, educators and policymakers may gain insight into the areas where learners struggle the most and the potential areas for improvement in the practical components of biology. This information can then be used to design targeted interventions to help learners overcome their challenges and make the most of the opportunities available to them ultimately improving their academic performance and success in Biology.

1.8 Delimitations of the study

The study is confined to Gokwe North District secondary schools in Midlands Province. Five secondary schools near Nembudziya Growth Point were selected due to their proximity to the researcher's station. Three public schools and two private schools are where five Biology teachers and thirty Biology learners targeted to participate in this study. The schools will be identified as School V, School W, School X, School Y and School Z.

1.9 Limitations of the study

Some limitations of this study on challenges and opportunities faced by Ordinary level Biology learners in Gokwe North District Secondary schools encounter during practical work and the impact on academic achievement include sample size and representativeness, financial constraints and time. The study may have a limited sample size and the findings may not be generalizable to all learners in the district or beyond. This is because there are many secondary schools in Gokwe North District but the sample is going to be taken from schools close to Nembudziya Growth Point which are accessible due to their proximity to the researcher.

The researcher faced financial constraints to travel to secondary schools that are a distant from the Growth Point and also to source materials needed for the success of this study. The internet is the main source of related literature hence money was needed for data bundles and paying at internet cafes during the days where the internet was not available from internet service providers mainly Econet Wireless and Netone Zimbabwe.

Time was also be a limiting factor as the researcher is a teacher currently teaching at Bande Primary School and conduct this research on a few days for the learners at Bande Primary School not to lose much of their precious time but maximising the few days for the success of this project.

1.10 Significance of the study

This study aims to identify and address the specific challenges and opportunities faced by ordinary level biology learners in Gokwe North District Secondary schools during practical work. By understanding these challenges and opportunities, educators and policymakers can develop targeted interventions to improve the quality of practical work experiences for these learners leading to improved academic achievement by the learners.

Furthermore, by examining the impact of these challenges and opportunities on academic achievement, this study can provide educators valuable insights into the factors that influence student learning outcomes in Biology. This information can be used to inform instructional practices and teacher professional development programs to better support the needs of Biology learners in Gokwe North District Secondary schools.

This study can also enable appreciation of parental involvement, collaboration and engagement in creating a conducive environment for practical work by supporting school initiatives aimed at improving the quality of practical work in science for example through fully paying science levies.

In a broader sense this study can contribute to the existing literature on science education and practical work in particular by highlighting the specific challenges and opportunities faced by students in this context. This can inform future research and policy discussions by the Ministry of Primary and Secondary Education on how to enhance the quality of practical work experiences for students in secondary schools.

The researcher is also an education practitioner and will also gain more from the research findings in the teaching and learning of Biology. Most importantly this study has been

conducted in partial fulfilment of the requirements for the completion of Bachelor of Science Education Honours Degree in Biology.

1.11 Definition of key terms

Joshi and Green (2024) defines Biology as a branch of Science that deals with living organisms and their vital processes

Communale and Robb (2023) defines science as the study of the universe around us and within us, natural phenomena and solutions to problems.

Nyatuka (2020) defines a teacher as someone trained and usually certified to instruct students in various subjects helping them to learn and grow in a structured educational setting.

The UNESCO Institute of Statistics (2024) defines a student as an individual who is enrolled in an educational programme for the purpose of learning with the term pupil used for students under the age of 18-20 years who attend school.

Seifert (2019) defines learning as relatively permanent changes in behaviour, skills, knowledge or attitudes resulting from identifiable psychological or social experiences.

Bolt (2011) defines academic achievement as the progress made towards the goal of acquiring educational skills, materials and knowledge usually spanning a variety of disciplines.

Phillips (2016) describes a school as a special environment where certain types of activities and occupations are provided with the goal of securing the child's development along desirable lines.

1.12 Summary

This chapter gave the background to the study of challenges and opportunities encountered by Ordinary level Biology learners during practical work, the statement of the problem, research

question, aims of the study, objectives of the study, purpose of the study, delimitations of the study, limitations of the study as well as definition of some of the key terms. The following chapter is the review of related literature.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.0. Introduction

Practical work in biology may pose cognitive, affective, logistical as well as technical challenges but also most importantly can offer learning, skill-building, collaborative, research, innovative and career opportunities. This chapter shall focus on the review of related literature to the challenges and opportunities encountered by ordinary level biology learners during practical work. Practical work and practical activities shall be unpacked. The theoretical framework is also covered in this chapter as well as the purpose of practical work also unpacking possible benefits and challenges to get a glimpse of existing literature on the challenges and opportunities encountered during practical work.

2.1. What is practical work?

Millar in Grin (2022) describe practical work as any science teaching and learning activity that at some point involves students working individually or in small groups in observing or manipulating objects to build up understanding. Grin (2022) states that practical work involves hands-on activities where students directly engage with scientific phenomena, materials and equipment with the aim to develop student's experimental skills, reinforce theoretical concepts through real world applications and foster scientific inquiry and critical thinking. Practical work can include laboratory experiments, field studies, demonstrations and project-based learning all designed to provide students with tangible experiences that complement their theoretical knowledge according to Grin (2022).

2.2 Theoretical framework

The study is guided by the Experiential Learning Theory propounded by David Kolb. Learning is the process whereby knowledge is created through transformation of experience according to Kolb. McLeod (2024) indicates that Kolb's experiential learning theory works on two levels, a four-stage learning cycle and four separate learning styles and concerns the learner's internal cognitive processes. Kolb states that learning involves the acquisition of abstract concepts that can be applied flexibly in a range of situations with the impetus for the development of new concepts provided by new experience.

The Experiential Learning Cycle

Kolb's experiential learning cycle theory is typically represented by a four-stage learning cycle in which the learner touches all the base as indicated by McLeod (2024).

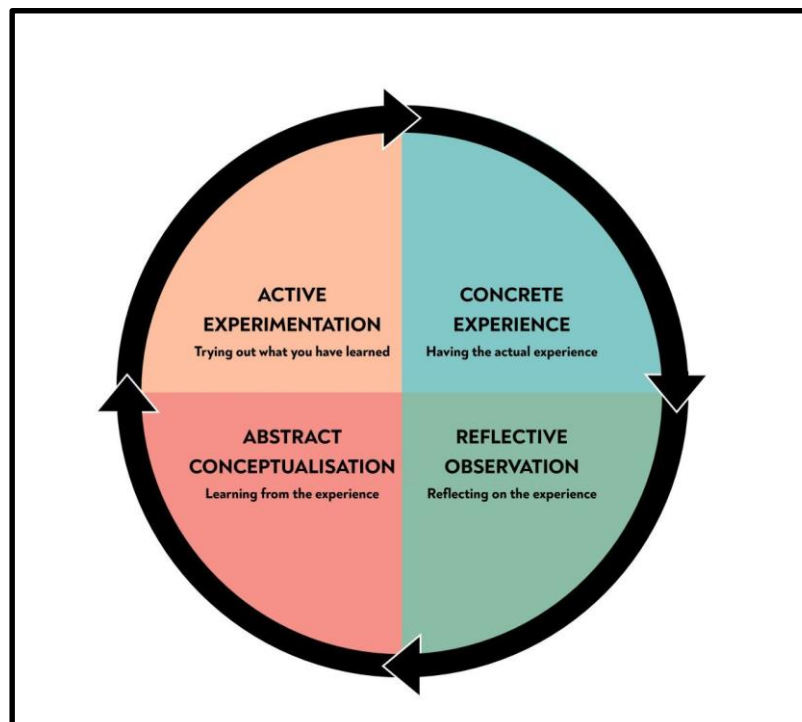


FIGURE 1: The Experiential Learning Cycle, Adapted from McLeod (2024).

The terms “Reflective cycle and “Experiential Learning Cycle” are often used interchangeably when referring to this four-stage learning process. The main idea behind both terms is that learning occurs through a continuous cycle of experience, reflection, conceptualization and experimentation according to Kolb.

1. Concrete Experience

The learner encounter a concrete experience, which might be a new experience or situation or a reinterpretation of existing experience in light of new concepts.

2. Reflective Observation of the New Experience

The learner reflects on the new experience in light of their existing knowledge and of particular importance are any inconsistencies between experience and understanding.

3. Abstract Conceptualization

Reflection gives rise to a new idea or modification of an existing abstract concept (the person has learned from experience).

4. Active Experimentation

The newly created or modified concepts give rise to experiments. The learner applies their ideas to the world around them to see what happens.

According to Kolb effective learning is seen when a person progresses through a cycle of four stages of (1) having a concrete experience followed by (2) observation of and reflection on that experience which leads to (3) the formation of abstract concepts (analysis) and generalizations (conclusions) which are then (4) used to test a hypothesis in future situations resulting in new experiences.

LEARNING STYLES

Kolb's theory 1984 sets out four distinct learning styles which are based on a four stage learning cycle. Kolb explains that different people naturally prefer a certain single learning style and various factors influence a person's preferred style for example social, environment, educational experiences or the basic cognitive structure of the individual. Whatever influence a person's choice of style, the learning style preference itself is actually the product of the pairs of variables choices that we make which Kolb presented as lines of axis each with conflicting modes at either end.

A typical presentation of Kolb's two continuums is that east-west axis is called the Processing Continuum (how we approach a task) and the north-south axis is called the Perception Continuum (our emotional response or how we think or feel about it).

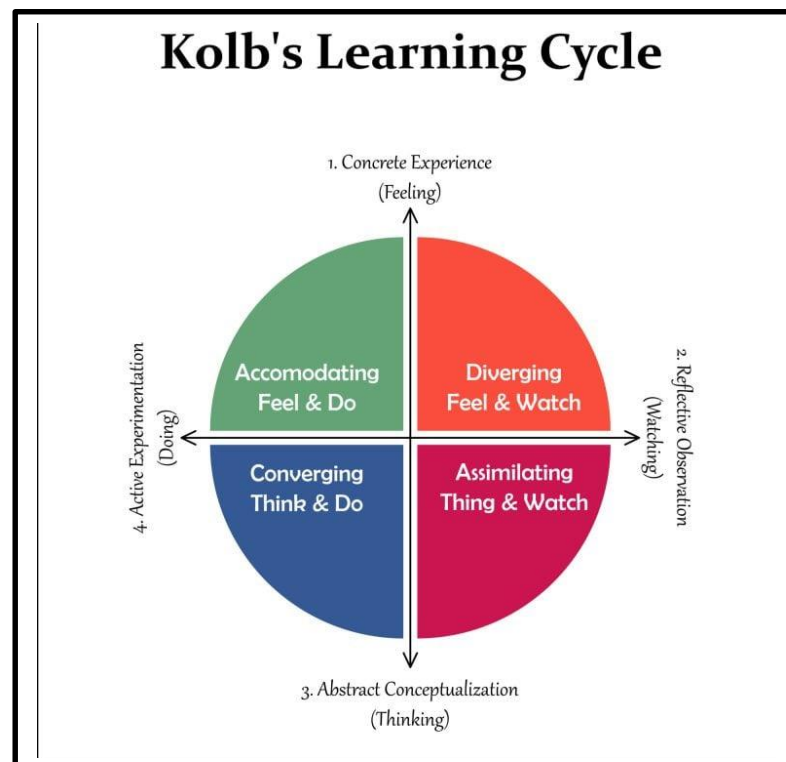


Figure 2: Kolb's Learning Cycle, Adapted from McLeod (2024).

