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BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN BIOLOGY

AN ASSESSMENT OF CHALLENGES ENCOUNTERED BY ORDINARY LEVEL BIOLOGY STUDENTS IN LEARNING AND DEVELOPMENT OF PSYCHOMOTOR SKILLS IN PRACTICAL TOPICS. A CASE STUDY OF THREE SCHOOLS IN INSIZA DISTRICT

SUBMITTED BY

Tsepo Moyo

B1441642

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE HONOURS DEGREE IN BIOLOGY EDUCATION.

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ABBREVIATIONS AND ACRONYMS

United Nations Education, Scientific and Cultural Organization (UNESCO),

Ministry of Primary and Secondary Education (MOPSE)

Provincial Education Director (PED)

District Schools Inspectors (DSI)

Zimbabwe School Examination Council (ZIMSEC)

Educational Technology (Edtech)

United Nations International Children's Emergency Fund (UNICEF)

ABSTRACT

The study sought to assess the challenges encountered during the teaching and learning of Biology practical skills at Ordinary Level schools in Insiza District. The qualitative research approach was employed and a case study research design provided tools for research to study the complex phenomena within its context. Data was collected from Biology classroom practitioners, heads of departments and three administrators, and

Ordinary Level Biology learners from the three sampled schools in Insiza district. Purposive sampling was used to select all participants. Questionnaires were used to collect data from learners and administrators. Interviews were used to collect data from classroom practitioners. The findings indicated that lack of resources and infrastructure, poor connectivity, lack of financial engagement by stake holders and parents, lack of knowledge and unfunded government initiatives are the major challenges in the teaching and learning of Biology practical skills in Insiza district. The author recommended that dialogue could improve stakeholder engagement, small business startups in school could cushion financial blows, improved improvisations skills, networking and collaboration with other knowledgeable individuals could help reduce challenges met in teaching and learning of practical skills in Ordinary level Biology in Insiza district

DEDICATION

This research study is dedicated to all Biology classroom practitioners in Insiza district and to my amazingly supportive husband Kennedy Chimutsotso who gave me the strength to excel every step of the way.

APPROVAL FORM

Name of student:

Tsepo Moyo

Registration Number:

B1441642

Dissertation Title:

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Signed  **Date** *30 June 2024*

Permanent Address:

1847 New Magwegwe

PO Magwegwe

Bulawayo

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To my husband, thank you for your support, advice and encouragement throughout this course, you were my pillar of strength may the Lord bless you abundantly. I know you always pray day and night for my success. I love you. Sincere gratitude is also extended to the workmates for being cooperative during the study

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

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Chapter 1

1.1 Introduction

To fully facilitate quality teaching and learning of biology, it is nearly impossible without the realization of the importance of practical experiments and psychomotor skills development of the learner. This research assesses the challenges encountered by Ordinary Level Biology students in learning and development of psychomotor skills in practical topics. A case study of three schools in Insiza District.

1.2 Background of the Study

Use of practical work greatly contributes to successful classroom pedagogy and is a strong pillar to 21st century learning of STEM subject. Psychomotor skills are needed in almost every subject being taught in schools in particular, Biology a STEM subject. Learners should be able to exhibit, exploit and harness practical skills so that they can expose the point of convergence between theory learnt and its applications. Biology commonly incorporates the need of practical skills which are central to future and further learning in both biology and other sciences. However to exhibit practical skills one has to have developed psychomotor skills in the area that they want to carry out practical work.

Practical activities have for a long time been recommended for use in biology teaching. Practical activities engage the learner and stimulate most of the learner senses during learning. Daba, Anbassa, Oda and Degefa, (2016) are of the view that learners tend to be more successful when they practice the subject matter through practical activities. This in turn prepares them better for future applications of theory and placement of various tertiary courses like advanced level medicine, research areas in science.

Furthermore, Biology has been identified as a very important science subject and its importance in scientific and technological development of nations has been widely reported (Adesoji & Olatunbosun, 2018). Ketevan (2015) pointed out that understanding biology is impossible without the realization of practical experiments. Psychomotor skills are necessary for success in work and life. Psychomotor skills are essential in the development of the a 21st century society with ever expanding technology. Learners should be able to fit in the upcoming society in which they will control means of survival

hence Biology learners should have relevant psychomotor skills to continue the technological era and remain relevant in the global village as competitive participants.

The psychomotor skills in Biology fall in the practical domain which includes physical movement, coordination, and use of the motor-skill areas (Simpson and Harrow, 2010). Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution, Practical domains are especially useful for the development of young people, Biology leaners should be able to calibrate, measure with precision, coordinate and control movement of apparatus.

The acquiring of psychomotor skills is so important so much that the examining board ZIMSEC scrapped off alternative to practical papers in all science subjects and made it compulsory for all ZIMSEC candidates to take a practical test which has the main focus of testing practical skills. This has been done, believable to create a brood of learners that can help grow a nation with scientists that can fit in the global village of scientists. Adesoji (2015) further pointed out that, it was as a result of the recognition given to the study of biology in the development of the individual and the nation that gave rise to making it a core-subject among the natural sciences and other science related courses in other developed countries education system.

It is visibly evident that practical work and psychomotor skills in Biology are indispensable attributes of a teaching and learning of biology but, Motswiri (2014) observed that classroom practices in most secondary school, biology lessons are characterized by chalk-and-talk and with little practical work. Furthermore, the pass rate of Biology practical component at Ordinary Level in Insiza district schools is relatively low, hence this depicts an amiss phenomenon within the teaching and learning of Biology practical work and psychomotor skills within the district.

Adherence to educational aims, develops teachers' abilities to assess the way they teach biology through practical activities at all education levels. This in turn increases the teachers' confidence and their ability to practice the methodology (Sharpe, 2012).

Furthermore, clarity is needed and conclusive facts are necessary to guide the learners in remote Insiza district on how best they can acquire adequate psychomotor skills in

Biology for the complete development of a competent Biology learner. A study in Biology subject area will help unlock the potential of marginalized African societies, this is consistent with the perspectives of Sichangi, (2018) who is of the view that concerns have been raised by prominent institutions on Africa's inability to fill most science, technology, engineering and mathematics (STEM) jobs within industries. The shortage of such workforce is linked to classroom teaching and learning practices that are pre-dominantly geared towards passing examinations, and not towards applying knowledge acquired and psychomotor skills that can be extrapolated to solve real life problems affecting societies.

Science in STEM comprises three related subjects: biology, chemistry and physics. Teaching Biology in such a way that it contributes positively to the success of STEM programs can help improve societies (Sichangi, 2018).

The widening economic gaps that exit between nations are attributed to corresponding gaps in science and technology. Considering Africa as a whole education is regarded as a key that unlocks the development of potential personal and national values and all other kinds of rights and powers in the world. Education is the only tool that can guarantee all aspect of human development which includes economic growth, social development, environmental protection, scientific development and employment opportunities in an equitable manner (Ekanem, 2010).

The nation of Zimbabwe is embarking on a deliberate journey towards self-organization and capacitation through systematic human capital planning, development, talent identification and maximum exploitation of their national talent to achieve the highest impacts in targeted fields of human activity, these aspects tend to gravitate towards economic prosperity faster than others. This study seeks to explore and find the challenges faced by learners in acquiring of psychomotor skills for Biology at Ordinary Level in Insiza district so as to facilitate and support national goals and agenda in human capital development strategies for the industrialization, innovation and modernization of Zimbabwe, (Svodziwa, 2021).

1.3 Statement of the Problem

This research seeks to assess the challenges in inculcating psychomotor skills which include speed and precision in hand eye coordination during the manipulation of

apparatus and during the execution of practical examinations among Ordinary Level Biology learners in Insiza District.

Inculcation of practical skills is of great importance in Biology at Ordinary level as evidenced in afore background. The learning of psychomotor skills is complex, the domain is higher than cognitive and affective domains according to the Bloom's taxonomy.

The question then becomes, what are the challenges leading to the failure of attaining of psychomotor skills in Biology, as evidenced by poor performance of learners? Maphosa (2020) is of the view that in Zimbabwe, Matabeleland South is experiencing poverty and as such Insiza District has a large digital divide yet the current situation calls for turning to the use of digital platforms for education continuity.

1.4 Aim of the Study

The aim of the study is to assess the challenges encountered during the teaching and learning of biology psychomotor skills at Ordinary Level schools in Insiza District.

1.5 Research Questions

1. What factors are influencing students' performance in Ordinary Level Biology practical examinations in schools in Insiza District?

2. What can be done to minimize difficulties in learning of Ordinary level Biology psychomotor skills and improve students' performance?

3. What are the effective pedagogical methodologies in teaching and learning of biology practical work and development of psychomotor skills in schools in Insiza District?

1.6 Research Objectives

The objectives of the study are to:

- Determine the factors are influencing students' performance in Ordinary Level Biology practical examinations in schools in Insiza District?
- Identify what can be done to minimize difficulties in learning of Ordinary level Biology psychomotor skills and improve students' performance?

- Evaluate the effective pedagogical methodologies in teaching and learning of biology practical work and development of psychomotor skills in schools in Insiza District?

1.7 Significance of the Study

The study seeks to explore the challenges encountered during the teaching and learning of biology psychomotor skills at Ordinary Level in schools in Insiza District.

Furthermore, this study seeks to navigate how best can the challenges be reduced or at its best results in elimination of the challenges.

It is therefore important to highlight the following groups of people who are impacted by the study these are-

Classroom Practitioners/ Facilitators

This research endeavors to assess learning of psychomotor skills and help the classroom practitioner on how to conduct, select and organize instructional media, for practical learning so that effective learning occurs in all the domains. Based on Edtech (2020), countries, regions districts and communities have different sets of financial, cultural and geographical factors that affect teaching and learning, therefore the study further seeks to expose possible alternatives or improvisations to help learners in Insiza district who may be experiencing poverty and digital marginalization. The study further seeks to illuminate the School Development Committees, parents, learners and school administrators to have confidence in verified facts about teaching and learning of practical skills and practical work.

Guardians/Parents

The study will make parents realize that they are an important stakeholder in the education of their children, thus providing with necessary resources and assisting with learning of psychomotor skills. This research will also make parents aware that their involvement has a great impact in their learners' academic performance (Sibanda and Mathwasa 2021).

Author

This study also helps the author to embrace as a problem-solving technique through an integration of theoretical knowledge learnt at college to practical work-related situations. The research adds literature on the subject under study and also provides reference to other scholars who would wish to do their research in the same field which is helpful both academically and later in the applications of their studies

Teachers Colleges

The study will have a positive impact on the curriculum design for training of classroom practitioners at Classroom practitioner's colleges on the pedagogy that is deposited in classroom practitioners so that psychomotor skills are possibly taught effectively in remote regions. This will save Insiza district a great deal of precious time and resources in rapid training of classroom practitioners on improvisation.

1.8 Delimitations of the Study

The study will fall within the physical geographical boundaries of Insiza district located in Filabusi in Matabeleland South Province of Zimbabwe. The geographical span of the study will not go beyond these boundaries. This choice will allow the research to have a concentrated study area and maximize the use of the limited time frame of the study and the limited financial resources.

The population sample of learners chosen will be limited to Ordinary Level Biology learners, in Insiza district. Ordinary level learners are the ones who are being prepared to go to tertiary educational institutions, some go directly into the industry as apprentices, and hence this sample is ideal to bring out the desired research study results. Ordinary Level Biology classroom practitioners within Insiza District will make the population for classroom practitioners.