Kolb believed that we cannot perform both variables as a single axis simultaneously for example think and feel. Our learning style is a product of these two decisions. It is easier to see the construction of Kolb's learning styles in terms of a two by two matrix with each learning style representing a combination of the two preferred styles. The matrix also highlights Kolb's terminology for the learning styles, diverging, assimilating, conserving and accommodating. This can be illustrated by the table below.

	Active Experimentation (Doing)	Reflective Observation (Watching)
Concrete Experience (Feeling)	Accommodating (CE/AE)	Diverging (CE/RO)

Abstract		
Conceptualisation	Converging	Assimilating
(Thinking)	AC/AE)	(AC/RO)

Table 2: Kolb's Learning Styles, Adapted from McLeod (2024).

Knowing a person's learning style enables learning to be oriented according the preferred method. That said everyone responds to and needs the stimulus of all types of the learning styles to one extent or another as it is a matter of using emphasis that fits best with the given situation and a person's learning style preference according to Cherry (2022) .

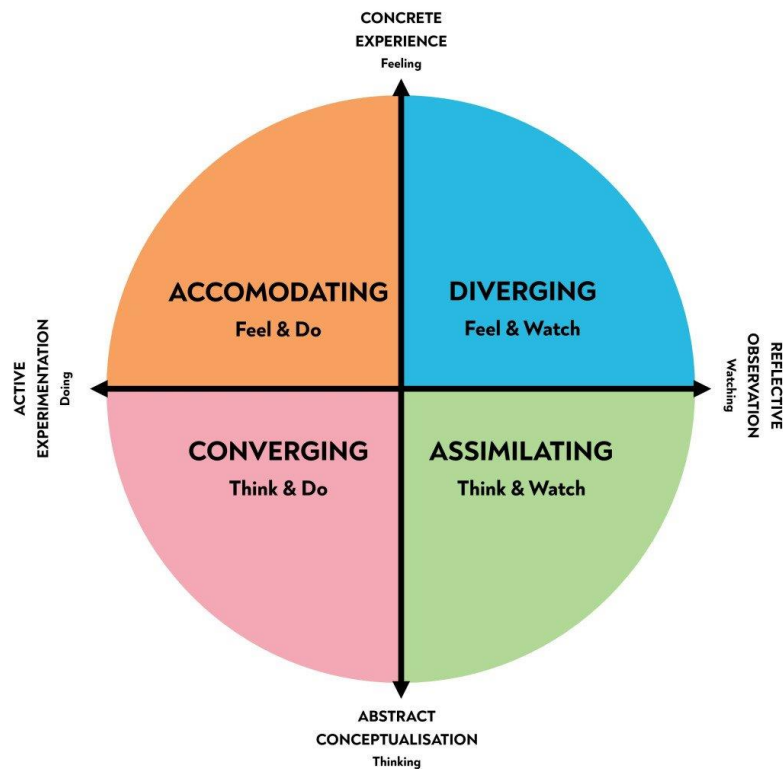


Figure 3: Kolb's Learning Styles, Adapted from McLeod (2024).

Experiential Learning theory was influenced by the work of other theories including John Dewey, Kurt Lewin and Jean Piaget. According to Cherry (2022), through the testing of our ideas we once again gather information through experience, cycling back to the beginning of the process with the process not necessarily beginning with experience but each person must choose which learning mode will work best based upon specific situation. Therefore practical work is important in teaching and learning of Biology and has to be fully utilised.

2.3 Practical activities

Millar in Grin (2022) described a practical activity as any science teaching and learning activity that at some point involves the students working individually or in small groups in observing or manipulating objects to build up understanding. The National Strategies (n.d) defines practical activity as any activity that allows students to have direct, often hands on connection with the phenomena they are studying.

The Essential Components of Practical Work

According to Grin (2022) practical work encompass numerous components that can be divided into three main groups

a) Core Activities

Included in this category are hands-on activities such as;

-investigations

-laboratory work and procedures

-fieldwork

Such activities can help improve the development of students' practical laboratory skills and help them comprehend key scientific concepts and phenomena.

b) Directly Related Activities

This task category is closely connected to the aforementioned core activities and encompass the following;

- planning investigations
- data analysis with the help of ICT
- results analysis
- teacher demonstrations
- phenomena experiencing

These tasks do not require hands-on participation or interaction with certain objects but rather processing data, analyzing it and drawing conclusions. Nevertheless such activities provide a deeper immersion into the topic than regular lessons.

c) Complimentary Activities

Such practical tasks entail the use of;

- presentations
- role play
- modeling

-simulations

-Science-related visits

-group discussions

However many would not agree to put these tasks under the practical activity umbrella considering rather supplementary than substitutionary according to Grin (2022).

2.4 Purpose of practical work in biology

The Open University 2024 states that different types of practical work and particular experiments will meet different objectives but the benefits of practical work include:

- Developing practical skills and techniques such as how to use a microscope.

-Gaining firsthand experience of materials, organisms and processes that may increase their understanding of science and help the retention of knowledge.

- Developing inquiry skills such as control of variables, analysis and recording of data and looking for patterns.

- Motivation and enjoyment.

- Encouraging and promoting higher levels of thinking as students can be asked to predict and explain when presented with problems and phenomena.

-Communications skills as practical work may provide a context for the development of communication skills. The link to shared experiences and real objects may be very helpful for learners with limited proficiency in English.

Types of Practical work include,

1. Demonstration
2. Structured practical
3. Rotating practical
4. Investigation
5. Problem solving

The Royal Society of Biology (2019) states that biology is a practical science and practical activities are not just motivational and fun as they also enable students to apply and extend their knowledge and understanding of biology in investigate situations which can aid learning and memory and stimulate interest.

Practical work is viewed by the vast majority of educators as an essential part of science education and an indispensable aspect of being a science teacher. Practical work involves hands on activities where students directly engage with scientific phenomena, materials and equipment. It aims to develop students' experimental skills, reinforce theoretical concepts through real world application and foster scientific inquiry and critical thinking. Practical work can include laboratory experiments, field studies, demonstrations and project-based learning, all designed to provide students with tangible experiences that complement their theoretical knowledge.

The main goals of Practical Work are to engage students in the subject and help them get a better grasp of the topic studies during science lessons. In fact practical work support learning in a variety of was with the overriding principle is being able to link the concrete and abstract worlds. Grin (2022) states that the topic of whether practical tasks should be part of national

curriculum at educational institutions is controversial. The following are the benefits of practical work according to Grin (2022).

Improved learning

It is thought that practical activities are beneficial for students as they help them strengthen their conceptual understanding of science and allow them to visualize and make sense of complex scientific laws and theories. In fact according to Edgar Dale's Cone of Experience, practical work is the foundation of profound learning outcomes. The Edgar Dale's Cone of Experience is illustrated below

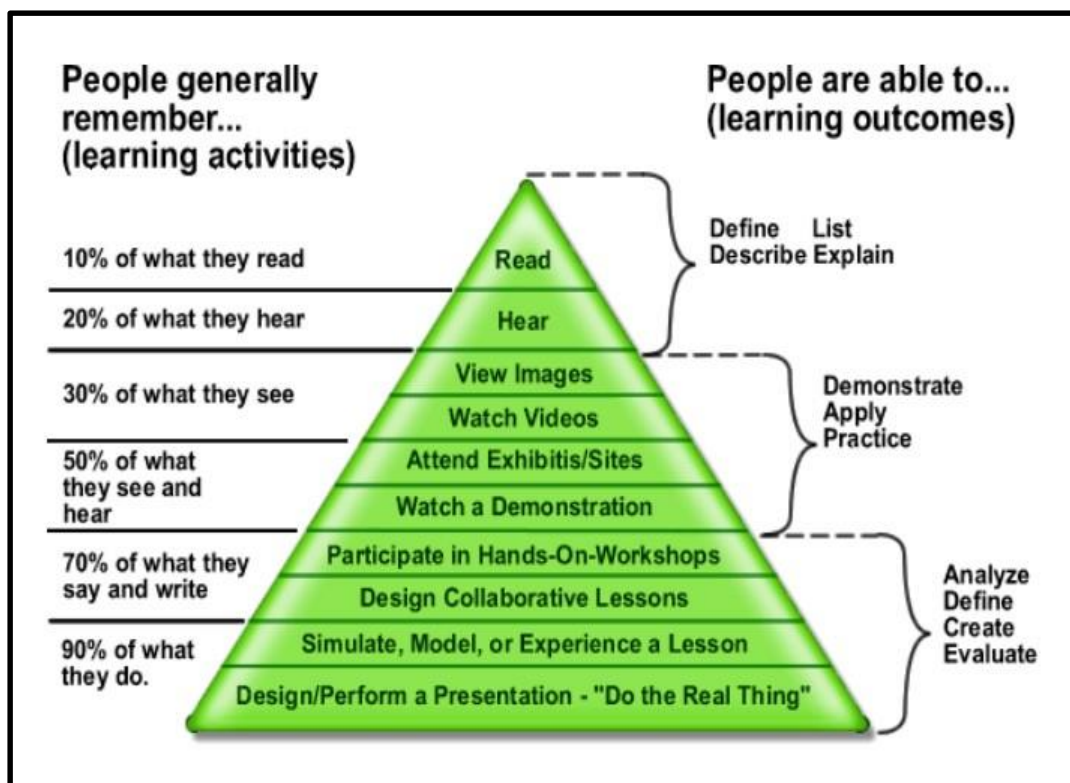


Figure 4: The Edgar Dale's Cone of Experience, Adapted from Grin (2022)

Increased motivation

This pertains to the enjoyment and motivational aspects of practical science activities. Indeed practical tasks are often used to spark interest and enthusiasm among students and are also known to assist them in remembering. According to the Journal of Technology and Science Education, when choosing an instructional method, it is crucial to involve students in the process for the sake of maximizing their information retention.

Skills Acquisition

Practical activities can help develop many transferrable skills. In other words such skills can add value to students and aid them on their chosen career paths.

However practical has some draw backs according to Grin (2022) and these may include;

Potential confusion

Practical activities can sometimes confuse learners rather than improve their understanding especially if the practical does not go according to the plan. Furthermore there is an assumption that practical tasks are not as a good method of teaching theory suggesting that theories comprise abstract ideas that can't be demonstrated physically.

Possible Demotivation

Many students dislike the prospect of performing practical tasks. There is also evidence indicating that typically boys enjoy practical work more than girls and therefore the later can often be less enthusiastic when participating in the same practical activity according to Wellington in Grin (2022).

Lack of Engagement

Some studies show that group work within practical science often will not improve key skills such as communication and interaction as widely believed but instead when studied more closely such activities demonstrate more forceful students dominating the duty, resulting in insufficient enjoyment and engagement for other students according to Wellington in Grin (2022).

2.5 Challenges faced by learners during practical work

Tuyishime and Tukahabwa (2022) state that various challenges encountered while teaching Biology practical lessons include lack of resources and facilities, overcrowded classes and limited time allocated to the practical biological lessons as well as the teachers who are not armed with practical skills. Daba, Tolessa and Anbesaw in Tuyishime and Tukahabwa (2022) indicate that the absence of laboratory equipment and unsuitable laboratory rooms remain the challenges which hamper biology teaching. Major constraints towards effective teaching of practical in Biology include poor laboratory conditions or status, inadequate staffing, non-availability of laboratory equipment, class size, teachers and students attitudes according to Dan-Ologe and Shittu (2012). The presence of these challenges in secondary school has a negative effect on learning and academic achievement of ordinary level Biology learners.