Insiza district is also suitable because this is the area where the author is stationed and operates as a classroom practitioner. This is a good choice because of the use of a local

language that the research is familiar with, the ethics of the community and local accessibility is very easy and allows the study to be carried out with minimum cost barriers

1.9 Limitations of the Study

This study is not without its limitations. The study will only focus on three schools. Care should be taken when generalizing the findings to all public schools. The author will try as much as possible to work cordially with all participants during the research process. The findings of this research study are findings that emanate from the research work done in Insiza district these findings may not resonate with other districts across the country.

The author will face some monetary restraints as there will be need to make phone calls and data bundles for internet connectivity for gathering the required information. Time constraints was a limitation, time for research was not sufficient since the author was also occupied with other school work. Since the research was expected to be done over a short period of time, some of the research findings may be compromised.

1.10 Definition of Terms

Challenges

Something that by its nature or character serves as a call to make a special effort, a demand to explain, justify, or difficulty in an undertaking that is stimulating to one engaged in it (IGI Global, 2022). Challenges refer to the obstructions that impede the participation of both learners and classroom practitioner's effective teaching and learning of practical skills within the context of this study.

Biology

The science that deals with the properties, composition, and structure of living things, the transformations they undergo, and the energy that is released or absorbed during these processes.. Briefly biology is the study of living organisms, divided into many specialized fields that cover their morphology, physiology, anatomy, behaviour, origin, and distribution.

Biology. As a science, it is a methodological study of life and living thing**s.** It determines verifiable facts or formulates theories based on experimental findings on living things by applying the scientific method. (Britannica, 2022).

Furthermore, Biology is a science that teaches learners how to describe and understand natural processes in our environment via observation and experimentation, (Kamarainen & Grotzer, 2019). Because of Biology's importance and relevance to life and society, it has been given a lot of attention in schools and by the nation as a whole as it can drive the economy of the country through research and competitiveness in the global sphere. The achievement of this begins with the study and application of scientific disciplines such as biology, physics, basic science, and chemistry in secondary school, but biology alone focuses on human health and his environment (Tholey et al., 2017; Marsland & Prince, 2012). Biology as a learning subject according to the Ministry of Primary and Secondary Education (MOPSE), aims at balancing knowledge, understanding and practical skills in order to produce effective learners. In depth, this study identifies key relevant broad aims of the secondary school biology curriculum are to enable students to:

- Appreciate the contribution of Biology to the sustainable socio-economic development of the country 3.2 develop practical skills such as accuracy, objectivity, integrity and enquiry
- Appreciate that the study and practice of Biology are subject to economic, technological, social, political, ethical and cultural influences 3.7 develop an interest in caring for the local and global environment.

Learning

According to Farrant (1993) defines learning as the process by which we acquire and retain attitudes, knowledge, understanding, skills and capabilities that cannot be attributed to inherited behaviour patterns or physical growth. On the other hand, learning is a mindset. Learning is progressive by itself. It is always in the process of happening.

When we are learning, we are actively changing.
We can define learning as the acquisition of new skills, knowledge, and values. Further, learning is an ongoing process. We learn throughout all our lives. And that's where the term lifelong learning comes from. Moreover, lifelong learning is a self-motivated

education. It is focused on personal development. The purpose of it is to achieve personal fulfillment. Within the confines of this research study learning will be defined as relatively change in behaviour.

Psychomotor skills

Psychomotor skills fall under the practical domain and includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution, (Patel, 2020). Psychomotor domains are especially useful for the development of children and young people, and for developing skills in adults that take people out of their comfort zones like adults can also learn practical skills for high skill jobs like performing surgery (Patel, 2020).

Odo (2015), further echoes that psychomotor skills are the abilities that are learned arid acquired freely by making use of the hands, such abilities are usually practiced without difficulty when the need arises. Thus, engaging biology students in hands-on activities with objects, materials, phenomena and ideas help them to become active participants in the learning process and as well draw meaning and understanding from those experiences. Physical manipulation of instruments or equipment has strong influence on psychomotor skills acquisition. These skills in Biology include; staging a microscope, use of scalpel, clamping a burette, reading a burette meniscus to suitable precision, decanting a supernatant from its precipitate, adjusting a gas burner to a specific temperature range when using a water bath. Others include; setting the meniscus of the pipette, handling reagents correctly, use and handling of science apparatus correctly and carefully, (Odo, 2015).

1.11 Chapter summary

The chapter looked at the background of the study and exposed how the study came about. Objectives of the study, statement of the problem, and sub problems were clearly outlined. Furthermore, the importance of the study clearly shows the justification of this study, key terms were defined and finally assumptions, limitations and delimitations are stated. The next chapter contains literature review where the prevalent theories and literature surrounding this research topic.

Chapter 2
Literature Review
2.1 Introduction

This chapter reviews the related literature on the effects of different types of teaching methods both traditional and modern teaching methods on learner's performance and skill development. The review is organized into the following subheadings: purpose of literature review, brief history of teaching and learning Biology in Zimbabwe, significance of psychomotor skills in science lessons, importance of psychomotor skills in science education, description of psychomotor skills, psychomotor skills in the 21st century assessment and pedagogical approaches in teaching psychomotor skills in Biology and a chapter summary.

2.2 Purpose of Literature Review.

According to Cantero (2019), literature review provides the reader with the most prevalent theories, studies on the topic, evaluations and comparisons of currently existing studies, furthermore it clearly shows the gaps that exist in literature, and this helps the reader to understand the project or study that is being carried out better. Gathering prevailing assertions and views might also be able to detect conflicting points of interests expressed by different authors on the topic under study. According to Denney (2013) conflicting points of view might indicate diverging or converging theories within the same study topic based on the work that has been carried out before. The overview given by literature review shows the reader what is known about a topic, and what is not yet known, thereby setting up the rationale or need for a new investigation, (Denney 2013). Literature review information is derived by author from studying the topic under investigation, by reading whatever has been published and that which appears to be relevant to the topic, (Cantero 2019).

2.20 Theoretical Framework

Osanloo and Grant (2014), are of the view that the importance of utilizing a theoretical framework in a dissertation study cannot be stressed enough. The theoretical framework facilitated the foundation from which all knowledge was constructed (metaphorically and literally) for the research study. It served as the structure and support for the rationale for the study, the problem statement, the purpose, the significance, and the research questions. The theoretical framework provided a grounding base, or an anchor, for the

literature review, and most importantly, the methods and analysis. The chosen theoretical frame work helped the author to reflect on important personal beliefs and understandings about the nature of knowledge, how it exist in relation to the observer, and the possible roles to be adopted, and tools to be employed consequently, by the author in his work, (Osanloo & Grant, 2014).

The systems theory was chosen, it is an interdisciplinary theory about every system in nature, in society and in many scientific domains that provides a framework to investigate phenomena from a holistic approach, (Calatrava et al, 2022). In the case of Insiza secondary schools, this may be the whole institution, academic division or department (Mwangeka, 2020). The provision of quality Biology education by upholding established standards can be examined from the general systems theory perspective, this line of scholarly thought resonates with this research study so much that the author chose systems theory for the study's theoretical frame work. This is because quality Biology practical skills in schools function in a system of human resources, physical resources, methods, procedures and processes working together in a definite environment to deliver desirable outputs, (Mwangeka, 2020).

The desired output within this context is the provision of quality biology education in Insiza secondary schools. Within the system (the school), nonconformities do occur, unchecked policy gaps, poor pedagogical approaches, and ununderstood technologies like AI tools. These non-conformities imply deviations from the set standards, desired outcomes, synchrony with national goals or norms, therefore a problem. By locating where they occur within the education system in Biology at secondary level and the causes thereof, solutions can be found that can lead to a progressive Zimbabwean Biology students. This will enhance the efficiency and effectiveness of the system and hence lead to the delivery of quality, (Mwangeka, 2020).

2.21 Assumptions of Systems Theory

Systems theory operates on the fundamental premise that a complex system consists of numerous smaller systems. It is also through the interactions of these smaller systems that the complexity of the overall system emerges (Bouchrika, 2023). By adopting a systems perspective, the author can comprehensively examine the intricate webs of relationships, contexts, and interdependencies that influence individuals and

communities. This holistic understanding enabled the author to address complex social issues more effectively and promote positive change (Imed 2023).

Systems theory helps authors to move beyond a narrow focus on individual problems, allowing them to recognize the broader systems and structures that contribute to challenges faced by their targeted population (Mwangeka, 2020). By considering the interconnectedness of various systems in secondary education in Insiza district such as interpersonal relationships, departments, affiliate organizations, and larger societal structures, authors can develop interventions that address the root causes. Sustainable solutions are then created for better education systems that are garnished with quality futuristic Biology education in Insiza secondary schools particularly in the practical skills in Biology

2.3 Brief history of teaching and learning Biology in Zimbabwe

Zimbabwe gained independence from British colonial rule in April 1980. Political independence did not necessarily result in immediate curriculum changes in education although there was increased access to education. Primary and secondary education continued to use a system which sees learners go through seven years of primary school education, two years of junior secondary school and two years of Ordinary Level (OLevel) studies. The junior secondary certificate national examinations have since been scrapped. Students who pass O-Level proceed to (A-Level) which takes another two years.

At Ordinary Level science is studied under a range of subjects namely Biology, Biology, Biology, Human and Social Biology and Combined Science. At A-Level, students take at least three subjects. The most common subject combinations for those who choose to do the sciences are: Physics; Chemistry and Mathematics or Biology; Chemistry and Mathematics. It can therefore be generalised that the majority of A-Level science students do Biology.

The University of Cambridge Local Examinations Syndicate (UCLES) did the assessment of students in Zimbabwe until a localisation process, which was completed in 2002. Consequently, the science curriculum used in Zimbabwe was the same as that of the United Kingdom and the scripts were marked abroad until the localisation process began.

In the same token, all the curriculum changes introduced in biology education in the United Kingdom were also implemented in the Zimbabwean education system. Consequently, in order to understand the place of investigation in the curriculum, it is necessary to give an outline of the historical developments in biology education, and practical work in particular, in the United Kingdom.

The historical developments of practical work in science in the United Kingdom are well documented in the works of Gott and Duggan (2017), Wellington (2013), Woolnough and Allsop (2011). According to these authors, nineteenth century biology education was characterised by lecture demonstrations as the mode of instruction of choice.

Demonstrations were useful to illustrate or verify known theories. The early years of the twentieth century saw the emergence of the heuristic approach Ordinary by Armstrong (Woolnough & Allsop, 2011). This approach sought to place pupils in the place of the original investigators. While the approach placed huge emphasis on individual practical work to equip learners with relevant psychomotor skills, the theoretical aspects of science were largely neglected. Around the 1920s the examination system had clear outlines on how practical skills were to be tested.

In the 1950s there were loud voices calling for a learner-centred approach to practical work in which learners would do open-ended investigations (Gott & Duggan, 2017). Learners were expected to do investigations with an emphasis on method rather than content. The 1960s saw the birth of the Nuffield Science initiative which proposed the discovery approach to practical work. It brought with it more emphasis on integrating scientific theory with practice. Science educators were given a collection of experiments to do with their learners. While this approach was deemed successful and achieving the desired outcomes, its major limitation was that of being too prescriptive. Practical work was all recipe type (Gott & Duggan, 2017).

According to the above-mentioned authors, a revision of the discovery approach gave birth to the process approach in the 1980s. The process approach was aimed at developing transferrable skills in learners, that is, process skills (Gott & Duggan, 2017; Woolnough & Allsop, 2011).