2.6 Opportunities for learning during practical work

SCORE (2011) practical work in science is hands-on experience which prompts thinking about the world we live in and is made up of a core two activity types which are scientific techniques and procedures in the laboratory or the field as well as scientific inquiries and investigations. Each of these core activities not only support the physical development of skills but also helps shape the understanding of scientific concepts and phenomena according to SCORE (2011).

SCORE (2011) indicates that science is an empirical subject and learning is very often more effective when it incorporates hands-on experience. Practical Work support,

- Skills development (planning, manipulation of equipment, observation, analyzing and evaluating.
- The development of personal learning and thinking skills.
- Experiential learning (test out own ideas, test out theories, develop problem solving strategies, develop teamwork and taking responsibility, develops students as self-learners.
- Independent leaning (students work at their own pace, students work at their own level, supports differentiation by outcome, task and questioning, builds student confidence.
- Learning in different ways (working in teams, working as individuals, manipulating materials and objects, observing using all senses, informal dialogue with peers and teachers.

Practical work can motivate learners by stimulating interest and enjoyment, be used to teach laboratory skills, enhance the leaning of scientific knowledge, give insights in to the scientific method and develop expertise in using it and develop scientific attitudes such as open-mindedness and objectivity as well planned practical work can stimulate and engage students' learning at different levels, challenging them mentally and physically in ways that other science experiences cannot according to SCORE (2011).

Achimugu in Imanda (2020) observes that effective science learning encompasses experimentation that involves hands-on and minds-on activities so that the learners can have a better understanding of the concepts and skills because experimental methods enable students to verify theories, laws and principles surrounding science phenomena.

Kulshretta in Imanda (2020) indicates that practical work in science enhances skills development, planning, manipulation of equipment, observation, analyzing, experiential learning, testing own ideas, testing out theories, developing problem solving strategies and teamwork.

Achimugu in Imanda (2020) also states that practical work enables learners taking learning responsibility, nurturing self-learning, and students work at their own pace and level, supporting differentiation by outcome, task and questioning.

Imanda (2023) say that Biology contributes tremendously to technological growth of nations and is a prerequisite in areas like medicine, agriculture, bio-informatics, biotechnology and nursing and that the study of Biology also contributes to the search of scientific solutions of several challenges the world is facing today including diseases, drug resistance, pollution, climate change and global warming, to name a few.

Cimer in Imanda (2023) argues that the concepts, topics and processes in Biology are considered to be difficult for secondary students and this affects their engagement in learning and academic achievement and the reasons behind the difficulties faced by students in Biology is the lack of inclusion of practical activities and experiments in Biology lessons. Millar and Abrahams in Imanda (2023) argue that when students are taught science using practical activities and experiments their level of understanding is improved. Therefore the impact of practical work on Biology learning cannot be overemphasized.

2.7 Ways of improving the quality of practical work

SCORE (2011) states that continuing to improve the quality of practical work in science is the responsibility of many people as teachers, schools, Government and its agencies, local and national bodies all have a role to play. Teachers can share good practice with colleagues in

science department by promoting high quality practical work, use ICT for data capture and analysis, make use of continuing professional development provision to improve quality and increase confidence in practical teaching and try out new practical activities to support learning, the school may develop science department and school leadership to promote high quality practical work, have appropriate pupil behaviour policies to ensure safe working, provide accessible and reliable ICT, ring fence funding to ensure standards are met, provide appropriate laboratory spaces and facilities, enable teachers and technicians to take up continuing professional development opportunities, ensure that there is appropriate curriculum time for practical science, allow preparation time for teachers and technicians, provide appropriate technical support especially from qualified technicians, and others may,

disseminate good practice and highlight shortcomings, provide clear safety advice, develop and share understanding of how to teach and assess the varied purposes of practical work, develop curriculum resources to support change, provide appropriate funding for equipment and resources, fund and support the development of appropriate laboratory spaces and facilities, provide relevant and suitable continuing professional development opportunities for using and assessing practical work, develop new practical ideas for the contemporary curriculum, ensure the science curriculum values hands-on experiences, develop assessment tool that recognize hands-on experience and support the development of technicians according to SCORE (2011).

SCORE (2011) further states that Best practice - practical work in science is an entitlement for all pupils and at regular intervals, all pupils should have opportunities in their science lessons which are:

'Brains-on' as well as **'hands-on'**, to promote effective learning.

Enquiry-based, complete or part investigations simulating the work of scientists.

Self-directed (including groups) to encourage pupil-ownership, motivation and independence.

Timely - effectively planned into most science lessons.

Purposeful - and demonstrating clearly to pupils the different purposes of Practical Work in science.

Relevant to pupils' personal interests and concerns in everyday life.

Adaptable to suit the varied needs of individual pupils and groups.

Connected to the world beyond the classroom- including fieldwork, projects and visits.

Technically authentic and contemporary, including the use of

ICT for data collection and analysis and for simulations and modelling.

Coherently planned and managed to cover the whole science curriculum.

Engaging all pupils in the 'messiness' of real data.

Dan-Ologe and Shittu (2012) state that it is necessary for students to handle laboratory equipment regularly and adequate time need to be given for students to handle laboratory equipment regularly and adequate time need to be given to students to learn techniques of using equipment and developing skills for practical activities.

Provision of standard laboratory and adequate laboratory equipment for secondary schools, teachers should improve their teaching methodology to sustain the interest of the students, enough qualified Biology teachers should be employed to cater for increase population of students and students should be allowed to access laboratory equipment have a positive impact on Biology teaching and learning according to Dan-Ologe and Shittu (2012).

Biology teachers need to be frequently sensitized through capacity building on the need and importance of the use of the learner-centred practical method according to Imanda (2023).

2.8 The effectiveness of practical work in biology

Grin (2022) states that there is much debate regarding the use of practical work within the teaching and learning of science in schools with the elemental question here has to do with cognition and how exactly we acquire knowledge and one answer to this dilemma originated from Jean Piaget who is credited as the pioneer of the constructivist theory of knowing. Piaget argued that people continuously construct more complicated and advanced representations of the world by modifying existing understandings through our actions. If Piaget is correct, then the use of practical work in observing and participating in the process must be vital for our understanding of science according to Miller in Grin (2022). Grin (2022) indicates that many of the conclusions drawn from research regarding the effectiveness of practical work remain somewhat ambiguous.

2.9 Summary

This chapter covered the review of related literature to the study of the challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected secondary schools in Gokwe North district and the impact on academic achievement. The review was guided by Kolb's Experiential learning theory. Practical work, practical activities as well as the rationale for practical work were unpacked. The following chapter covers the research methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research methodology used in the study of the challenges and opportunities encountered by Ordinary level Biology learners during practical work and the impact on academic achievement. The research paradigm, research approach, research design, population, sample and sampling procedure, research instruments as well as ethical considerations are clearly outlined.

3.2 Research paradigm

Ulz (2023) states that the research paradigm is the framework into which the theories and practices of your discipline fit to create the research plan to guide all areas of research plan including the aim of the study, research question, instruments or measurements used and analysis methods. Most research paradigms are either positivism or interpretivism. This study adopted an interpretivism paradigm. The research paradigm helps to establish the structure and foundation for a research project, helps create a research plan, brings clarity to the study and improves the quality of the methods and analysis.

INTERPRETIVISM PARADIGM

Interpretivists believe in the existence of multiple realities rather than a single reality according to Ulz (2023). Interpretivism holds that because human behaviour is complex it cannot be studied by models such as those used under positive paradigms and that knowledge can only be created by interpreting the meanings that people put on behaviour and events. It is conducted within the reality of those being studied according to Ulz (2023). The study on challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected secondary schools in Gokwe North district and the impact on academic achievement

was conducted with the researcher visiting the respective schools for interviews, focus group discussion and observations to collect data.

3.3 Research approach

Quantitative research methodology, qualitative research methodology and mixed methods research methodology are the three different research methodologies. Budert-Waltz and Moffitt (2023) define a research approach as the procedure selected by the researcher to collect, analyse and interpret data. This study adopted a qualitative research approach. Qualitative is the collection, analysis and interpretation of comprehensive narrative and visual data to gain insights into a particular phenomenon of interest and can be characterised as the simultaneous study of many aspects of a phenomenon and the attempt to study things as they exist naturally and uses inductive reasoning according to Budert-Waltz and Moffitt (2023). The qualitative research approach has strengths and weaknesses. This study employed a qualitative approach with data collected through face-to-face interviews, observations and focus group discussions comprehensively narrated by the researcher.

STRENGTHS OF QUALITATIVE RESEARCH APPROACH

Qualitative research offers deep insights into human behaviour, provides context and understanding of complex issues, allows for flexibility in data collection and helps uncover trends and patterns that quantitative data might miss according to Vaughan (2021). Vaughan (2021) further stresses that qualitative research is crucial for exploring the depth and complexity of human experiences, capturing emotions, motivations and cultural contexts that quantitative methods may overlook. Hence the qualitative research approach was crucial for the study on challenges and opportunities encountered during practical work by Ordinary level

Biology learners in five selected secondary schools in Gokwe North district and the impact on academic achievement.

WEAKNESSES OF QUALITATIVE RESEARCH APPROACH

Vaughan (2021) states that weaknesses of qualitative research approach include potential bias in data interpretation, time consuming data collection and analysis and difficult in generalizing findings to a larger population and challenges in replicating the study. Researchers can minimize bias by using strategies such as triangulation (using multiple data sources), reflexivity (being aware of personal biases) and ensuring transparency in the research process according Vaughan (2021).

3.4 Research design

Bhandari (2024) defines a research design as a strategy for answering research questions using empirical data. This study is a qualitative research. Qualitative designs are about gaining a rich, detailed understanding of a specific context and phenomenon and allows for creativity and flexibility in designing the research according to Bhandari (2024). Case study and ethnography are the common types of qualitative research designs. The researcher adopted a case study in this study. Bhandari (2024) indicates that a case study is a detailed study of a specific subject for example place, event or organisation and data being collected using a variety of sources and methods focused on gaining a holistic understanding of the case. Yin in (Drew 2023) defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when boundaries between phenomenon and context are not clearly evident. Researchers conduct case studies for number of reasons such as to explore complex phenomena within real-life context, to look at particularly interesting instance or

situation, to dig deeper into something of interest identified in a wider-scale project. A case study has its advantages and disadvantages.

ADVANTAGES OF CASE STUDIES

According to Drew (2023) case studies have several advantages including;

1. In-depth analysis of complex phenomena as case study design draws researchers to delve deeply into intricate issues and situations.
2. Case studies can help us to understand a topic holistically and from multiple angles.
3. Examination of rare and unusual phenomena, among others.

DISADVANTAGES OF CASE STUDIES

Drew (2023) states that case studies have disadvantages including;

1. Case studies are not generalizable because they tend not to look at a broad enough corpus of data to be able to infer that there is a trend across a population.
2. Qualitative data in case studies relies heavily on researcher interpretation and are more prone to subjectivity that attention has to be put on this, and
3. It is difficult to replicate results.