The work of the Assessment of Performance Unit led to the holistic approach to practical work in early 1990s (Gott & Duggan, 2017). Investigative work was incorporated into the science curriculum. Investigations were intended to give learners opportunities to apply concepts and cognitive processes while sharpening their practical skills. As a result of the curriculum changes with a shift towards investigative practical work in science, theBiologyof Cambridge Examinations Syndicate introduced the assessment of planning skills in their international A-Level Biology syllabus in 1996. In the practical examination, learners were assessed on their ability to design, plan and carry out investigations.

The complete localisation of the examinations in Zimbabwe in 2002 did not bring with it full curriculum changes. In fact, the Zimbabwe Examinations Syndicate (ZIMSEC) adopted the UCLES syllabi and repackaged them in their own name. The nature of the assessment therefore remained the same with investigations an integral part of the biology handling, applying and evaluating information. However the current Biology syllabus at ordinary level going through its aims, it is apparent that the curriculum designers intended to see practical work playing a pivotal role in the teaching and learning of “O” Level Biology. The aims place huge emphasis on the development of crosscurricula critical skills, including process skills, which are required by students to become useful citizen.

2.4 Significance of psychomotor skills in Science Lessons

According to Hodson (2019), practical work can motivate students, stimulate their interest in teaching and learning, enhance the learning of scientific knowledge, give them experience in using scientific knowledge and widen their way of thinking. Bases on the research done by Tsakeni (2018) where he explored access to effective practical work for physical sciences learners in two South African high school schools. The results of his academic work in the neighbouring country revealed that the absence of practical examinations resulted in underestimating practical work in physical sciences classrooms, and thus marginalised learners. Tsakeni (2018), further indicated that the limited access led to a social justice agenda due to the high expectations linked to studying physical sciences. Tsakeni recommended supporting practical work through the processes of assessment and tools for instructional leadership.

According to Dillon (2008), there are many reasons for doing practical work for scientific subjects in schools. Some of the reasons are to encourage accurate observations and descriptions, to change theories into real-life application, to keep the interest of students in scientific studies and promote a logical and reasoning method of thought. It is very important to note that based on Dillon (2028) Education 5.0 can be achieved through thorough inculcation of practical work and skills among the Zimbabwean Ordinary level learners so that they can achieve innovation, creativity and eventually industrialisation.

As well, Bryson, Millar, Joseph and Mobolurin (2012) argue that practical work helps to improve students' scientific knowledge. Therefore it can be widely argued that practical work is essential to teaching and learning in the field of scientific studies and that good quality practical work helps develop students' understanding of scientific processes and concepts (Jakeways, 2016).

Consequently, science teachers should be trained based on the most recent research studies to amend their practices and put forth more time and effort to reflect on linking scientific concepts with the natural world (Jokiranta, 2014). However, one should keep in mind that the feedback from teachers of laboratory work is a vital source of information about its value (Jokiranta, 2014). Laboratory work is vital for studying sciences but there are certain problems they faced such as: lack of materials needed for the required experiments, insufficient information for carrying out the experiment, insufficient techniques followed during the experiment, lack of information about the glassware and the chemicals that are needed for the experiment, lack of information about safety rules, lack of information about the steps that should be followed to avoid any accident during the experiment and finally what should be done in case of an accident during the experiment (Aydogdu, 2015; Boyuk, Demir & Erol, 2010).

2.5 Psychomotor skills

The most common classification of practical skills (in essence they are psychomotor skills) is "gross" and "fine." The gross motor skills are defined as those that involve larger groups of muscles for example, arms or legs, while fine motor skills are those that involve smaller groups of muscles such as those found in fingers. (Hill, Fadel and Bialik, 2018). The psychomotor domain includes physical movement, coordination, and use of the motor-

skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

According to Bloom's Taxonomy the psychomotor is one of three domains of educational activities. Psychomotor domains are especially useful for the development of children and young people, even writing, often identified as a fine motor skill, additionally requires coordination of larger muscle groups in the arm. Biology learners in Insiza are no exception they should be able to calibrate, measure with precision, coordinate and control movement of apparatus. Hence the teaching and learning of Biology involves the learning of practical skills. In practice, most movements require a combination of gross and fine motor skills.

Practical skills are needed for the carrying out of practical's in biology worldwide, it has been recognised that science education is indispensable and should be effectively taught in schools. Studies conducted globally have shown the pivotal role played by laboratory work in enhancing science concepts' teaching and learning in educational institutions, (Mwangu and Sibanda 2017). This is in line with the findings of the study by Gatsby Foundation (2012) which was carried out in the United Kingdom which stated that classroom practitioners failed to assess practical skills correctly in the teaching and learning of science learning areas.

2.6 Measure and description of psychomotor skills

The practical domain includes physical movement, coordination, and use of the motorskill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. Practical domains are especially useful for the development of children and young people, and for developing skills in adults that take people out of their comfort zones like adults can also learn practical skills for high skill jobs like performing surgery (Patel, 2020).

The ability to use sensory cues to guide motor activity is perception (awareness). This ranges from sensory stimulation, through cue selection, to translation. Detects non-verbal communication cues. (Fairlie and Loyalka 2020). The Ordinary Level Biology learners in

Insiza district can harness these skills for the excellent performance in final examinations and later use them in other areas of life where they can benefit and take part in innovation and entrepreneurship**.**

2.7 Relevance of psychomotor skills in the 21st century

Psychomotor skills represent how we use our motor functions, this ability is useful and important in society at the most basic level. As our economy continues to evolve and technology advances, we will continue to observe shifts in what practical skills are demanded by employers and for future success (Hill, Fadel and Bialik, 2018). Meta-motor abilities are likely to withstand these shifts. In other words, while the base motor skills necessary for success in the 21st century may dramatically change, despite those changes, one will need to be able to coordinate and adapt these skills. In fact, it is our ability to coordinate and adapt that will allow us to evolve with the world's technological advancements, (Hill, Fadel and Bialik, 2018).

Biology teaching and learning is more responsive to global trends and expectations. According to the Ordinary Level Biology syllabus the thrust of the compulsory practical component is on the acquisition of planning skills furthermore the practical questions test the extent to which the learner can manipulate laboratory equipment. The current Biology syllabus make so much reference on acquiring of Biology psychomotor skills which can lead to the production of competitive learners that can fit in economic development of the country (Munikwa, Chinamasa and Masimba, 2011). Practical work in the science curriculum has become the nucleus of curriculum reform initiatives which have taken place worldwide that can lead to economic reforms and competitive innovations in Insiza district and the global village.

2.8 Assessment of psychomotor skills in Ordinary Level Biology

Practical work must be assessed in a way that will promote the development of key skills necessary for destinations beyond the Biology school laboratory. In their study Zezekwani and Nkopodi (2020) discovered that Biology classroom practitioners were not satisfied because the current method of practical work assessment used by the Zimbabwe Schools Examination Council (ZIMSEC) is not efficient in encouraging learners to develop a variety of practical work skills as learners concentrated on mastering presentation and analysis skills at the expense of other crucial psychomotor skills like equipment manipulation, observational, planning and designing.

Learners should sit for practical work examination and produce a practical work report. The assessment is based on the submitted practical work report at the end of the practical work examination. Learners should be directly observed on how they carry out the practical and how they manipulate laboratory instruments, this is useful for innovation outside the Biology laboratory, Insiza district needs learners with skills for innovation both theoretical and psychomotor for sustained entrepreneurship in the 21st century.

2.9 Pedagogical approaches in teaching psychomotor skills in Biology.

In order to bring about improvements in the teaching and learning processes, three basic domains from Bloom's Taxonomy must be applied. The domains of learning described in Bloom's Taxonomy are the development of cognitive, affective and practical skills. Most of the learners' cognitive mental skills (knowledge) are developed through classroom instruction. The affective skills component, involving a growth in feelings or emotional areas (attitude), is developed through such activities as the structured leadership of group design projects, career development activities and events (co-curricular activities), competitions, (Salim et al 2015). The affective domain has since grown positively in Insiza district with increased numbers of enrolment in Ordinary level learners in general.

Learners' psychomotor skills, commonly referred to as manual or physical skills which are normally developed in the laboratory setting. Salim et al (2015), investigates the levels of practical skill acquired by learners after conducting the laboratory experiments with reference to practical domain taxonomy. This can be achieved by carrying out a practical laboratory test at the end of a learning unit. In the laboratory experiments, learners have the opportunity to develop and practise both their practical and hands-on skills.

According to Khaparde and Shaker (2018), the Biology laboratory work is supposed to develop in learners, a variety of important cognitive and psycho-motor abilities and skills related to experimental Biology. It is very necessary for learners working within the practical domain to be familiar with the laboratory equipment used in the experiments, (Fairlie, and Loyalka 2020). The ideal place to do this within the practical domain was during laboratory activities. Insiza district Biology learners should therefore spend quality time in the laboratory manipulating science equipment as this is the basis of an inventing and innovating mind.

According to the Zimbabwe School Examinations Council, Ordinary level Biology syllabus (2008 – 2012) the best strategy for preparing learners for the design practical question is by affording learners opportunities to design some of their own experiments, under close, safe supervision, during the Ordinary Level course or by practicing on past examination papers. This calls for granting learners autonomy to conduct own experiments and to create platforms to work on past examinations questions to master the planning skills assessed by the design practical question. However, the syllabus is not specific on the methodology of teaching and using of the past examination design questions. The discretion is left to the individual classroom practitioner, (Munikwa, Chinamasa and Masimba 2011).

The 21st century is dominated by an ever growing number of technological innovations, yet a growing number of learners in Insiza district leave school without the basic understanding of the physical principles that are the basis of these technological developments. One can deduce that something is seriously wrong with the teaching and learning of Biology since the majority of Biology learners graduate with rudimentary understanding of concepts, (Kim and Tan 2010). It is therefore of great importance to inculcate adequate practical skills in Ordinary Level Biology learner in Insiza district for the sustainability growth of the district economy that can take part in global village of the 21st century.

Ramnarain (2011), advocate for more use of motivational experiments for the advancement of learners better understanding of Biology concepts, such experiments spark the curiosity of learners, interests and change their attitudes towards the subject. This leads to innovation, modification and invention. Therefore, this calls for the prioritising of motivational experiments in Biology teaching to effectively prepare learners for the new technological environment, (Munikwa, Chinamasa and Masimba 2011). This is therefore an indication that the quality of an education system cannot exceed the quality of its classroom practitioners.

In essence, if Zimbabwe is to develop, and Insiza district be visible in the sphere of innovation and technological advancement, it should seek to improve the quality of its classroom practitioner education programs in order to prepare high quality classroom

practitioners who will in turn produce quality products in schools. Classroom practitioners should be lifelong authors and readers to keep up with current trends in technology and education (Shava et al 2016). This is an indication that it is imperative to invest in the preparation of Biology classroom practitioners as an approach to teaching of practical skills so that Insiza district contributes to the economic development of the country in terms of innovation and entrepreneurship.

2.9.1 Advent of AI technologies in education and classroom realities around Biology psychomotor skills inculcation in schools.

According to UNESCO (2019) technological developments inevitably bring multiple risks and challenges, which have so far outpaced policy debates and regulatory frame works. Despite the clear potential of harnessing AI in poverty eradication and creating sustainable development UNESCO acknowledges that certain technological advancements can be so rapid to an extent that before their formal regulatory frame work is drafted or endorsed it (technological advancement) will be already widely spread used in the society. AI is one such technology, policies debates and regulatory frame work are still in progress or at infancy stages in most countries and nations, yet there seems to be wide spread utilization of the AI technology in educational institutions and societies.