3.5 Population

Thomas (2023) defines a research population as the entire group or set of individuals, objects or events that possess specific characteristics and are of interest to the researcher. It represents the larger population from which a sample is drawn. The population of this study was Biology Ordinary level learners (Form 3s and Form 4s) and Biology teachers in Gokwe North district in the Midlands province.

3.6 Sample and sampling procedure

Thomas (2023) says that a sample is a subset of the research population that is carefully selected to represent its characteristics and researchers study this smaller, manageable group to draw inferences that can be generalized to the larger population. The researcher selected five secondary schools in Gokwe North district that are offering Biology as a subject Ordinary level. Thirty Ordinary level learners were selected from these five schools. Fifteen were Form 3s and the remaining fifteen were Form 4s. From these Fifteen were female students and remaining fifteen males. A teacher who is currently teaching Biology at Ordinary level was selected from each school to give a total of five Biology teachers. Four teachers were male and one was female. Sampling is a method that allows researchers to infer information about a population based on results from a subset of the population without having to investigate every individual as this reduces costs and workload according to Shantikumar (2018). The researcher used purposive or judgment sampling in this study. Shantikumar (2018) states that judgment or purposive sampling is also known as selective or subjective sampling and researchers may implicitly choose a representative sample to suit their needs or specifically approach individuals with certain characteristics. Purposive sampling is time and cost effective. The learners were selected considering equal gender representation however only one female teacher was teaching Biology.

3.7 Research instruments

Collins (2021) defines research instruments as any tool that is used by a scientist to obtain, measure and analyse data. Interviews, focus group discussions and observations were used in this study.

INTERVIEW

George (2023) defines an interview as a qualitative research method that relies on asking questions in order to collect data and involve two or more people of whom one is the interviewer asking questions. There are structured, unstructured and semi-structured interviews. Structured interviews have predetermined questions asked in a predetermined order and are often open-ended, featuring dichotomous or multiple choice questions and unstructured interviews are free flowing. Semi-structured interviews were used in this study. Semi-structured interviews are a blend of structured and unstructured interviews that while the interviewer has a general plan for what they want to ask, questions do not follow a particular phrasing or order. Semi-structured interviews are often open-ended, allowing for flexibility, but follows a predetermined thematic framework giving a sense or order according to George (2023).

Interviews are a great research tool as they allow to gather rich information and draw more detailed conclusions than other research methods taking into considerations nonverbal cues, off-the-cuff reactions and emotional responses according to George (2023). The interviews helped to gather in-depth and detailed information about learners' experiences, challenges and opportunities. The interviews provided the learners a platform to share their thoughts and feelings about practical work in Biology. The interviews did not require a special environment and were conducted in laboratories, in classrooms and open spaces as well. The interviews enabled the researcher to establish rapport with learners and Biology teachers and the researcher also gained a lot from non-verbal communication cues by the interviewees. The interviews also enable communication and clarification of questions as well as further probing. However George (2023) indicates that interviews can be time consuming and challenging to conduct properly. The researcher planned the interviews well in advance and visited a school

per day to give enough time for the interviews. The interview guides for the learners and teachers are on Appendix I and Appendix II respectively.

FOCUS GROUP

Ananian (2024) describes a focus group as a qualitative data collection method where a group of participants are asked set questions and engaged in a facilitated discussion. A focus group brings together a group of participants to answer questions on a topic of interest in a moderated setting according to George (2023). Focus group discussions helped the researcher to gain in-depth insights about the learners' experience and perspectives on challenges and opportunities during practical work. They were also flexible and stimulated discussion among the researcher and the participants. Focus group discussions are however time consuming and there is also possibility of dominance by vocal participants. The researcher planned well in advance at conducted the focus group discussions by setting out a day for each and every school in this study. Everyone was made to realize that he or she is highly valued in terms of their contributions and the learners were eager to participate for the benefit of Biology education. The focus group discussion used in this study is on Appendix IV.

OBSERVATION

Masud (2024) defines observation in research as a method in which researchers observe and systematically record behaviour, events or phenomena without directly manipulating them. It is important as it provides a practical application for a hypothesis and can help make research work complete. Observation was also important in this study as it provided direct access to rich, contextual data, about different learning environments, teacher-to-learner interactions and learner behaviour. However with observation, there is a chance of researcher bias and observation alone is not adequate according to Masud (2024). The observation were time consuming that the researcher planned well and observed the learning with observation well

planned and different days allocate for different schools in this study. It was difficult to change the norm at the schools and the observations were conducted in environments similar to the day to day running of schools in this study. The observation guide used in this study is on Appendix III.

3.8 Credibility and trustworthiness

Triangulation was used in this study with the use of interviews, focus group discussions and observations. Triangulation is a mixed methods data analysis technique that involves combining multiple data sources, methods to validate and confirm the research findings with the goal of increasing validity and reliability of this study. Data triangulation was used in this study of challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected schools in Gokwe North District. This brought richer insights and improved validity and reliability of this study.

3.9 Data analysis

Mixed methods data analysis was used in this study. The study involved triangulation with the use of interviews, focus group discussions and observations. Thematic analysis was used as the researcher categorized responses from participants into themes. Tables and graphs were used on demographic data of participants as well as some research findings on this study on challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected secondary schools in Gokwe North district.

3.10 Ethical considerations

Bhandari (2024) states that ethical considerations in research are set of principles that guide the research design and practices as researchers must always adhere to a certain code of conduct when collecting data from people. Voluntary participation, informed consent, anonymity and

confidentiality are among others are the ethical considerations taken note of in this study. The researcher sought permission to conduct the research from the authorities and stated the aims of the study and clearly that the instruments of data collection included interviews, focus group discussions and observations. The Heads of schools, principals of private schools were visited before the researcher proceeded to the teachers and students. The research informed the participants and stressed that their participation is well appreciated while their participation is voluntary and that their names were not to be asked or recorded and will not be published anywhere in this study. The discussion was confidential and a copy of this study shall be made available to all the participants.

3.11 Summary

This chapter covered the research methodology on the study of the challenges and opportunities encountered by Ordinary level Biology learners in five selected schools in Gokwe North district and the impact on academic achievement. The research approach, research design, population, sample and sampling procedure, research instruments as well as ethical considerations were given. The following chapter shall focus on data presentation, interpretation, analysis and discussion.

CHAPTER 4: DATA PRESENTATION, INTERPRETATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter is on data presentation, interpretation, analysis and discussion on the challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected schools in Gokwe North district secondary schools and the impact on academic achievement. The thematic approach was used for the responses given by the participants as well as observations in trying to answer the research questions.

4.1.1 Biographical data for learners

LEARNER	AGE	SEX	SCHOOL	SCHOOL TYPE	YEARS STUDYING BIOLOGY	EXPERIENCE WITH PRACTICAL WORK
1	16	F	V	Day	1	Yes
2	16	F	V	Day	1	Yes
3	16	M	V	Day	1	Yes
4	17	F	V	Day	2	Yes
5	17	M	V	Day	2	Yes
6	17	M	V	Day	2	Yes
7	16	F	W	Private	1	Yes
8	16	M	W	Private	1	Yes
9	17	M	W	Private	1	Yes
10	17	F	W	Private	2	Yes
11	17	F	W	Private	2	Yes
12	17	M	W	Private	2	Yes

13	15	F	X	Day	1	Yes
14	16	F	X	Day	1	Yes
15	16	M	X	Day	1	Yes
16	17	F	X	Day	2	Yes
17	17	M	X	Day	2	Yes
18	17	M	X	Day	2	Yes
19	16	F	Y	Private	1	Yes
20	16	M	Y	Private	1	Yes
21	16	M	Y	Private	1	Yes
22	17	F	Y	Private	2	Yes
23	17	F	Y	Private	2	Yes
24	17	M	Y	Private	2	Yes
25	15	F	Z	Boarding	1	Yes
26	16	M	Z	Boarding	1	Yes
27	16	F	Z	Boarding	1	Yes
28	17	M	Z	Boarding	2	Yes
29	17	M	Z	Boarding	2	Yes
30	17	F	Z	Boarding	2	Yes

Table 3: Learner biographical data.

The total of 30 learners was comprised of 2 fifteen year olds, 12 sixteen year olds and 16 seventeen year olds. 15 were female and 15 the other were male. 15 were Form 3s and 15 Form 4s. 12 were from day school, 12 from private school and 6 from boarding school. All the learners. All the learners were exposed to at least one practical in Biology.

4.1.2 Biographical data for teachers

Teacher	School	Sex	Qualification	Subject Specialisation	Teaching experience	Years teaching Biology	Role in the department
1	V	M	Diploma	Biology	30 years	20 years	H.O.D
2	W	M	First degree	Biology	1 year	1 year	H.O.D
3	X	M	First degree	Biology	7 years	5 Years	Teacher
4	Y	M	Diploma	Biology	3 Years	3 Years	H.O.D
5	Z	F	Diploma	Chemistry	4 years	4 years	Teacher

Table 4: Teacher biographical data.

From the total of five teachers 4 were male and 1 was female. 3 were Diploma in Education holders while the other 2 had First degrees in Biology. 30 years, 1 year, 7 years, 3 years, and 4 years were their teaching years' experience with a handful of these years spent teaching Biology. 3 were Heads of Department (Sciences) who also taught Biology while the other 2 were teachers.

4.2 Challenges and opportunities encountered by learners during practical work

RESEARCH QUESTION 1

What challenges and opportunities do Ordinary level Biology learners in five selected schools in Gokwe North District encounter during practical work?

CHALLENGES

The following table shows some of the challenges encountered by ordinary level learners in five selected secondary schools in Gokwe North district as indicated by the learners during interviews.

Learner	Did practical work at least once		Equipment and materials		Understanding instructions		Science laboratory		Lab used by		Working space	
	Yes	No	Adequate	Inadequate	Yes	Sometimes	Available	Unavailable	O'Levels	O & A Levels	Adequate	Poor
1	✓			✓		✓	✓		✓		✓	
2	✓			✓		✓	✓		✓		✓	
3	✓			✓		✓	✓		✓		✓	
4	✓			✓		✓	✓		✓		✓	
5	✓			✓	✓		✓		✓		✓	
6	✓			✓	✓		✓		✓		✓	
7	✓			✓		✓		✓				

8	√			√		√		√				
9	√			√		√		√				
10	√			√		√		√				
11	√			√		√		√				
12	√			√		√		√				
13	√			√		√		√				
14	√			√		√		√				
15	√			√	√			√				
16	√			√		√		√				
17	√			√		√		√				
18	√			√		√		√				
19	√			√		√		√				
20	√			√		√		√				
21	√			√		√		√				
22	√			√		√		√				
23	√			√		√		√				
24	√			√		√		√				

25	√			√		√	√			√	√	
26	√			√	√		√			√	√	
27	√			√	√		√			√	√	
28	√			√		√	√			√	√	
29	√			√	√		√			√	√	
30	√			√	√		√			√	√	

Table 4: Challenges from learners.

From the total of 30 learners, all indicated that science equipment and materials were inadequate, 23 faced challenges on understanding instructions during practical work, 18 learners were from schools without science laboratories while 6 learners indicated that they shared the same science laboratory with Advanced level students, among other challenges.