Hardman (2023), acknowledges that there is excitement, confusion and terror around the use of AI tools in education, as it may be considered as uncharted territory despite the fact that the technology has been around for some time. The problem is exposed in the sense that previously the technology had not been widely used and not accessed by everyone. Currently most people with internet connectivity are likely to access AI tools in education. Therefore the need for policy frames works that govern and regulate the technology, and its potential in education

Flores-Vivar and García-Peñalvo, (2023), further affirms the premise that AI in education has not been adequately excavated to expose its opportunities and challenges. The released Beijing Consensus, planning education in the AI era was left to governments and other stakeholders in UNESCO's member states, in accordance with their legislation, public policies and practices, (UNESCO, 2019). The consensus recommended that, policies be mindful of the multidisciplinary nature of AI and its impacts, align AI in education with public policies, particularly education policy, adopt whole-government,

inter-sectoral and multi-stakeholder approaches to the planning and governance of AI in education, and set strategic priorities based on local challenges in achieving SDG 4 and its targets as well as the other SDGs, (Flores-Vivar, & García-Peñalvo, 2023).

Years later, UNESCO (2023) through a new global survey of over 450 schools and universities found that fewer than 10% have developed institutional policies and/or formal guidance concerning the use of generative AI applications. This exposed how polices and clear frames works are lacking when it comes to global usage of AI in educational systems in Africa, Zimbabwe is no exception to lack of such policies.

Therefore in it is imperative to note that learners in Insiza district can easily replace real world experience with digital means and yet get the same results as that of a student who carried out a practical if they use generative artificial intelligence. Considering post COVID-19 effects which lead to a wide embrace and exacerbation of use and manipulation of online learning platforms, there exists a rift between real life experiences and what can be done virtually. Such phenomena do have an impact on the development of psychomotor skills. Transferability of skills gained online to real life skills is out of the scope of this research but there is some impact or effect on challenges associated with development of psychomotor skills amongst biology learners

In class rooms during the learning process science teachers do agree that practicals are one of the fundamental tools enabling students both to learn scientific knowledge, and how to do science (Gatsby Foundation, 2017). However, carrying out practical work in class has its own challenges. Teachers express that there are some difficulties they face finding suitable space, time and resources to carry out a practical. Planning and preparation can take time, finding space and appropriate resources can be difficult and of course, all practical work must take place in a safe environment. Health and safety issues are always confronting student inexperience recognising and using scientific equipment. Some of the research questions will attempt to assess the validity of such concerns from teachers regarding carrying out and developing psychomotor skills in Biology learners in Insiza district.

Furthermore it has been established from other scholars like (Gatsby Foundation, 2017) tht psychomotor skills development in Biology learners also play an important role in

developing 21st century transferrable skills, with universities and future employers looking for critical thinkers who can problem-solve

2.10 Chapter summary

The author presented and in-depth discussion on teaching and learning of practical skills, and exposed the realities of practical work and skills learning in Insiza district. The next chapter focuses on research design and methodology

Chapter 3

Research Methodology

3.1 Introduction

Consistent with the chapter title, this chapter includes the research methodology of the study project. In more details, in this part the author outlines the research design, data collection methods, the population and the sampling techniques used, and the research instruments for data collection. Further the research will in descriptive detail outline data collection procedures, data analysis, ethical considerations and the chapter summary which will synthesize the chapter.

3.2 Research design

A research design is the structure of a research that holds all of the components in the research together, it is similar to a plan, map, strategy or a blueprint for data collection, measurement and analysis (Akhtar, 2016). McCombes (2021), further asserts that a research design is a strategy for answering the research questions using empirical data. The research design is the framework of research methods and techniques chosen by the author so that predetermined procedures for collecting, analysing, interpreting and reporting data in research studies can answer the research questions

The selected strategy helped the author in answering the research questions that have been set up in beginning of the research study. It is therefore appreciable to note that the chosen research design allowed the author to hone in on the research methods that are suitable for the subject matter and set up the study for success. In answering the research question on challenges encountered by Ordinary Level Biology students in learning and development of psychomotor skills in practical topics. The author chose a case study research design with a qualitative approach.

3.3 Case study research design

Baxter and Jack (2015), are of the view that the case study research design provides tools for research to study complex phenomena within their context. This design allowed the development of theory, evaluation programs and systems within an organization and

develop interventions suitable for the focused case in questions. Case study research design allowed the author to work within the chosen schools and collected the data from its original setting. A case study allows for a detailed study of a specific subject and the data can be collected using a vast number of sources and methods. A holistic understating of challenges encountered by Ordinary Level Biology students in learning and development of psychomotor skills in practical topics so that a detailed futuristic strategy can be put in place so that a bright academic achievement is certain for Ordinary Level Biology students that are relevant in global village and local communities.

3.4 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analysed, and used when undertaking research. Research philosophy is seen as the development of the research background, research knowledge and its nature.

Therefore, the author employed a pragmatic philosophy.

3.5 Research Paradigm

According to Maxwell (2014), no fact, investigation, or conclusion can be theory free. In order to understand any educational phenomenon, it is important to keep a wider view of social, economic and political contexts within which that phenomenon is embedded and seek out theories that connect there. Hence it is on these assertions that this study adopted a constructivism paradigm which is derived from the traditional interpretivist paradigm of philosophy.

Constructivism paradigm asserts that people construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences. Furthermore, constructivist paradigm privileges local knowledge that is to say, local or home grown knowledge created within a community of persons (family, organization and classroom) who have first-hand knowledge and experience of themselves and their situation is important and superior compared to other external sources of information (Mogoshoa, 2014).

According to the chosen paradigm reality is subjective, multiple, experience based and socially constructed. The chosen paradigm allowed for the pursuit and generation of a

rich and deep understanding of the phenomenon being investigated. This is closely associated with qualitative methods of data collection and case study research design.

3.6 Research approach: Qualitative Approach

The qualitative research approach was be employed in this study to make an assessment of the challenges in met by students in learning of psychomotor skills in Biology in Insiza district. Qualitative research is a system of inquiry which seeks to build a holistic, largely narrative, description to inform the author's understanding of a social or cultural phenomenon. The author chose this approach because of its flexibility in getting rich data for the topic under study through verbal interaction with participants. Qualitative research allows the author to gain in depth knowledge of a specific context (Maxwell, 2014).

Considering the relative small size of Insiza district and the number of schools that have been chosen it is ideal to choose a qualitative approach as smaller but focused samples are more often needed in qualitative methodology rather than large samples as is the case with quantitative methods, this will allow the author to have an in depth inquiry and excavate the issues surrounding the research question in Insiza district.

Qualitative research values individuality, culture, and social justice which provides a content and context rich breadth of information which, although subjective in nature. The learners, stakeholders, guardians, classroom practitioners and administrators in Insiza district have their unique characteristics in the educational global sphere hence through qualitative research individuality, culture and social justice was considered while unearthing the contents of the research study. Having said that, the employment of qualitative approach methods does not prevent the administration of a critical, disciplined and balanced study into any educational issue.

3.6.1 Advantages of Qualitative research approach

Berg and Howard (2013) characterize qualitative research as meanings, a concept, a definition, metaphors, symbols and a description of things. This implies that qualitative research involves every necessary instruments that can evoke recall which aids problemsolving. The qualitative data instruments such as open-ended questionnaires and indepth interview were used to gather information from the respondents in their natural

settings that is their areas of work or learning in schools. This approach in gathering information, gave full description of the research with respect to the respondents involved. A qualitative research method is regarded as being unique. The reliance on the collection of data such as words and pictures by the author who serves as an instrument makes qualitative research well suited for providing factual and descriptive information (Johnson and Christensen, 2012).

3.6.2 Disadvantages of Qualitative research approach

Christensen and Johnson (2012) found that qualitative authors view the social world as being dynamic and not static. It is understood that authors understand the social world as always changing. Because of this the author limited his findings to a particular group of people being studied instead of generalizing (De Vaus 2014). The focus here is only for a particular group that is the selected school. Also qualitative authors do not make use of numbers making it difficult and impossible to simplify findings and observations. Qualitative authors believe that the social world experiences have many dimensions, hence explanations are based on the interpretations based on the author (Leedy and Ormrod, 2014). In this view proper explanation cannot be brought forward because results depend on the explanation of the author at that time of which different authors may have different explanations of a similar phenomenon.

3.7 Population of the Study

Population is a group of individuals or items that share one or more characteristics from which data can be gathered and analysed. This group should have something in common. Population can also be viewed as a collection of elements about which the author wants to make inference, (Christensen & Johnson, 2012). Therefore, it is in this notion that the author highlights Biology classroom practitioner, science heads of department, guardians, school administrators and Ordinary Level Biology learners in three schools in Insiza district

3.7.0 Sample Size

A sample is a small portion of a group selected for observation and analysis, it is a subset of the population, and it is a selection from the target group (Christensen & Johnson,

2012). Thus for this research, its sample comprised of six Biology classroom practitioner, three heads of departments and three administrators, three guardians and eighteen Ordinary Level Biology learners from the three sampled schools in Insiza district. Three schools with Ordinary level sciences from the several schools in the district will be purposively sampled to assist the author have a manageable group to work with.

3.7.1 Sampling Techniques and Procedures

To be direct and carry out the study cost effectively within the stipulated time frame and attaining valid and reliable data in this study, the author used the purposive sampling. Purposive sampling is a selection that is based on interested traits in population units, (Christensen & Johnson, 2012)

Furthermore, this type of sampling is not time consuming as only the interested respondents take part. Therefore, it is in this light that the Biology classroom practitioner, heads of science departments and Ordinary Level Biology learners were selected in this research.

The selected samples for the study will purposefully help the author get the relevant data to answer all the research questions. For the benefit of this study, the O' Level Biology classroom practitioner, heads of science departments and O' Level Biology learners will be the best informants.

No random selection of the sample will be done but rather Ordinary Level Biology classroom practitioner will be expertly sampled from schools in Insiza district so that only the knowledge of practical skills teaching and learning will be dealt with, this will save time going through irrelevant primary data collected from irrelevant source since time is a constraint

3.8 Data Collection Instruments

Research instruments are procedures or devices for systematically collecting data. These are data collecting tools. The author, for this study chose to use questionnaires and interviews.

3.8.0 Interviews

The author will use semi-structured interviews guides as instruments to generate data. There will be two sets of interview guides, one for Science classroom practitioner and the other for guardians. The guardians are to expose the role played by parents at home, the extent at which they are involved in ensuring continuity of education at home, (Kumar, 2011)

3.8.1 Semi-structured interview guides

The author will use semi-structured interview guides as instruments to generate data from participants. Interview guides are sets of questions that the interviewer asks when carrying out an interview. The interview guides will consist of open-ended questions asked by the interviewer. The participants will give their responses orally; using openended response formats while the interviewer records all the responses in writing. Qualitative research the interview format is not highly structured because the author's goal is to help participants express their views of the phenomenon in their own terms.

3.8.10 Advantages of semi-structured interviews

The reason of choosing structured interviews is to avoid diverting to issues which are of little concern in answering the research questions, structured interviews are very useful in maintaining course of the interview and asking exactly what is needed by the author (Kumar, 2011). Further-more the main advantage of the structured interview is that it provides the collection of complete information with greater understanding. The research will ask questions regarding the responses so that he understands what the respondents mean with their statements right away

The interview is more personal and individualistic, as compared to questionnaires, allowing us to have higher response rates and real life issues with in-depth understanding are excavated in their natural setting. It allows for more control over the order and flow of questions. We can introduce necessary changes in the interview schedule based on initial results (which is not possible in the case of a questionnaire study/ survey). If the interview guide does not lead to the answering of any research question it can be tailor made so that it gathers data that us relevant to the research study being under taken.

3.8.12 Disadvantages of semi-structured interviews

Data analysis, especially when there is a lot of qualitative data. Interviewing can be tiresome for large numbers of participants

3.8.2 Questionnaires

A questionnaire is a data collecting document containing a list of questions which the respondents are expected to answer literally. In a questionnaire the sampled respondents read the questions, interpret what is expected and then write down the answers. In other words, a questionnaire is a document containing questions that participants have to respond to address the sub-problems under study and hand delivered to the respondents

Questionnaires will be given to Ordinary level learners in the three sampled schools, another targeted group for questionnaires are the school administrators. Some questionnaire will be given electronically through WhatsApp and or emails to respondents to save time and reduce costs. Learner will express their views on how they view learning of practical work and skills in Biology and the challenges they face.

3.8.21 Advantages of questionnaires

According to Cohen and Manion (2013) a questionnaire has an advantage of gathering a vast amount of information over a short space of time and can reach out to a large number of people. The results of the questionnaire are usually quick and easy to analyse. The major advantage of questionnaires in this research in the fact on anonymity, respondents will not disclose identity and anonymity allows the chances of extracting accurate information from respondents to increase as compared to face to face interactions.

3.8.22 Disadvantage of questionnaires.

On the other hand, a questionnaire can bring some disadvantages. Gary (2017) notes that the disadvantage of a questionnaire is that there could be a low return of questionnaire. Some respondents can delay answering them and end up complaining about internet connectivity and data bundles. To overcome this, the author needs to make a follow up on distributed questionnaires by identifying respondents through recording names of participants who received the document.

3.9 Trustworthiness of the research instruments.

The trustworthiness of the research instruments will be ascertained by the pilot study of the instruments which will be done prior to data generation. The pilot study will be carried out with a sample population with which the study would not be carried out. The interview guides would be sent to the Biology head of departments and classroom practitioner. The pilot study participants will be asked for suggestions that will help in improving the instruments.

Furthermore, the trustworthiness of the instruments will be assured through triangulation of participants. Triangulation is a research strategy involving the use of several methods to reveal multiple aspects. Triangulation involves the use of multiple and different methods, investigators, sources and theories to obtain corroborating evidence. Triangulation helps the author to reduce bias and cross examines the integrity of participant's responses. The triangulation that uses multiple participants which will bring different perceptions of the inquiry and help to strengthen the integrity of the findings is employed in this study. The author will use this principle through considering the data to be collected from questionnaires and interviews. These will be linked to perceive if the data is consistent in both instruments.

3.10 Reliability and validity

To ensure reliability in qualitative research, examination of trustworthy is crucial. In addition, Reliability is a consequence of the validity in a study. In relation to this study, the data to be gathered and collected through questionnaires and interviews is going to give the author conclusions on the classroom practitioner's views around the mist when learners learn practical skills in Ordinary level biology in Insiza district.

3.11 Data collection procedures

Data collection procedures are means and ways of gathering data from members. This shows the way how data is going to be collected from the participants. For this study, the author will gather data through administering of questionnaires and interviews. With the support of a data generation clearance letter from the Bindura University of Science Education (BUSE), the author will make an application to seek permission to carry out the research in Insiza secondary schools from the Provincial Education Office in Gwanda for

permission to carry out a study in Insiza District of Matabeleland South Province. With the approval letter from the

Provincial Education Director, the author will then proceed to disclose the purpose for the visit arranged to the three school heads of the sampled schools. This will be in the bid to seek the chance to attain data from the participants, particularly the Ordinary Level Biology classroom practitioner and heads of science departments**.**

3.12 Data analysis procedures

3.12.1 Analysis of data

Data analysis is a process of presenting data in a deep and rich form. Our minds are not good at processing large amounts of information, our minds prefer to simplify complex information into simpler patterns and easily understood configurations. It is therefore amplifiable to note that data analysis involves breaking down of information into separate components for individual examination.

For this research, the author will make use of the thematic approach in presenting and analysing data that is going to be gathered. The author in this scenario will start by presenting demographic data. This will be the data obtained from the questionnaires. The author will further advance to presenting data in a thematic manner mainly based on the research questions and objectives. The data generated from the interviews will be presented in a qualitative manner guided by the research questions in chapter one in a thematic manner.

The themes will include some of the following major themes:

- Factors that influence students' performance in biology practical examinations in schools in Insiza District?
- Strategies that can be employed to minimize difficulties in learning biology psychomotor skills and improve students' performance?
- Effective pedagogical methodologies in teaching and learning of biology psychomotor skills in Insiza District

- Structures that have been set up to facilitate the teaching and learning of psychomotor skills in Zimbabwean education system and
- the relevance of biology practical skills in the development of technologically upright society in the 21st century.

3.13 Data coding during data analysis

Coding is the procedure of fragmenting and classifying text to form explanations and comprehensive themes in the data. It is the process through which author gather or 'tag' content related to a specific theme or idea. Data will be reduced by sorting out the information transcript into manageable and meaningful transcript segments with the aid of coding framework. Data coding in qualitative research involves the assigning labels or codes to different sections of text that related with different problems. In the research study open coding will be employed during data coding.

In analysing qualitative data, narrative analysis will be used guided by research questions in, analysis will be through words or text. The findings will be interpreted supported by relevant literature that is currently existing within the context of this research study.

After all the themes have been presented and analysed, the author will then discuss the findings theme by theme. The views from various theories and perceptions are to be incorporated in the discussion of the findings by the author also giving one's judgements on the findings obtained from respondents and theories.

3.13.1 Justification of Thematic analysis

The two main reasons to use thematic analysis are because of its accessibility and its flexibility. Thematic analysis provides an entry into a way of doing research that otherwise can seem vague, mystifying, conceptually challenging and overly complex. It offers a way into qualitative research that teaches the mechanics of coding and analysing qualitative data systematically, which can then be linked to broader theoretical or conceptual issues

3.14 Ethical Considerations

Thus ethics imply preferences which influence behaviour in human relations and ethics indicates what is right and correct. For this research the research will contemplate these

ethics through taking into cognisance the permission attained from the Ministry through the approval from the heads of school and the Provincial Education Officer.

The research will make use of the principle of informed consent. This will be done through informing the participants that the author is carrying out a research on the challenges met by student in learning of practical work and skills in Ordinary level biology in Insiza district. All learner participants the author will follow all the consent protocols needed that is ask for consent from guardians and school administrators.

The other principle to be considered in this study will be that of privacy, privacy is that which normally is not intended for others observe or analyse. The author will then have the mandatory task to separate individuals from other group members. This will help the participants disclose asked information freely without any fear to be heard by passers-by. In this study the author will not disclose names of the participants. All this will be in bid to maintain privacy by the author. Those to partake under the study in interviews, questionnaires will remain anonymous

The study will respect human life, conservation of natural resource, will not divulge private and personal information. The study will not mislead the educational fraternity with falsified results. The material from other sources and other authorities will be given due credit to the author.

3.15 Chapter summary

It is from this chapter that the methodology was clearly designated. The author further gave the design, population as well as the sample alongside all the sampling techniques that need to be followed by the author. The author also discussed on the data collection instruments clearly explaining how these are to be administered and collected from respondents. Reliability, trustworthiness and validity of the research instruments, as well as the ethical consideration for the study were deliberated. Lastly, data collection and analysis was cited in an easy manner that gives an insight of how the research methodology is all about, and how the research will be presented, analysed and discussed in the next chapter.

Chapter 4
Data Presentation, Analysis and Interpretation

4.1 Introduction

This chapter discusses data presentation techniques, description and analysis of data. The data presentation process involved scanning and sifting the data collected, coding and thematic analysis of data was employed and finally summarizing it. Data was presented in the form of tables, graphs and pie charts, interpreted and then analyzed. Data was collected from three types of participants which were six (6) Biology classroom practitioners, three (3) heads of departments and three (3) administrators, three (3) guardians of Ordinary Level Biology learners and eighteen (18) Ordinary Level Biology learners from the three sampled schools in Insiza district. The data collected from the study was presented agreeing to the themes derived from the research questions and indepth analysis of data.

Data Presentation

4.1.1 Coding Of Participants

To ensure confidentiality participants were given pseudonyms. Table 4.1 shows pseudonyms and codes assigned in place of the real names of the participants. Table 4.1

Participants	**Data collection Instrument and sample size**	**Pseudonym**
Head of Department/Administrators	Questionnaires,3 Respondents	School X- HDX1 School Y- HDY1 School Z- HDZ1
Classroom practitioners	Interviews, 6 Participants	School X- CPX1 , CPX2 School Y- CPY1, CPY2 School Z- CPZ1, CPZ2

Guardians	Respondents, 3 participants	School X GDX1, School Y GDY1 School Z GDZ1
Biology Ordinary level learners	Questionnaires, 18 Respondents	School X- X1to X6 School Y- Y1to Y6 School Z- Z1 to Z6

4.2.1 Respondent Rates

Table 4.1.1

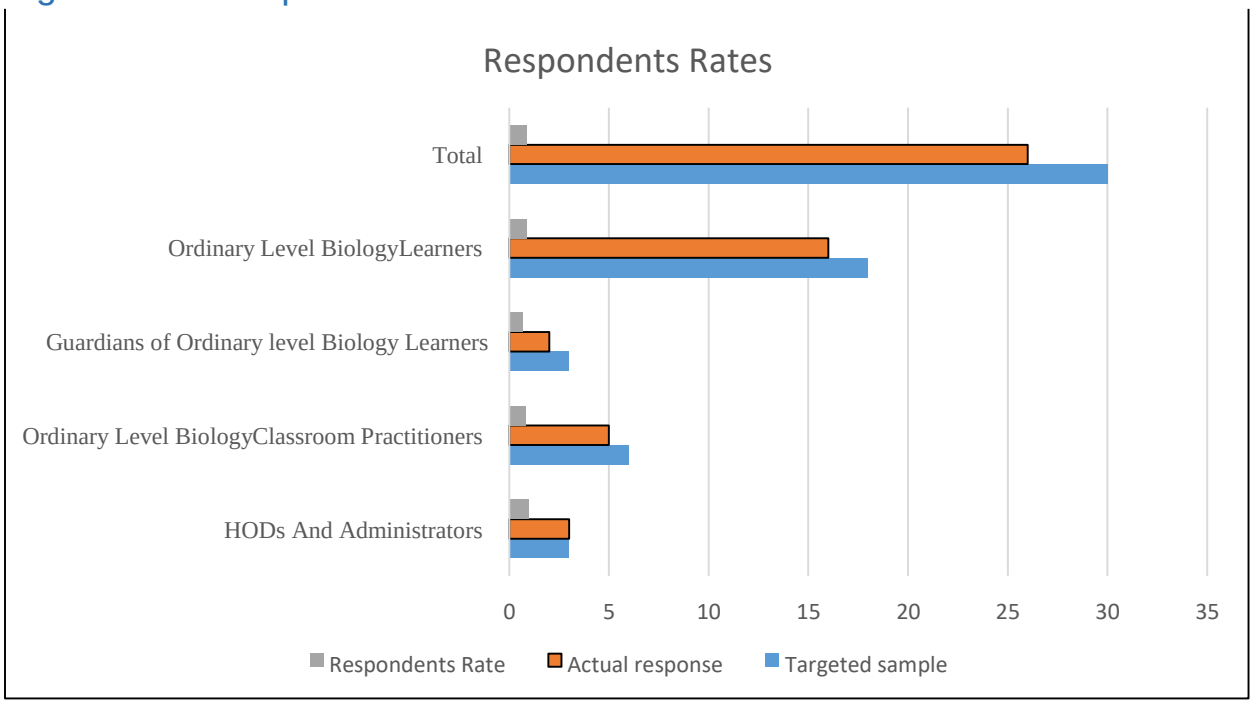
Respondents	**Targeted sample**	**Actual response**	**Respondents Rate**
HODs And Administrators	3	3	100%
Ordinary Level BiologyClassroom Practitioners	6	5	83%
Guardians of Ordinary level Biology Learners	3	2	67%
Ordinary Level BiologyLearners	18	16	89%
Total	**30**	**26**	**87%**

The author targeted a sample of thirty (30) respondents from three schools in Insiza District. The author had targeted to send questionnaires to twenty-four (24) participants which included eighteen (18) learners and six (6) Administrators and Heads of Science department evenly distributed amongst the selected three schools. One questionnaire was subtracted from the total sample size they had incomplete data that couldn't be used for analysis. This means that one questionnaire, of all the questionnaires distributed one was completely discarded from the analysis.