CHALLENGE	Inadequate equipment & materials	Understanding of instructions	Without science laboratories	Sharing lab with A' level students	Poor working space
NUMBER OF LEARNERS	30	23	18	6	18

Table 5: Summary of challenges from learners.

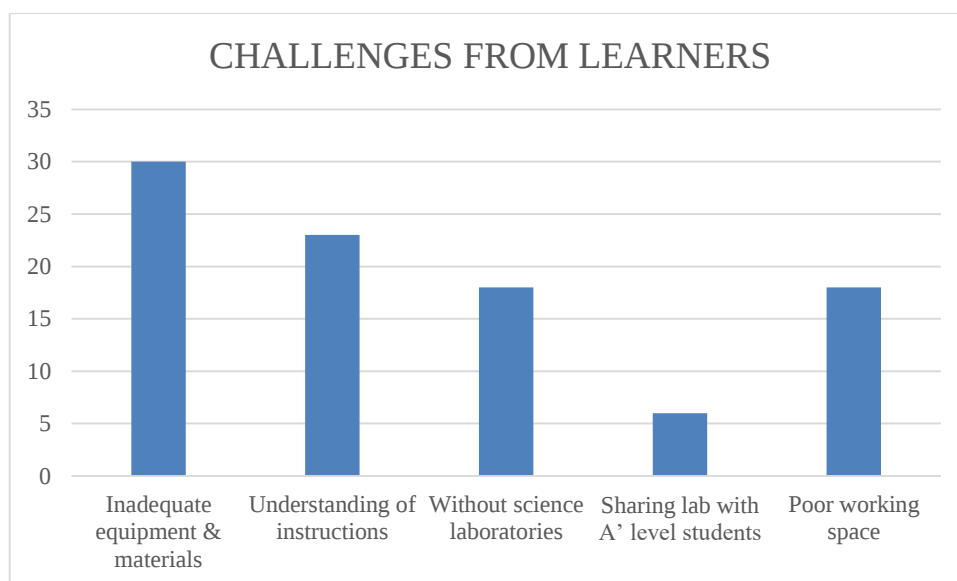


Figure 5: Challenges from learners' graph. The challenges encountered and the number of learners is shown

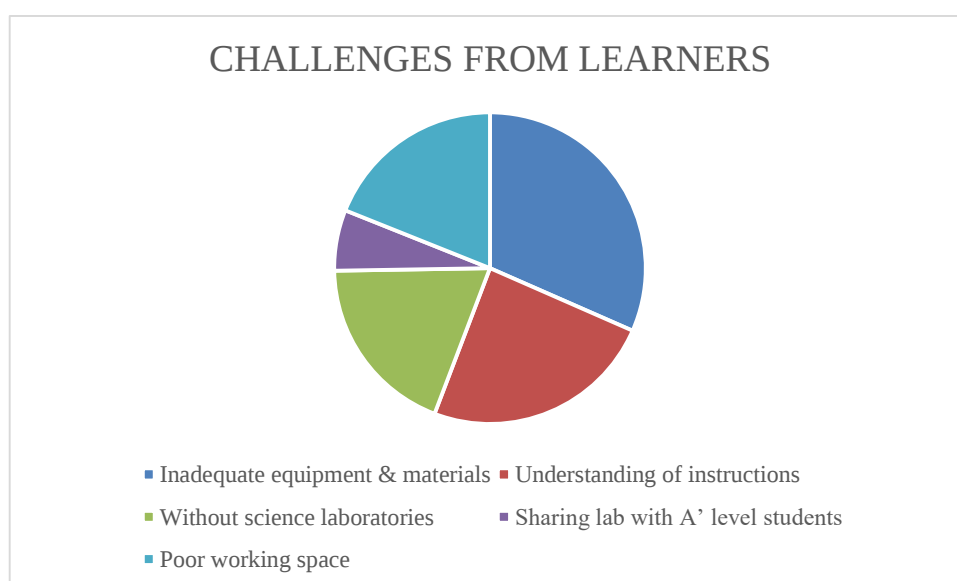


Figure 6: Challenges from learner's pie chart. The contribution of each challenge is shown.

The following table shows some of the challenges encountered by ordinary level learners in five selected secondary schools in Gokwe North district as indicated by Biology teachers during interviews.

Teacher	Class size		Equipment and materials		Understanding instructions by learners		Science laboratory		Lab used by		Working space	
	Normal	Huge	Adequate	Inadequate	Yes	Sometimes	Available	Unavailable	O'Levels	O & A Levels	Adequate	Poor
1	✓			✓		✓	✓		✓		✓	
2	✓			✓		✓		✓				
3	✓			✓		✓		✓				
4	✓			✓		✓		✓				
5	✓			✓	✓		✓			✓	✓	

Table 7: Challenges from teachers.

From the total of 5 teachers, All indicated that equipment and materials for practical work were inadequate, 3 of them indicated that they are facing challenges with learners failing to understand instructions during practical work, three schools did not have science laboratories and the other school had only one functional laboratory that is being shared by Ordinary level learners and Advanced level learners, among other challenges.

CHALLENGE	Inadequate equipment & materials	Understanding of instructions	Without science laboratories	Sharing lab with A' level students	Poor working space
NUMBER OF TEACHERS	5	5	3	1	3

Table 8: Summary of Challenges from teachers.

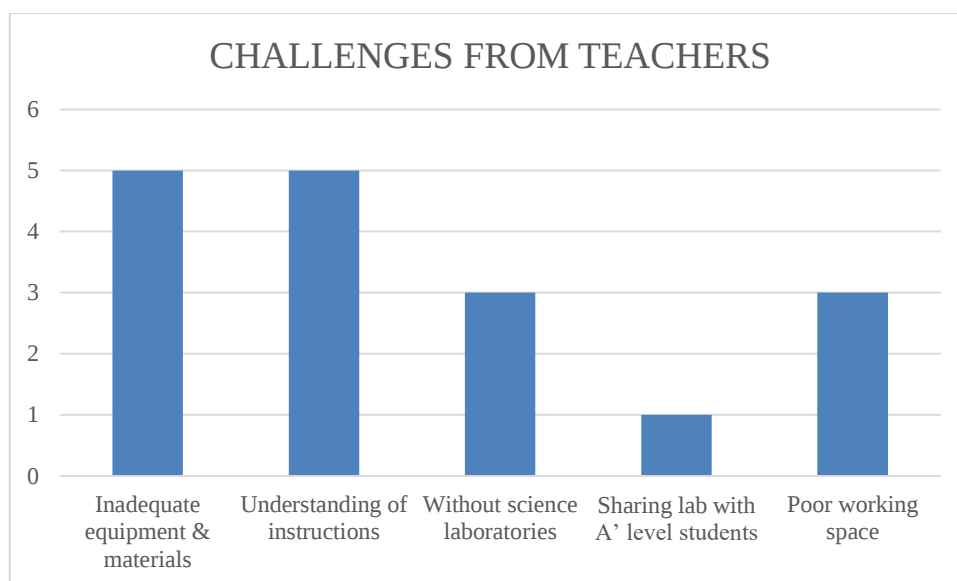


Figure7: Challenges from teachers graph.

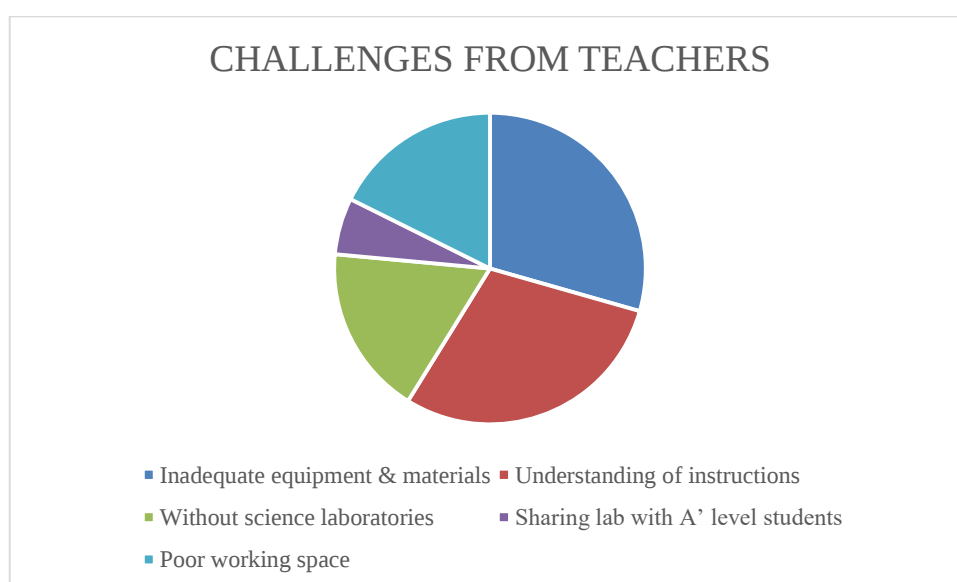


Figure8: Challenges from teacher's pie chart. The contribution of each challenge is shown.

The following table shows some of the challenges encountered by ordinary level learners in five selected secondary schools in Gokwe North district as noted during observations during this study.

School	Qualified Biology teacher		Equipment and materials		Science laboratory		Technology integration		Lab used by		Working space	
	Yes	No	Adequate	Inadequate	Available	Unavailable	Yes	No	O'Levels	O & A Levels	Adequate	Poor
V	✓			✓	✓		✓		✓		✓	
W	✓			✓		✓		✓				
X	✓			✓		✓		✓				
Y	✓			✓		✓		✓				
Z	✓			✓	✓		✓			✓	✓	

Table 9: Challenges observed.

The researcher observed inadequate equipment and materials for Biology practical work in all schools. Three schools did not have science laboratories at all and the other school's science laboratory was used by both O and A level learners, among other challenges.

CHALLENGE	Inadequate equipment & materials	Without science laboratories	Sharing lab with A' level students	Poor working space
NUMBER OF SCHOOLS	5	3	1	3

Table 10: Summary of Challenges observed.

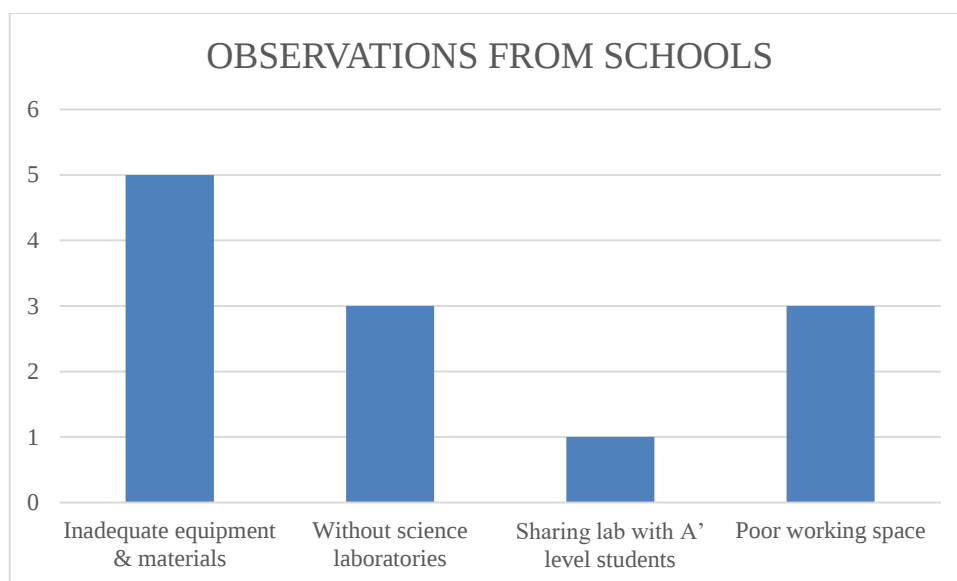


Figure 9: Graph for challenges from schools.