Only twenty-three (23) participants who responded to the questionnaires were used to interpret the results and all the participants targeted for interviews were available and

consented to taking part in the interview. The analysis made by the author revealed that a respondent's rate of 87% was justified. This is supported by Gruiger (2016) who noted that the respondent rate must be above 50% for it to be approved. Mazivofa and Kubvoruno (2013) are of the view that the reliability and validity levels can be measured if the respondent rate is high. The respondents' rate is considered high when it is above 50% therefore the respondent rate of 87% was highly justified.

Figure 4.1.0 Respondents rates



The responses were relatively good this can be attributed to the questionnaires sent out in good time. Another reason could have been that the questionnaires were simple and easy to complete. Gary (2017), blows a warning horn that the disadvantage of a questionnaire is that there could be a low return of questionnaires. This alerts authors to be aware that some participants may decide not to answer the questionnaire or may answer it and fail to return it. To overcome this, the author made vigorous follow ups on the distributed questionnaires.

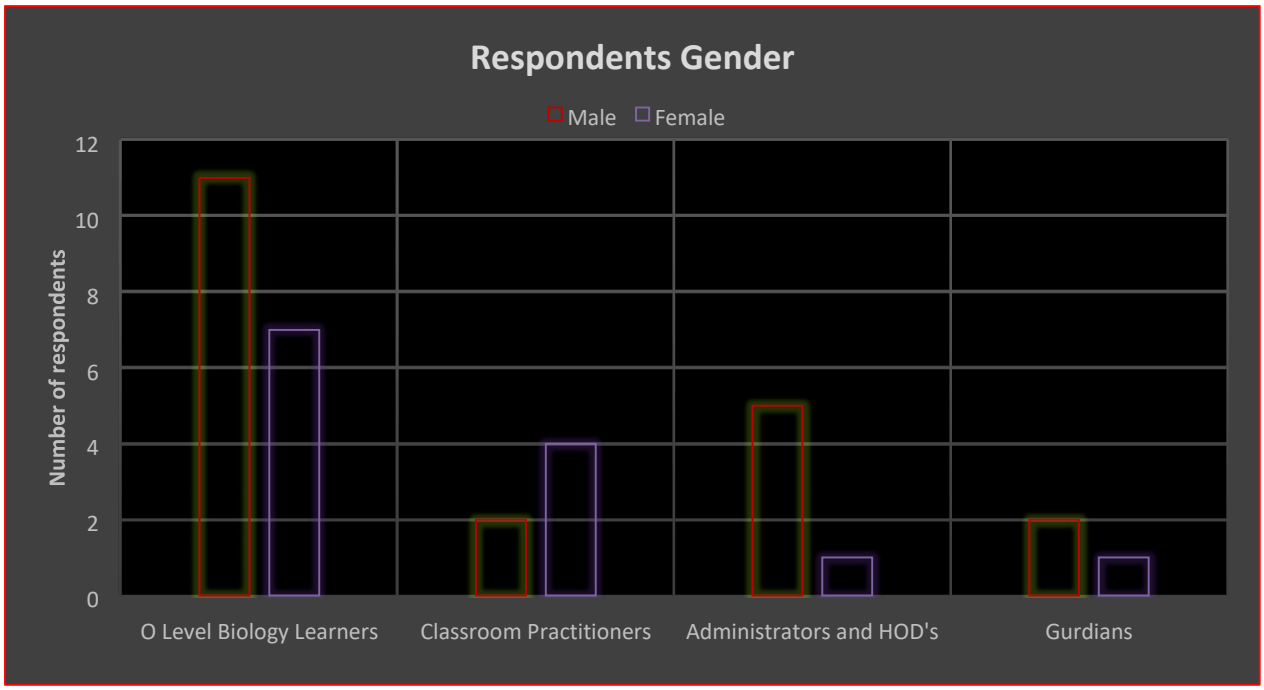
4.2.2 Personal Biographical data

This section of the questionnaires covered the respondents' age, gender, and highest academic and professional qualifications, teaching experience in Insiza District. Though not central to the study, the personal data helped contextualize the findings and the

formulation of appropriate recommendations to enable more understanding around the phenomenon of computer virtual learning and facilitation in Insiza district.

4.2.2.3 Respondents Gender

Figure 4.1 Gender for the respondents



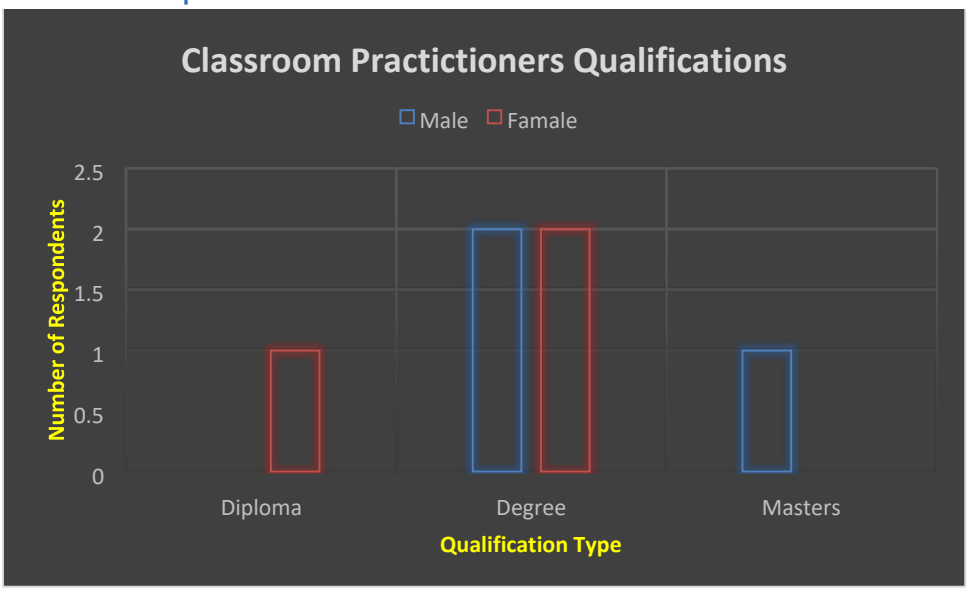
From the study all female respondents including learners were twelve (12) out of thirty (30) thus female participants did not dominate the study with only 40%. Male participants dominated the study and had a representation sample of eighteen (18) people which constituted 60%. An analysis was made in connection to the study that women's participation in Biology still exhibits lack of gender balance in the education sector.

According to Hazari et al (2010), though the gender difference in participation in the field of Biology has troubled science educators for decades, this difference has persisted to the present. The Biology field has failed to increase women's participation and continues to suffer low female undergraduate graduation percentages. Although the IAS (Institute of Applied Sciences) (2016) argues that, a classroom practitioner's gender does not have a large influence on subject choice. The majority of learners respond to good teaching, irrespective of whether the classroom practitioner is male or female. Insiza district Ordinary Level Biology learners cannot be affected by the learning outcomes based on gender distribution in Ordinary Level Biology classroom practitioners.

4.2.2.4 Highest academic and professional qualification

The majority of the respondents are adequately trained for the line of teaching they are doing except for one educator who is currently studying toward their first degree so that they are adequately trained for Biology classroom facilitations. This educational distribution seems to suggest that all classroom practitioners in the sample are professionally trained to execute their mandate. The explanation for this outcome would be that there are more Bachelor's degree holders in education holders than there are diploma and master's degree holders

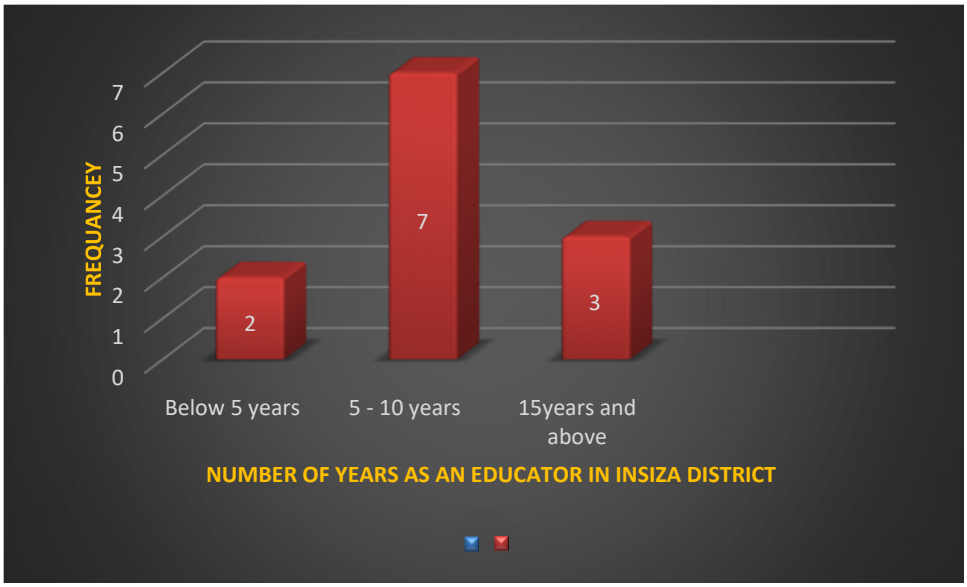
Figure 4.2 Teacher qualification



Lacina and Block (2011) note that, for effective teaching and learning to take place, torch lighters are needed, classroom practitioners who distinguish themselves and set themselves apart from the rest. Quality instruction comes from a classroom practitioner who had been exposed to the foundations of education.

Knowledge of effective pedagogical practices seem to be topical in coming up with the profile of effective teaching. Therefore, the higher the professional qualification the more effective the classroom practitioner becomes. This is supported by Hetoc, (2015) who argued that classroom practitioners need better education level to be in a position of applying various teaching methods. This indicate that education levels are important in determining the effectiveness of inculcation of practical skills in Biology.

4.2.2.5 Number of years in facilitating learning in Insiza district Figure 4.3



Although the questionnaire and the interview guide required teaching experience in Insiza District some educators and administrators had prior experience before serving in Insiza district. However according to the distribution showing experience of classroom practitioners, the results show the highest number of respondents have adequate teaching experience in the teaching profession.

Mavhundutse (2014) is for the view that experience is one of the major factors contributing towards effective teaching. Traditionally quality classroom facilitation comes from someone with experience, a classroom practitioner with more years of service is more experienced as compared to those who are new in the profession. Therefore, more experience means advanced skills in teaching and advanced selection of teaching methods based on the type of learners. Administrators who also have lots experience are capable of making sound judgement and decisions when it come to the affairs of the academic institution. However, considering the current changes in the learning and classroom facilitation fraternity in which instruction is delivered in the modern society, young classroom practitioners with good skills in using ICT gadgets can deliver and achieve better than older seasoned classroom practitioners who are less tech savvy.

Kini and Podolsky (2016), are of a strong view that teaching experience is positively associated with learner achievement gains throughout a classroom practitioner's career. The gains from experience are highest in classroom practitioners' initial years, but continue for classroom practitioners in the second and often third decades of their careers. Classroom practitioners continue to develop their effectiveness throughout their careers. Furthermore, Kini and Podolsky (2016) generally found that while classroom practitioners improve at greater rates during the first few years of their career, classroom practitioners continue to improve, albeit at lesser rates, throughout their career. The teaching experience of the educators is considerable adequate to add ever increasing value in lesson delivery in Insiza district schools.

4.3 Description and Analysis of Data

Thematic analysis of data was employed in this study. Thematic analysis is a method for systematically identifying, organising, and offering insight into, patterns of meaning (themes) across a dataset, (Maguire and Delahunt 2017). Interview transcripts and questionnaire provided a descriptive account of the study, but they do not provide explanations and deeper meaning. Data has to be sorted, arranged and analysed above semantic meaning, latent meaning has to be exposed.

Distinguishing between a top-down or theoretical thematic analysis, that is driven by the specific research question(s) and/or the analyst's focus, and a bottom-up or inductive one that is more driven by the data itself, this data analysis was driven by the research question and was more top-down than bottom up, (Russell and Vallade 2010).

Using a theoretical thematic analysis rather than an inductive one, the author coded each segment of data that was relevant to or captured something interesting about our research question. The author did not code every piece of text but the author used open coding, that means no pre-set codes were set, codes were developed and modified the codes as the process of coding took place. Codes were developed into themes these themes captured something important about the data in relation to the research question, (Maguire and Delahunt, 2017).

4.3.1 Findings form data collection instruments

According to Burnard et al (2010), using the theoretical thematic approach, the findings are subsequently followed by a separate supporting discussion section in which the findings would be critically discussed and compared to the appropriate existing research. Having carefully read through the collected data to gain an overall understanding of the material six themes were identified and analyzed:

The themes will include some of the following major themes:

- Factors that influence students' poor performance in Biology practical examinations in schools in Insiza District?
- Strategies that can be employed to minimize difficulties in learning Biology practical work and skills and improve students' performance?
- Effective pedagogical methodologies in teaching and learning of Biology practical work and skills in Insiza District
- Structures that have been set up to facilitate the teaching and learning of practical skills in Zimbabwean education system and
- The relevance of Biology practical skills in the development of technologically upright society in the 21st century.
-

a) Factors that influence students' poor performance in Biology practical examinations in schools in Insiza District

According to what was gathered from the collected data administrators highlighted that they were faced with a different set factors that impeded good performance in Biology practical examinations 83% of their institutions are ill equipped to facilitate threshold learning and teaching of Biology practical skills to ordinary level biology learners. The challenges faced by administrators and heads of science department overlapped with those coined by learners and classroom practitioners in their interviews. Erratic network connectivity, lack of electricity, lack commitment amongst parents and stakeholders in funding school laboratory projects. One administrators pointed out that both parents and stake holders needed a change of mind-set since they were still strongly attached to archaic teaching methods.

Learners expressed different learning preference when it comes to practical work. Learner X1, Y3 and Z5 stated that they want their teacher to guide them until the end of the practical, they expressed that guidance from experienced personnel made them understand fast. Most learners across all schools stated that they never understood what most practical's were all about, they echoed that teachers never take time to explain properly beforehand so that learners even if they are doing the practical alone they do understand what is happening and what they can safely explore.

Classroom practitioners expressed that lack of equipment and lack of adequate time for preparation as some materials are only bought towards exam periods only. One of the most intriguing classroom practitioners from school X2 during their interviews separately both stated that one of the factors that negatively impacted performance in practical examination was that the school administrators and some teacher under estimate the value of practical work and practical skills development in Ordinary Level Biology.

b) Effective pedagogical methodologies in teaching and learning of Biology practical work and skills in Insiza District

The Biology practitioners were the targeted respondents through an interview guide to tackle this questions since they operate in the classroom where the teaching and learning of practical skills of Biology occurs. Most of the facilitators preferred the questioning technique, guided classroom experiments and guided discovery learning. The discovery learning was coupled with design experiments where learners are left to design and carry out their own experiments using their choice of apparatus and methodology.

c) Measuring the acquisition of practical skills

The answers that emerged were rather diverse and no noticeable trend was established. Some classroom practitioners stated that they prefer discovery learning, while others preferred real life problem solving techniques. Learners are given a real life problem and they are tasked with solving it, by tackling the problem the facilitator can measure and determine how they manipulate laboratory equipment to solve the problem at hand.

However, despite the various different answers given by the classroom practitioners there was one method that the author noted as a way of measuring the acquisition of practical skills that is questioning. All classroom practitioners stated questioning in a latent manner as a method of measuring the extent to which the learners have acquired practical skills.

d) Views on the use of subject specific software (Virtual Laboratory software) to enhance practical skills learning in Biology

All classroom practitioners stated that use of subject specific software can be effective as much as face to face learning and can enhance concepts learnt in the classroom but the major challenge was that it is expensive as it will require extensive use of software that need constant license renewal. Furthermore, most administrators asserted that most of their staff in their station were not adequately trained in facilitating learning on computer virtual platforms and through use of virtual media.

Learners however pointed out that they did not consider use of subject specific software's as an effective method of learning practical skills, furthermore, learners from school Y expressed a variety of dissatisfaction levels with the subject specific software known as *virtual-Sci-generation*. Learners preferred face to face learning and guided demonstration during practical work. Classroom practitioners considered use of computers as an effective method provided that adequate resources were unveiled. One of the classroom practitioners CPX5 pointed out that, *"Computer virtual learning can be effective only if it can support face to face learning that is create blended learning rather than fully computer virtual learning"*

Based on what was gathered from the data collected from interviews with classroom practitioners, the majority of them pointed out that there are other latent major challenges surrounding the use of subject specific software these included, expensive data, intermittent network problems, sporadic power cuts and gadget problems. Most of the participants pointed out that they did not have any subject specific software that could aid in the learning of practical skills in biology.

During interviews most of the facilitators pointed out that they were not adequately trained to facilitate computer virtual teaching, although they could basically use their gadgets and computers very well they felt they needed adequate training to so that they could have in-depth knowledge of how to select content and package it well so that it could be suited for computer virtual learning platforms. In one of the interviews another Biology classroom practitioner stated fear that learners can be easily distracted during computer virtual learning and move off the learning platforms and attend to social media messages and trends.

e) Strategies that can be employed to minimize difficulties in learning Biology practical work and skills and improve students' performance?

All most everyone who took part in this study pointed out that laboratories needed to be refurbished and adequately equipped with at-least threshold standard lab equipment. However there were other different answers to this questions which lead to some of the important answers below- □ Improve on the frequency of practical sessions

- Embrace the use of ICT
- Self-development on handling various science related online media
- Embracing the innovative teaching methods
- Improved improvisation skills
- Networking with other knowledgeable Biology teachers from other schools, districts and provinces
- Exposition of the importance of practical work/skills development to the O' level Biology learners

- Engage stakeholders

f) Structures that have been set up to facilitate the teaching and learning of practical skills in Zimbabwean education system and

School administrators stated that they unveiled funds to aid classroom practitioner's laboratory equipment but the response from learners and classroom practitioners show that laboratories are ill equipped. None of the respondents stated any information pointing to acquiring help form government or other external non-governmental organizations. One school administrator stated that the school responsible authority offered its school Wi-Fi to classroom practitioners, so that they could download some software but they needed payments to be assess product keys.

g) the relevance of Biology practical skills in the development of technologically upright society in the 21st century

Heads of science of departments, administrators and classroom practitioners stated that practical skills were very relevant in 21st century as they facilitated the development of competitive societies in the global arena. One classroom practitioner stated that practical skills in Biology enabled learners to exit the school with skills which can be turned into entrepreneurship opportunities.

In Insiza district classroom practitioners stated that leaners can solve problems in their societies and engage in solar energy harvesting project, which can boost agriculture in their home areas. Furthermore, classroom practitioners stated that practical skills led to the ability by learners to verify Biology theory by manipulation of apparatus, this leads to in-depth understanding of concepts which are taught theoretically.

4.4 Discussion

Multiple studies showed that practical work confers many advantages, including developing laboratory skills and scientific knowledge, as well as understanding science concepts and theories (Fadzil & Saat, 2013) this resonated with the fact that was pointed

out by one of the teachers who stated that some educators do not understand the importance and impact of practical skills development in learners.

Zimmerman, Croker and Hartig, (2016) stated that “Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe – to be discovered.” Giving leaners more time in the laboratory will positively impact on the current and future skills hence the results of the study agrees with what other studies came up with.

Administrators were faced with challenges associated with funds for acquiring lab equipment and their institutions are ill equipped to facilitate computer virtual learning and teaching. During the time of gathering and analysis of these results one administrator pointed out that some time ago Econet provided affordable data bundles and free connectivity for learners along with self-test software which can be used without any data connection once it has been installed. Poor information dissemination is also a serious factor that is leading to the challenges faced schools in Insiza district. This is also evidence by the factor that no learner showed any use or knowledge of Ruzivo application rolled out through Higher Life Foundation Mamlok-Naaman, 2007).

In the educational process, laboratories can be used to develop scientific notations and create models to test hypotheses. Laboratory work also helps in understanding the difference between observation and presentation of data (Lawson, 2015). In support of this fact, it is documented that “Laboratory activities appeal as a way of allowing students to learn with understanding and, at the same time, engage in a process of constructing knowledge by doing science” (Tobin, 1990). Laboratory experiments have vital importance in the study of all scientific subjects (chemistry, physics, and biology).

The high regard of relevance of practical skills in Biology as importanct in the 21st century for Zimbabwean learners converges with the views of United Arab Emirates (UAE) 2021 vision to progress as a nation and invest in its youth in hopes of becoming amongst the highest ranks in the world in reading, mathematics and science, the country has recently

made major developments in the education system (UAE Vision 2021, n.d). In an effort to work towards achieving the vision, the emirate of Abu Dhabi in particular has recently made drastic changes in its education system in terms of teacher qualifications and classroom practices and equipment. (McKnight, Yarbro, Graybeal and Graybeal, 2016) further place an emphasis on developing 21st century skills and preparing students to enter the modern market

The goals of practical work are to improve students' understanding, develop their skills in solving problems and understanding the nature of science, by replicating the actions of scientists. Sotiriou, Bybee and Bogner (2017) state that: "While solving a scientific problem, students should act like a scientist and follow scientific processes." According to Hodson (2010), practical work can motivate students, stimulate their interest in teaching and learning, enhance the learning of scientific knowledge, give them experience in using scientific knowledge and widen their way of thinking. Solving problem associated with poor performance in practical work in Insiza district can help motivate learners and enhance their learning

Tsakeni (2018) explored access to effective practical work for physical sciences learners in two South African high school schools. The results revealed that the absence of practical examinations resulted in underestimating practical work in physical sciences classrooms, and thus marginalised learners. Tsakeni (2018), indicated that the limited access led to a social justice agenda due to the high expectations linked to studying physical sciences. Tsakeni (2018) recommended supporting practical work through the processes of assessment and tools for instructional leadership. The study by Tsakeni (2018) is in agreement with the fact that teachers should be able to adequately measure the acquisition of practical skills.