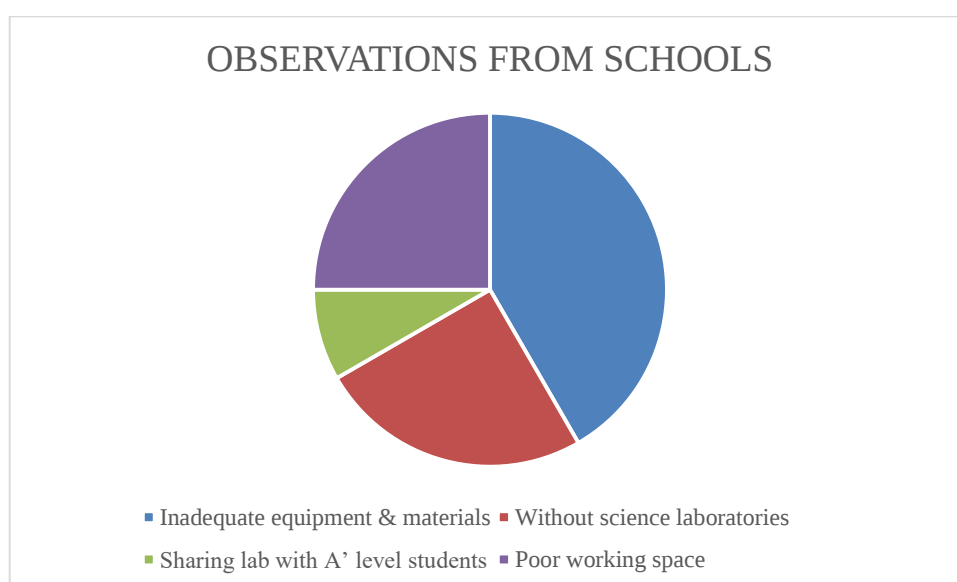


Figure 10: Pie chart for challenges from schools. The contribution of each challenge is shown.

On equipment and materials, and during interview another learner said,

“We only did an experiment on testing a leaf for starch in groups, it was interesting but we have limited apparatus and materials to carry out other experiments”

Learners from all of the schools in this study indicated that they have inadequate equipment and materials for practical work. Another learner said,

“On another day we failed to complete our experiments on chemicals of life due to lack of food samples”

The other Biology teacher indicated that they are using expired biological reagents and these could not give accurate results as expected, so as for observations during the practical work to match the theory given to the learners as some experiments will be unsuccessful. The Biology teacher said,

“We are facing a challenge when doing practical work using for example expired biological reagents because they may fail to give accurate results as expected, as we may want experiments to replicate the results from the theory covered by the learners.”

Another Biology teacher said,

“Scientific Masters in Harare, Amag Laboratory Supplies in Gweru and Science Equip in Bulawayo are where we buy our apparatus and materials for use in science where we are expected to buy in bulk so that the goods will be delivered to our station. Buying equipment for example worth less than \$50 would be expensive as the Travelling and Subsistence expenses would require more than \$100 for a member to bring these to a school in Gokwe North district.”

The Biologist teacher said,

“The reason we are forced to use expired reagents is because we know that half a loaf is better than nothing, at least learners are benefiting and become familiar with practical. The apparatus and materials needed for our practical are from cities far from Gokwe North”

On science laboratories, another Biology teacher when answering about the laboratory said,

“This classroom is our laboratory as we do not have a science lab, we conduct experiments here but the conditions are poor and there is risk of accidents and learners may be affected by acids and without running water it’s a danger, we are not doing practical work as expected by the syllabi.”

During focus group discussions with learners from another school, learners said,

“We rarely do experiments in these rooms which are poorly ventilated, we do in these classes for example on the topic of genetics when we used beads on monohybrid inheritance demonstrations.”

It was observed that the learners are facing limited access to science laboratories. Only two out of five secondary schools in this study have science laboratories. These laboratories lacked running water, electricity and gas. The other secondary school is using an ordinary classroom as science laboratory with equipment and materials being piled in huge boxes limiting accessibility and making them prone to breakage and leakage. The other two schools are using poorly ventilated rooms that for doing practical work. The classrooms noted are not accessible to learners with disabilities. Apparatus and materials like biological reagents are either stocked in huge boxes or locked in cupboards. Learners also testified to have carried out a few experiments using these materials.

On understanding instructions during practical work, Another Biology teacher said,

“The learners we have cannot understand instructions due to poor English background, sometimes we allow them to use vernacular language when giving report backs from groupwork. We are really worried as poor English background may cause accidents when learners cannot read and understand labels from chemicals.”

It was observed that most of the learners are finding it difficult on working with instructions as well as communicating with peers and teachers during practical work as many learners could carry out some practical work in groups with little communication and giving feedback was also a challenging as learners were choosing someone they know can better communicate using better English language to give report back to the class.

On safety rules, another learner said,

“I have a lab coat at home but I just feel that if I am the only one wearing a lab coat during practical work, I must be the best student in my class so that I must not be ashamed by being outstanding”

It was observed that most of the learners could not follow laboratory safety rules. The learners were carrying out some experiments without wearing protective equipment. The learners were carrying out experiments without lab coats.

On emotional challenges, most of the Form 3 learners indicated anxiety and stress during practical work. The learners stated that they carried out a few experiments in Biology and other subject areas like Physics and Combined Science and they were not familiar with the equipment and materials used. Another learner said,

“As Form 3s were are not given many practical work as compared to Form 4s”

Form 4 learners are being given better practice as they are being prepared for the Zimbabwe Schools Examination Council (ZIMSEC) Biology Paper 3. However it was is adequate for most of the learners to be confident enough. A Biology teacher said,

“Practical work is important and we give Form 4s more work as we prepare them for the Paper 3 Biology ZIMSEC Paper 3.”

On cognitive challenges, the some Biology teachers said that some learners have little understanding of biology concepts, applying theoretical knowledge to practical Work and to interpret and analyse data. Another Biology teacher said,

“We have some learners with learning difficulties who may find it challenging to understand biological concepts so that they will be able to apply theory to practical work.”

Some biology teachers are demotivated and are not giving practical work to the learners as expected. Another Biology teacher said,

“We are not motivated by the way we are handled by the administrators as we ask for our departmental needs and then be forced to work in conditions that are risky for learners to get into accidents. This will make us have a few practical sessions with learners. Our department needs an attentive teacher, and of sound mind and healthy.”

Therefore Biology ordinary level learners in five selected schools in Gokwe North District are facing many challenges during practical work and these are lack of science laboratories, inadequate equipment and materials for conducting practical work, safety challenges, cognitive and emotional challenges and a demotivated teacher among other challenges. These challenges echoes with Dan-Ologe and Shittu (2012) who state that major constraints towards effective teaching of practical in Biology include poor laboratory conditions or status, inadequate staffing, non-availability of laboratory equipment, class size, teachers and students attitudes. These challenges are indeed a corroding malady to effective teaching and learning of Biology and learner academic achievement.

OPPORTUNITIES

Most of the learners during interviews and focus group discussions indicated that practical work in Biology helps them in improving their understanding and retention of biological concepts. This was agreed by Biology teachers in this study who indicated that practical work

enables hands-on-experience, understanding and scientific skills development. During interview another learner said,

“Testing for starch involves many stages but with practical work you will be able to understand all the procedures that you will not be worried even if the task is given in the final examination paper.”

Most of the learners indicated that they are doing practical work in Biology and other areas like Combined Science and they are helping them to be geared for assessments and final examinations. Another Biology teacher said,

“Practical work is very important and reduces anxiety and stress among learners as they do their Paper 3 examination. We now have little problems on handling apparatus as ZIMSEC exams enable schools to have left-overs that may be used by other classes for practice.”

From the interview with the learners practical work is important for careers in Biology and related fields. Another learner said,

“Doing practical work in Biology is great because I feel to be a biologist because Biology is a science and being a scientist is being practical.”

Hence a few practical activities done by the learners aided their understanding as the learners were motivated. As propounded by SCORE (2011) practical work can motivate learners by stimulating interest and enjoyment, be used to teach laboratory skills, enhance the leaning of scientific knowledge, give insights in to the scientific method and develop expertise in using it and develop scientific attitudes such as open-minded ness and objectivity as well planned practical work can stimulate and engage students' learning at different levels, challenging them mentally and physically in ways that other science experiences cannot. This cannot be disputed. The little they are gaining has a share on the positive disposition of the subject, understanding and careers of learners.

4.3 The impact on academic achievement

RESEARCH QUESTION 2

In what way do these challenges and opportunities encountered during practical work impact academic achievement of Ordinary level Biology learners in five selected schools in Gokwe North District.

The challenges encountered by Ordinary level Biology learners in five selected secondary schools in Gokwe North District have a negative impact on academic achievement as stated above. These challenges and their impacts cannot be overemphasized.

The learners and teachers during interviews stated that practical work enhances academic performance. They stated that hand-on-experiences are crucial for understanding and retention of biological concepts and improves learner's grades in examinations. Another Biology teacher said,

“We are happy with ZIMSEC examinations that allow us to have equipment and materials for use with other learners at the school after ordinary level examinations”

The Biology teacher also said that ZIMSEC requires new sets of materials every year and this aided practical work across all Forms and increase in pass rates. The betterment of results is said to be the impact of materials and equipment left after ZIMSEC examinations as they are encouraging using new things every year.

The following table shows observed pass rates for school V.

YEAR	2023	2022	2021
PASS RATE (%)	53	25	14

Table 11: School V Biology pass rate

The pass rate is also shown by the graph below.

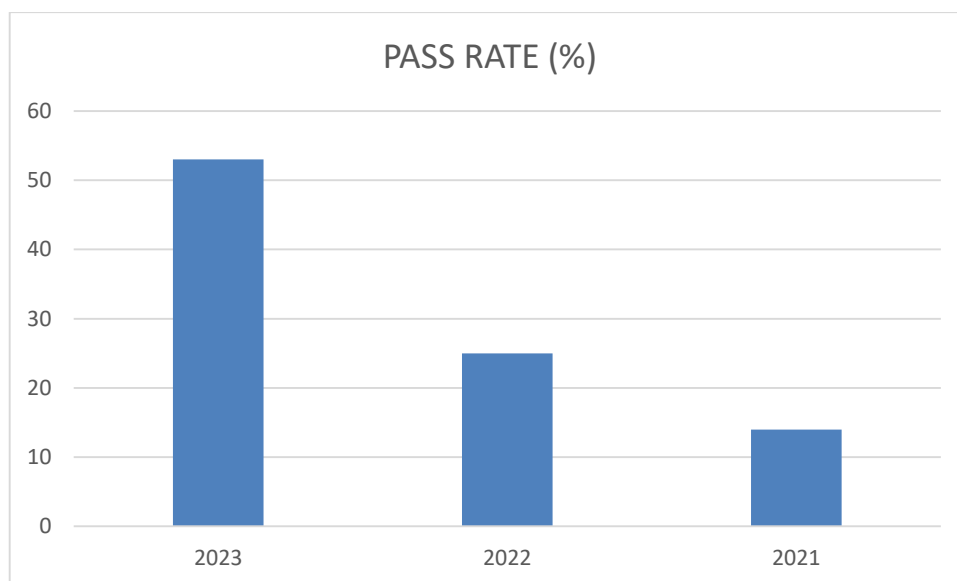


Figure 11: Biology pass rate for School V

Therefore the challenges encountered by Ordinary level Biology learners are negatively affecting effective teaching and learning of Biology and academic achievement. However some opportunities are arising as ZIMSEC examinations are encouraging schools to purchase new equipment and materials for practical work every year, resulting in left-overs being used by other classes. To an develop assessment tool that recognize hands-on experience and support the practical work is crucial according to SCORE (2011).Pass rate in Biology is improving although it is still lower due to the challenges that are outweighing opportunities.