Millar (2004) proposes that students' minds should be stimulated prior to starting any practical work by providing them with some background information on what it is they are investigating. Also, the task design should direct students' efforts to make links between the two domains of knowledge. Teachers should be torch bearers and this result was found as a learners expressed that many a times they do not understand what they are

doing, hence this affects their ability into stepping into the unknown as they learn by exploration.

Consequently, science teachers should be trained based on the most recent research studies to amend their practices and put forth more time and effort to reflect on linking scientific concepts with the natural world (Jokiranta, 2014).
Classroom practitioners also pointed out that they needed trained lab-techs or themselves be adequately trained so that lack insufficient information for carrying out the experiment, insufficient techniques followed during the experiment, lack of information about the glassware and the chemicals that are needed for the experiment, lack of information about safety rules, lack of information about the steps that should be followed to avoid any accident during the experiment and finally what should be done in case of an accident during the experiment, gets eliminated (Aydogdu, 2015; Boyuk, Demir & Erol, 2010).

Inyang and Josiah (2016) echo that Biologyis a cross-cutting discipline that is applied in many sectors for economic development. Josiah (2011), is of the view that the understanding of Biology concepts is a pre-requisite for developing modern instrumentation and techniques in the various sectors of modern society and in the technological development of information technology. The relevance of Biology practical skills is very much relevant in the 21st century, without these skills technological advancement is stalled beyond reasonable doubt. Insiza district also need such technological advancement in this 21st century hence practical skills are needed to solve local problems before solving regional and national problems.

4.5 Summary of the Chapter

The chapter looked at data presentation, analysis and interpretation. The collected biographic data was presented in the form of bar graphs, pie charts and tables. The chapter focused on the data which was collected from questionnaires where questions were each analysed and interpreted accordingly. The number of the population that was sampled, analysed and interpreted was twelve. A bar graph was used to simplify the data that was found. The author also used simple interviews where respondents were asked questions and gave feedback which was also documented, analysed and interpreted. This

chapter focused on the main findings revealed by the research and supported by various authorities. Then the next chapter will focus on summary conclusions and recommendations of the study

CHAPTER 5
Findings, Conclusions and Recommendations

5.1 Introduction

This chapter endeavors to present a concise summary of the whole research on assessment of challenges encountered during the teaching and learning of Biology practical work and skills at Ordinary Level schools in Insiza District." Conclusions are drawn based on the findings, after which recommendations for remedial measures are made to all those involved in the teaching and learning of Biology at Ordinary level in Insiza district and Zimbabwe as a whole.

5.2 Summary of highlights of study

The purpose of the study was to carry out an assessment of challenges encountered during the teaching and learning of Biology practical work and skills at Ordinary Level schools in Insiza District."

The first chapter mainly exposed background of the problem, context and objectives

The qualitative research approach was employed and a case study research design provided tools for research to study the complex phenomena within its context.

The author used purposive sampling. Furthermore, the author made use of the thematic approach in presenting and analysing data that was gathered from the questionnaires and interviews.

5.3 Research Findings

Lack of equipment and apparatus in specialist's rooms to facilitate threshold learning, lack of adequate practical time or time spent in the laboratory. Erratic network connectivity, lack of electricity, lack of commitment amongst parents and stakeholders in funding school laboratory projects, were the major factors pointed out that are leading to poor performance in Biology practical examinations

Child centered teaching methodologies were considered as the best pedagogical methodologies in teaching and learning of Biology practical work and skills in Insiza District. The best pedagogical approaches that were found by this study were guided discovery learning, experimentation and problem solving.

Practical skills development in the 21st century is very relevant, the research study found out that classroom practitioners and administrators strongly agree that Biology practical skills are important, they lead to problems solving, innovation and technological development in the 21st century societies like Insiza district.

5.4 Conclusions

Lack of equipment and poor financial interests of parents and stake holders in schools in Insiza district are the factors leading to poor results in Biology practical work. It is important that author exposes that it is not the quality of learners nor the caliber of teacher in these schools that leads to poor performances in practical examinations.

Teaching methodologies recommended by all participants converged to child centered learning with a discovery learning approach.

Measuring of acquisition of practical skills is measurable through application of learnt skills and observing the learner exhibiting behavioral changes and not merely answering a question paper only. Teachers are more worried about the skill that can be used for lifelong learning and application in developing of the society. 21st century learners are highly inclined to innovative teaching methods that include use of virtual reality amongst other types of technology.

Educators believe in the great importance of practical skills for 21st century learners as they are needed for future learning and creating exit profiles for global competitive individuals.

The government of Zimbabwe through MOPSE has presented good blue print educational initiatives but is limited in funding and resource allocation so that education with practical skills development for entrepreneurship shaping is a reality in Zimbabwe

5.5 Recommendations

In light with the study conclusions, the following recommendations are put forward by the author:

5.5.1 Classroom Practitioners

The study recommends that classroom practitioners should be well versed on how to use virtual learning platform as Biology learning tool more effectively. This can be done by taking interest in various learning platforms. Embracing change and ICT gadgets should be an interest for Biology classroom practitioners, that is exploring and experimentation through the use of these any virtual or software that they may come across with. This will give classroom facilitators more room to grow and develop their skills on how to arrange and package content.

The author recommends the use of guided discovery learning, experimentation and problem solving teaching methods for the learning of Biology practical skills in Insiza district.

Classroom practitioners are recommended to create more extra contact time with learners so that they can give learners maximum time to interact with their laboratory equipment.

5.5.2 Parents/ Guardians

The research recommends that parents/guardians should be active stakeholders engage themselves in income generating projects, like irrigation schemes poultry keeping so that they would be able to get money for buying resource to assist learners and equipment needed for Biology practical skills development.

5.5.3 School administrators

The research recommends school administrators to work hand in hand with stakeholders such as Non-Governmental Organization to assist their institutions and learners with funds, gadgets and software that can help various forms of learning.

Networking of classroom practitioners facilitates cross pollination of ideas of Insiza district schools and other schools from other provinces. It highly recommended that administrators should process affiliations fees for workshops so that teachers go out and bring in new strategies from other colleagues.

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Research Instruments
Interview Guide
Ordinary Level Biology Classroom Practitioners '15 minutes'

Gender, Age and Years of Experience in Teaching Biology at Ordinary Level

1. ***What are the qualifications that you hold?***

2. ***What is your general perspective or views in terms of Biology enrolment in Insiza District***

3. ***Can you kindly share your general experiences in teaching Ordinary Level Biology practical skills or psychomotor skills in Insiza district?***

4. ***As a Biology classroom practitioner what are the pedagogical approaches you use in teaching of Ordinary level Biology practical skills.***

5. ***How do you measure the acquisition of practical skills amongst your Ordinary level Biology learners?***

6. ***Assess any efforts that have been implemented to enhance improved Biology practical skills teaching and learning at your schools and in Insiza District***

7. ***Describe the relevance of Ordinary Level Biology practical skills in the 21st century in a developing country like Zimbabwe?***

Thank you for your participation

Interview Guide
Guardians Of Ordinary Level Biology Learners
(15-20 Minutes)

Gender, Age

(Local language can be used to enhance in-depth interview)

1. What are the major areas which need improvement in your local child school in terms of passing ordinary level biology adequately?

2. What is your general perspective or views in terms of Ordinary level Biology enrolment in Insiza District?

3. Can you kindly share your views on support of education at home by parents in Insiza District

4. Describe any efforts that have been implemented to enhance improved Biology practical skills teaching and learning at your schools and in Insiza District

5. Describe the relevance of Ordinary Level Biology practical skills in the 21st century in a developing a district like Insiza in Zimbabwe?

Thank you for your participation

Questionnaire For Ordinary Level Biology Learners In Insiza District

My name is **Tsepo Moyo B1441642L** a final year student at BINDURA UNIVERSITY OF SCIENCE EDUCATION doing my Bachelor of Science Education Honours in Biology

(HBScEd in Biology)

I am carrying out a research study entitled **"*An assessment of challenges encountered during the teaching and learning of Biology practical work and skills at Ordinary Level schools in Insiza District.*"**

I am kindly asking for your assistance as a participant to the research under study by completing the questionnaire. The responses you will provide will be treated with utmost confidentiality, anonymity and will be used exclusively for academic purposes. Your cooperation will be greatly appreciated.

INSTRUCTIONS

- Please answer all questions honestly.
- **YOURE NAME OR YOUR IDENTITY AND SCHOOL IS NOT REQUIRED.**

SECTION A: GENERAL INFORMATION

1.1Gender of participant……

SECTION B

1. How many Biology practical sessions have you had in Ordinary level Biology so far?

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2. Briefly describe your best practical lessons? Include the aim/topic of the practical

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What was the teaching method used by the teacher during the practical work?

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3. Indicate the challenges that you have met during Biology practical work at your school

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4. What do you think should be done by your teachers to help you learn Biology practical skills?

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5. Have you ever used any subject specific software to facilitate learning of Biology practical work for Ordinary level Biology? Specify the software and how you used it?

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6. In your opinion and past experiences do you think your school is well equipped to conduct good Biology practical work?

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Thank You

Questionnaire For Head Of Science Department In Insiza District

My name is **Tsepo Moyo B1441642L** a final year student at BINDURA UNIVERSITY OF SCIENCE EDUCATION doing my Bachelor of Science Education Honours in Biology

(HBScEd in Biology)

I am carrying out a research study entitled **"*An assessment of challenges encountered during the teaching and learning of Biology practical work and skills at Ordinary Level schools in Insiza District.*"**

I am kindly asking for your assistance as a participant to the research under study by completing the questionnaire. The responses you will provide will be treated with utmost confidentiality, anonymity and will be used exclusively for academic purposes. Your cooperation will be greatly appreciated.

INSTRUCTIONS

- Please answer all questions honestly.
- **YOURE NAME OR YOUR IDENTITY AND STATION IS NOT REQUIRED.**

I am willingly taking part in this exercise

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SECTION A: GENERAL INFORMATION

1.1Gender of participant

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1.2Age of participant

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1.3 Highest Professional qualifications
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1.4 Briefly describe your experience as an educator in Insiza district

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1.5 What are the positions you have held in the education sector?

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SECTION B

7. What are the responses of stake holders and guardians in your school on the acquisition of lab equipment to facilitate the teaching and learning of practical skills in Biology at your school?

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8. In your school, what are your perceptions on the percentage of classroom practitioners who are adequately trained to facilitate Biology practical sessions?

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9. How are the available subject specific software and or minimum adequate laboratory equipment suitable to facilitate Biology practical skills learning at Ordinary level?

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10. In your own opinion describe any steps that can be taken to set up and sustain adequate teaching and learning of Biology practical skills at Ordinary Level in Insiza district

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11. What method of teaching and learning would you consider suitable and effective for learners in Insiza district in learning practical skills in Biology?

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12. Based on your views in technological advancement, do you consider practical skills in Ordinary level Biology relevant in the development of technologically competitive societies on the 21st century

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13. Indicate any challenges that you have met in implementing adequate learning of practical skills at Ordinary Level Biology at your station

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14. What measures can be done to make adequate teaching and learning of practical skills at Ordinary Level Biology in Insiza district better and effective

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15. Which method of learning would you consider suitable and effective for learners in Insiza district in learning practical skills in Biology?

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Thank you for your participation