4.4 Opportunities for improving the quality of practical work

RESEARCH QUESTION 3

What opportunities exist for improving the quality of practical work experiences for Biology learners in Gokwe North Secondary schools?

From the interviews held with another Biology teacher it was discovered that at their school, learners are paying “Science Levy” that is aimed at rehabilitating and modernising the science laboratory as well as purchasing science equipment and materials. The teacher said,

“At our school we are grateful because the learners are paying Science Levy which was approved by the Ministry of Primary and Secondary Education and aimed at improving our science subjects.”

The Biology teachers in schools in this study are qualified and meet the requirements for the job. Teacher professional development courses are necessary for teacher to keep updated with contemporary methodologies.

Teamwork among teachers was observed in all schools. Some teachers in public schools are also assisting teachers in private schools as the learners are writing examinations in these public schools. They are also sharing science equipment and materials. Learners are also encouraged to work in groups for them to assist one another.

The researcher observed the appreciation of safety and ethics among some of the learners and teachers in this study. Another learner indicated ownership of a lab coat and can be brought to school. This can be used for the benefit of Biology education.

Practical work is appreciated by schools in this study despite the challenges they face and they ensure that learners write their final ZIMSEC Ordinary Level examinations with experience in practical work.

It was observed that Heads of Department (H.O.Ds) Sciences in schools in this study have functional laptops. These can be used for the provision of multimedia resources to assist learners in Biology education.

Therefore there are many opportunities to improve the quality of practical work in Gokwe North secondary schools. Dan-Ologe and Shittu (2012) argue that the provision of standard laboratory and adequate laboratory equipment for secondary schools, teachers improving their teaching methodology to sustain the interest of the students, enough qualified Biology teachers employed to cater for increase population of students and students being allowed to access laboratory equipment have a positive impact on Biology teaching and learning. The schools have qualified teachers and may only need lab technicians. Some schools are receiving funding in form of science levies that may assist on constructing and modernising science laboratories and securing equipment and materials for practical work. Practical work is well appreciated and its role is not underestimated by teachers and learners. ICT tools are available and can be integrated with the teaching and learning of Biology using practical work.

4.5 Discussion

From the interviews with Biology learners, Biology teachers, focus group discussion and observations it was clear that Ordinary level learners in the five selected schools in Gokwe North are facing several challenges during practical work in Biology. These challenges include lack of proper science laboratories that are well functioning and well equipped with adequate equipment and materials for conducting practical work effectively, lack of personal protective equipment, failure to understand instructions and follow safety procedures among others. Practical work is being done better with the Form 4s better than the Form 3s due to preparation for the Biology Paper 3 but it is however not adequate eliminate stress and anxiety among learners. The challenges can be eradicated by seeking funding and rehabilitating existing science laboratories, building new ones, equipping them with adequate equipment and materials for conducting practical work. All Ordinary level learners must be given practical

work as required by the syllabus and opportunities for learning must be maximized. Practical work must be for effective learning and not just for preparation of exams.

4.6 Conclusion

This chapter covered data presentation, interpretation, analysis and discussion for the challenges and opportunities encountered during practical work by Ordinary level Biology learners in five selected schools in Gokwe North district. Some of the data from interviews were presented as verbatim. The challenges and opportunities were presented, interpreted, analyzed and discussed in order to answer the research questions. The following chapter shall be on summary, conclusion and recommendations.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter provides the summary, conclusion and recommendations on this study on the challenges and opportunities that Ordinary Level Biology learners in five selected schools in Gokwe North district encounter during practical work and the impact on academic achievement. The study aimed at answering research questions firstly, what challenges and opportunities do Ordinary level Biology learners in five selected schools in Gokwe North District encounter during practical work?, secondly, in what way do these challenges and opportunities encountered during practical work impact academic achievement of Ordinary level Biology learners in five selected schools in Gokwe North District?, lastly, What opportunities exist for improving the quality of practical work experiences for Biology learners in Gokwe North Secondary schools? The recommendations are highlighted for the stakeholders including Biology teachers, Heads of schools, parents, curriculum developers and policymakers.

5.2. Summary

The purpose of this study was to investigate into the challenges and opportunities encountered during practical work by Biology Ordinary level learners in five selected secondary schools in Gokwe North district and the impact on academic achievement. The study was organized into five chapters. Chapter 1 provides an introduction to the study, background, research questions, and research objectives, significance of the study as well as the definition of key terms. Chapter 2 reviews related literature on practical work in Biology. The review of related literature was guided by the Experiential Learning Theory by Kolb. Several authors also justified the inclusion of practical work in science. Chapter 3 describes the research methodology used in this study. Data was collected using interviews, focus group discussions and observation with

analysis given with some responses from interviews given as verbatim. Chapter 4 presents, interprets, analyses and discusses the findings of this study.

The research identified several key challenges encountered by Biology Ordinary level learners in five selected secondary schools in Gokwe North district. These challenges include lack of science laboratories, inadequate equipment and materials, safety concerns, understanding instructions, demotivated teacher. Most of the schools were using ordinary classrooms as they did not have science laboratories and ventilation, adequate space, appropriate furniture and required storage facilities to conduct practical work well. A few schools' science laboratories require rehabilitation and modernization and also lacked running water and electricity to carry out practical work well. All the schools did not have adequate materials and equipment to conduct practical work well. This inadequacy hinders all Ordinary level learners to engage in practical work. Unsafe practices were also noted as learners conducted practical work. The learners also faced challenges on understanding instructions during practical work with teachers encouraging the use of vernacular language when learners are challenged. Biology teachers are demotivated with little effort by the administrators towards improvement of functionality of science laboratories, textbooks and the functionality of the Science Department as a whole.

In spite limited resources and other challenges being faced by the learners, they are also opportunities they encounter during practical work. These include better understanding, skill development, and learner engagement as well as collaboration and peer learning. Increased opportunities for practical work is assisting learners' understanding and improvement in pass rate at Ordinary level examination is also a testimony to that. Critical thinking, problem-solving and collaboration among learners, promoting peer-to-peer learning are among critical skills developed in learners. Discussing and sharing experiences enhances understanding. Collaboration is a life skill as no man is an island in this world.

These challenges and opportunities encountered during practical work have an impact on the academic achievement of Ordinary level Biology learners in five selected schools in Gokwe North District. With ZIMSEC Ordinary level Biology Paper 3 being practical and schools being advised to purchase some new equipment and materials for practical work, the schools are accumulating excess and left-overs for use with other learners. This is enhancing understanding and better learner performance. The learners are improving on confidence and the pass rate in Biology is increasing to be better although it is still low as the learners are facing many other challenges.

Opportunities also do exist for improving the quality of practical work experiences for Biology learners in Gokwe North Secondary schools. Science levies being collected by schools have to be channeled towards the construction of science laboratories, purchase of equipment and materials for practical work, purchase of appropriate furniture and textbooks. The Ministry of Primary and Secondary Education may assist but avoiding diverting Science levies to other purposes. The schools have qualified Biology teachers who appreciate practical work and must be continuously be offered professional development opportunities for them to be up to date. There is also teamwork among Biology teachers across schools and this is quite positive as it promotes sharing of resources and best practices.

5.3. Conclusions

In conclusion, Biology ordinary level learners in five selected secondary schools in Gokwe North district are facing numerous challenges during practical work that are affecting their academic achievement. These challenges are lack of science laboratories, space constraints, limited equipment and materials, safety concerns including lack of gloves, lab coats and goggles, limited understanding of instructions and anxiety among others. These challenges are negatively affecting their academic achievement. However the schools are accumulating some

equipment and materials for practical work from preparations of ZIMSEC Biology Paper 3 and other practical papers like Combined Science. These are giving the learners opportunities for practical work resulting in better understanding of biological concepts, development of scientific skills, development of interest, confidence and self-esteem, development of transferable skills as well as preparation for careers in science. Availability of qualified teachers who know the value of practical work and cooperation with other teachers and availability of funds from science levies are among opportunities that can be used to improve the quality of practical work in Gokwe North secondary schools.

5.4. Recommendations

Based on the findings of this study, the following recommendations are proposed for addressing the challenges encountered by ordinary level Biology learners during practical work and leverage on opportunities thereby improving their academic achievement:

- The schools should prioritize seeking and allocation of financial resources to provide necessary facilities, equipment and materials for Biology practical work. The funds may come from the parents after they are made aware of the purpose at Annual General Meetings and approval is sought from the Ministry of Primary and Secondary Education. The schools may also seek assistance from local organisations and the government. The Heads of schools and School Development Committees must then allocate these funds to their intended purpose.
- Teachers must improvise some equipment so example some apparatus using locally available materials in order to carry out some practical work for the benefit of learners.
- The schools must establish and enforce safety protocols in science laboratories. Safety gear must be compulsory and regular training sessions conducted on safety practices by both teachers and learners.

- Regular teacher professional development opportunities must be offered through workshops from the district level up to school level to ensure that teachers are equipped with knowledge and skills necessary to guide learners effectively during practical work in Biology. Experienced teachers in the district can be used to facilitate as they are assets who can be used to assist the newly qualified teachers.
- Curriculum designers must continue to offer the assessment that include practical work so that learners are fully equipped with scientific knowledge and skills.
- The Ministry of Primary and Secondary Education can also assist secondary schools in rural areas for them to have adequate facilities, equipment and materials for practical work so that they are not left behind.

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Appendix I: interview guide for learners

Number. :.....

INTRODUCTION

My name is Mupfaranyuri Lovemore, I am a Teacher and currently teaching at Bande Primary School. I am also a student studying with Bindura University of Science Education. My program is Honours Bachelor of Science Education Biology degree. As part of my program, I am conducting a research on the challenges and opportunities encountered by ordinary biology learners in selected Gokwe North District secondary schools. Your responses are going to assist me identify the challenges and opportunities that can inform improvements in Biology education. Your participation in this study is voluntary and information you will give will be confidential and used only for the purpose of this study.

TYPE OF SCHOOL

Day school	Boarding school	Private school	Other (Specify)

SECTION A: BACKGROUND INFORMATION

1. What is your sex ? Female Male.....
2. What is your age? 15 years.....16 years..... 17years..... Above.....
3. How long have you been studying Biology? 1 year..... 2 years..... More.....
4. Have you had any prior experience with practical work in Biology or other sciences? Yes No.....

SECTION B: CHALLENGES ENCOUNTERED DURING PRACTICAL WORK

1. What challenges do you face during Biology practical work?

Equipment:

Materials:

Understanding Instructions:

Other:.....
.....
.....

2. Can you recall a practical activity that was particularly difficult for you? Yes..... No.....
3. What was it?
4. What made it challenging?
5. How do you think these challenges affect your learning and understanding of Biology concepts?.....
.....

SECTION C: OPPORTUNITIES AND POSITIVE EXPERIENCES

1. What do you enjoy most about Biology practical work?
.....
2. Can you think of a practical activity that you found particularly interesting or engaging? Yes..... No
3. What was it?
4. What made it enjoyable?
5. How do you think practical work helps you understand and apply Biology concepts?
.....
.....

SECTION D: SUGGESTIONS FOR IMPROVEMENT

1. What changes would you suggest to be made to the Biology practical work to improve your learning experience?
.....
.....
2. Are there any additional resources or support that you think would help overcome challenges during practical work?
.....
.....

3. Do you have any ideas for new or innovative practical activities that could enhance your understanding of Biology concepts?

.....

.....

CONCLUSION

Thank you for sharing your thoughts and experiences with me today. Your responses are well appreciated and will help me understand the challenges and opportunities that Biology Ordinary Level learners face during practical work.

Appendix II: interview guide for biology teachers

Number. :.....

INTRODUCTION

My name is Mupfaranyuri Lovemore, I am a Teacher and currently teaching at Bande Primary School. I am also a student studying with Bindura University of Science Education. My program is Honours Bachelor of Science Education Biology degree. As part of my program, I am conducting a research on the challenges and opportunities encountered by ordinary biology learners in selected Gokwe North District secondary schools. Your responses are going to assist me identify the challenges and opportunities that can inform improvements in Biology education. Your participation in this study is voluntary and information you will give will be confidential and used only for the purpose of this study.

TYPE OF SCHOOL

Day school	Boarding school	Private school	Other (Specify)

SECTION A: BACKGROUND INFORMATION

1. What is your sex? Female Male
2. What are your qualifications? Diploma in education..... First Degree..... Master's degree Other
3. What is your area of specialization?
Biology.....Mathematics.....Chemistry.....Computer Science.....Other
4. What is your teaching experience?
5. How many years have you been teaching Biology?years.
6. What is your current role in the department?
7. What is the typical (average) class size of your Biology classes

SECTION B: CHALLENGES ENCOUNTERED BY LEARNERS DURING PRACTICAL WORK

1. What challenges do you observe Biology Ordinary Level learners facing during practical work?

Equipment:.....

Materials:

Understanding instructions:

Other.....

.....

.....

2. How do you think these challenges impact learners' understanding and application of Biology concepts?

.....

3. Can you recall a specific instance where a learner struggled with a practical activity?
Yes..... No

4. What was the instance?

5. How did you address this issue?

SECTION C: OPPORTUNITIES AND EFFECTIVE STRATEGIES

1. What opportunities do you think practical work provides for Biology Ordinary Level learners?

Hands-on-experience.....

Scientific skills development:

Others :

.....

.....

2. What strategies do you use to facilitate effective practical work in your Biology classes?

.....
.....
.....

3. How do you assess the effectiveness of practical work in achieving learning objectives?

.....
.....
.....

SECTION D: RESOURCES AND SUPPORT

1. What resources do you think are essential for effective practical work in Biology?

Equipment:.....

Materials:

Technology:

Other:

.....
.....

2. How do you currently support learners who struggle with practical work?

.....
.....

3. Are there any additional resources or support that you think would enhance the practical work experience for Biology learners?

.....
.....

SECTION E: FUTURE DIRECTIONS AND RECOMMENTATIONS

1. What would you suggest making to the Biology practical work or pedagogy to better support learner needs?

.....
2. How do you think technology for example simulations and virtual labs could be leveraged to enhance practical experiences in Biology?

.....
3. What recommendations do you have for policymakers, administrators or educators to improve the overall quality of practical work in Biology education?

.....
.....
.....
.....

CONCLUSION

Thank you for sharing your thoughts and experiences with me today. Your perceptions are well appreciated and will help me understand the challenges and opportunities that Biology Ordinary Level learners face during practical work.

Appendix III: Observation guide for the challenges and opportunities biology learners encounter during practical work.

TYPE OF SCHOOL

Day school	Boarding school	Private school	Other (Specify)

SECTION A: CLASSROOM ENVIRONMENT AND RESOURCES

1. Science laboratory layout and organisation: Is the science laboratory well organized and conducive to practical work?
2. Availability of resources: Are necessary resources for example equipment, materials and safety gear available and accessible to learners?
3. Technology integration: Is technology for example microscopes and software used to support practical work, and if so, how effectively?

SECTION B: TEACHER FACILITATION AND SUPPORT

1. Teacher demonstration and explanation: Does the teacher clearly demonstrate and explain practical procedures and concepts?
2. Teacher support and guidance: Does the teacher provide adequate support and guidance to learners during practical work?
3. Teacher feedback and assessment: Does the teacher provide constructive feedback and assess learner understanding during practical work?

SECTION C: LEARNER ENGAGEMENT AND PARTICIPATION

1. Learner interest and motivation: Do learners appear interested and motivated during practical work?
2. Learner participation and engagement: Do learners actively participate and engage in practical activities?
3. Learner collaboration and teamwork: Do learners work collaboratively and demonstrate teamwork during practical work?

SECTION D: CHALLENGES AND OPPORTUNITIES

1. Challenges encountered: What challenges do learners encounter during practical work?

2. Opportunities for learning: What opportunities for learning and skill development do learners have during practical work?
3. Teacher strategies for addressing challenges: What strategies do teachers use to address challenges and support learners during practical work?

SECTION E: IMPACT ON ACADEMIC ACHIEVEMENT

1. Learner understanding and application: Do learners demonstrate understanding and application of Biology concepts during practical work?
2. Learner confidence and self-efficacy: Do learners appear confident and self-efficacious during practical work?
3. Teacher assessment of learner achievement: How do teachers assess learner achievement and understanding during practical work?

ADDITIONAL NOTES

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This observation guide is designed to provide a comprehensive understanding of the challenges and opportunities encountered by Biology Ordinary Level learners during practical work as the impact on academic achievement.

Appendix IV: focus group discussion guide

INTRODUCTION

My name is Mupfaranyuri Lovemore, I am a Teacher and currently teaching at Bande Primary School. I am also a student studying with Bindura University of Science Education. My program is Honours Bachelor of Science Education Biology degree. As part of my program, I am conducting a research on the challenges and opportunities encountered by ordinary biology learners in selected Gokwe North District secondary schools. Your responses are going to assist me identify the challenges and opportunities that can inform improvements in Biology education. Your participation in this study is voluntary and information you will give will be confidential and used only for the purpose of this study.

SECTION A: EXPERIENCES WITH PRACTICAL WORK

1. Can you share your experiences with practical work in Biology? What do you enjoy most about it?
2. What challenges do you face during practical work in Biology? How do you overcome them?
3. How do you think practical work helps you understand Biology concepts better?

SECTION B: CHALLENGES AND OPPORTUNITIES

1. What are some of the biggest challenges you face during practical work in Biology?
2. Can you think of any opportunities that practical work provides for you to learn and develop skills?
3. How do you think teachers or school can support you better during practical work?

SECTION C: IMPACT ON ACADEMIC ACHIEVEMENT

1. Do you think practical work in Biology has helped you achieve better grades or understanding of the subject? Why or why not?
2. Can you recall a specific instance where practical work helped you understand a complex Biology concept better?
3. How do you think practical work can be improved to better support your academic achievement in Biology?

THANK YOU FOR YOUR TIME AND INPUT.

Appendix V: Request to conduct research

P Bag 1020
BINDURA
ZIMBABWE

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

SAMED


BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 14/10/24

TO WHOM IT MAY CONCERN

NAME: MUPFARANTUZI
LOTEMORE REGISTRATION NUMBER: B225848A

PROGRAMME: HBSc Ed/Bz PART: 2.2

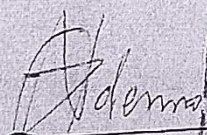
This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

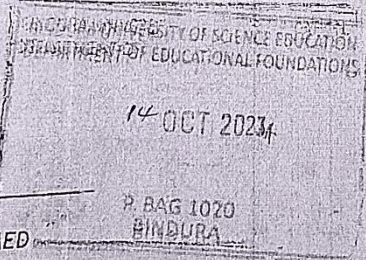
The student has to undertake research and thereafter present a Research Project in partial fulfillment of the BACHELOR OF SCIENCE EDUCATION programme. The research topic is:
HONOURS DEGREE IN BIOLOGY
THE CHALLENGES AND OPPORTUNITIES THAT ORIGINALLY LEVEL BIOLOGY
LEARNERS IN FIVE SELECTED SECONDARY SCHOOLS IN GOKWE NORTH
DISTRICT ENCOUNTER DURING PRACTICAL WORK AND THE IMPACT
ON ACADEMIC ACHIEVEMENT.

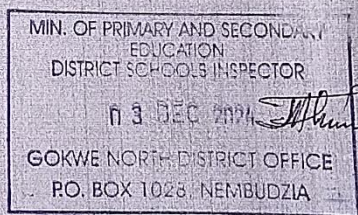
In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

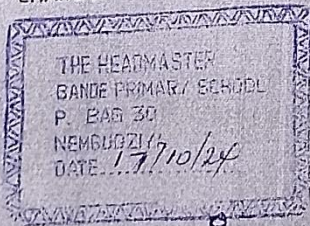
Your co-operation and assistance is greatly appreciated.

Thank you


Zindemo (Dr.)
CHAIRPERSON - SAMED


14 OCT 2024
P. BAG 1020
BINDURA


MIN. OF PRIMARY AND SECONDARY
EDUCATION
DISTRICT SCHOOLS INSPECTOR
13 DEC 2024
GOKWE NORTH DISTRICT OFFICE
P.O. BOX 1028, NEMBUDZIA

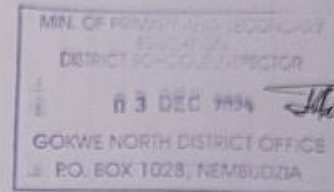

THE HEADMASTER
BANDE PRIMARY SCHOOL
P. BAG 30
NEMBUDZIA
DATE: 17/10/24

2024

Bande Primary School
Private Bag 1030
Nembudzia

28 November 2024

The District Schools Inspector
Gokwe North District
Private Bag 1028
Nembudzia.



Dear Sir/Madam

**RE: APPLICATION FOR PERMISSION TO CARRY OUT RESEARCH PROJECT
IN FIVE SCHOOLS IN GOKWE NORTH DISTRICT**

I am a student at Bindura University of Science Education under the Teacher Capacity Development Programme seeking permission to carry out a research project in five schools in Gokwe North District in partial fulfilment of the Honours Bachelor of Science Education Biology degree programme.

My topic is "The challenges and opportunities that Ordinary Level Biology learners in five selected secondary schools in Gokwe North District encounter during practical work and the impact on academic achievement." I will collect data using interviews, observations and focus group discussions.

Your assistance is greatly appreciated.

Yours faithfully

Mupfanyuri Lovemore (Registration Number: B225848A)