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BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN BIOLOGY

AN INVESTIGATION INTO FACTORS AFFECTING THE USE OF PRACTICAL LESSONS BY TEACHERS.A CASE OF SCHOOLS IN NYANGA DISTRICT.

BY

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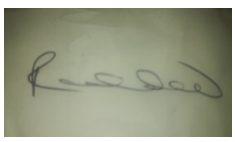

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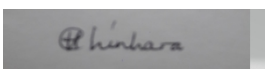

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My family have been very supportive throughout the study. Lastly I want to thank the Almighty who was with me throughout the research project.

DEDICATION

This study is dedicated my beloved wife Maria and our children, Nigel, Nicole and Nathan who supported me in every possible way.

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CHAPTER 2

ABSTRACT

This study aims at investigating these challenges in secondary schools in Nyanga district of Manicaland province and provide strategies that could be taken by schools, policy makers and relevant stakeholders to address these and enhance the effectiveness of practical lessons. In this research study the researcher investigated the factors affecting science teachers in conducting practical lessons in schools of Nyanga District in Manicaland Province. To investigate, the researcher collected qualitative and quantitative data using a mixed questionnaire. The data showed that various challenges are faced by teachers and these include shortage of well-equipped modern science laboratories, shortage of Laboratory technicians, shortage of enough resources for use during practical lessons such as chemicals and laboratory equipment, large classes and shortage of enough time allocated on timetables for conducting practical lessons. These challenges significantly impact on conducting practical lessons, learners learning outcome and overall science education.

KEY WORDS: Science education, practical lessons, teaching and learning.

CHAPTER ONE

INTRODUCTION AND BACKGROUND OF STUDY

1.1 INTRODUCTION

This study investigated the factors affecting science teachers in conducting practical lessons in schools. The study focused on the schools in Nyanga district of Manicaland province. This chapter also provided the background of the study as well as the problem statement. Thereafter, it outlined the research aim and the objectives of the study. Attached to that it availed the research questions, significance of the study, and the ethical considerations that guided the sanity of the study. This study was limited to schools in Nyanga whose limitations are cited as far as conducting practical lessons is concerned

1.2 BACKGROUND OF STUDY

Teaching of Science is considered incomplete without conducting practical work as noted by Faize & Dahar (2011). Globally science teachers are encouraged to make sure that learners are involved in carrying out practical work. Developed nations encourage the teaching of science including practical activities for the learners to have practical skills. Science education is perceived to prepare learners for an ever-changing world. The advent of technology has also given science educators a platform to be informed about the attitudes and emotions of learners in the science field. In developed countries such as the United Kingdom practical lessons are conducted much more in classes than in any other country, as noted by Dillion, (2008). This is done because experiment and observation help learners to understand science concepts, Dambrăveanu, (2007). Practical work is among teaching and learning approaches that helps in the interaction between learners and materials. Abraham and Miller (2008) realised that practical work helps learners to develop relationships between observations and ideas. According to, Omeodu (2018) practical work increases knowledge acquisition of learners, develop skills and competencies required to meet scientific and technological demands of the nation, makes scientific phenomena more real and during practical work social interactions are enhanced. In Zimbabwe, there is an accelerated effort in the improving of learning of science through bodies such as UNESCO and Ministry of Primary and Secondary Education. In addition, there is the

introduction of STEM and training of science teachers at selected universities such as Bindura University of Science Education. Science education and innovations in science are seen as the vehicle used to solve various challenges in life as supported by Keane (2005). Mwenje (2012) concluded that annual conferences on science and Mathematics education have been conducted to educators on new methodologies of teaching of science practical work.

The purpose of this study is to identify factors that affect practical lessons by teachers and look for ways to promote conducting practical lessons .It is believed that if these challenges are addressed it will go a long way in the teaching and learning of practical lessons.

1.3 STATEMENT OF THE PROBLEM

Science experiments are important in providing students with hands-on experience and skills development. Science teachers face several challenges that prevent them from effectively conducting practical lessons. Research has shown that many teachers in Zimbabwe fail to conduct practical work. Few studies are dedicated to determining factors affecting teachers in conducting practical lessons, hence the need for this study.

1.4 AIM

The research is aimed at investigating factors affecting Science teachers from conducting practical work in Nyanga district and it is aimed at achieving the following objectives.

1.5 RESEARCH OBJECTIVES

To identify factors affecting Science teachers in conducting practical work.

To establish whether knowledge of the subject affects teachers' use of practical lessons.

To explore the strategies used by science teachers to overcome challenges faced in conducting practical lessons.

1.6 RESEARCH QUESTIONS

What are the major challenges faced by science teachers in conducting practical lessons in secondary schools?

What factors contributed to difficulties in conducting science practical lessons and how do these factors interact?

What strategies do science teachers use to overcome the challenges they face in conducting practical lessons and how effective are these strategies?

1.7 SIGNIFICANCE OF STUDY

Although research indicates that many teachers are failing to conduct practical lessons, little has been done to find factors affecting conducting of practical lessons in order to solve the problems. The study is aimed at finding factors affecting Science teachers from conducting practical lessons in schools .It is hoped that the study would contribute to the development of effective strategies for teaching science practical lessons, benefitting both teachers and students. In addition, it will inform policy makers to allocate resources and funding for infrastructure and equipment. Learners will enhance curiosity and have interest in learning and be prepared for a real world applications and careers. Lastly, the community would have prepared skilled and competent workforce for industry and economy with fostered innovation and entrepreneurship through practical learning.

1.8 ETHICAL CONSIDERATIONS

There are ethical issues that have to be observed in any study. Bertram and Christiansen (2014) noted that ethics has to do with behaviour that is considered right or wrong. In that respect the study has strived to work for the integrity and quality of the research by abiding by all ethical issues. The participants were informed about the study's aim and had the opportunity to choose whether to participate in the study or to withdraw at any point during the study if they feel uncomfortable without any questions. Furthermore, the participants were informed that no names

will be disclosed in report writing and data generated from the research will be kept confidential. It is a requirement in the Research Ethics Framework that participants be fully informed of all information relating to the research. The participants' were made aware of what would be expected of them in the research study and they would decide whether they want to participate or not. Confidentiality is another element within the scope of the Research Ethics Framework observed by Dowling & Brown (2010). The study was honest in collecting and analyzing data for future studies and research.

1.9 DELIMITATION OF STUDY

The study was carried out at schools in Nyanga district of Manicaland province.

1.10 LIMITATIONS OF THE STUDY

The study was carried out at schools in the Nyanga district. The schools included two boarding schools and eleven day schools. The population and sample are from fifteen selected schools. The day schools are low-performing, and the results cannot be generalizable to other schools. Also, the external validity of the findings could be questioned in the sample of six schools in the district.

1.11 DEFINITIONS OF KEY TERMS

Practical lessons: Refers to lessons learned through hands-on experience or practical application. It is a component of science teaching that focuses on investigating the phenomenon through hands-on and minds inquiry. It is seen as hands-on, or minds-on practical learning opportunities by students or learners, Kumar &Kumar 2020. In this study, practical work is called experiments or hands-on practical activities.

A science teacher: is defined as an educator who helps students understand scientific concepts and develop critical thinking and problem-solving skills, Mayer, 2019. Science teachers play a critical role in STEM education as well provides instruction and guidance to help students explore and understand important concepts in science and how to gather evidence to support.

Factors: Are defined as elements that limit or affect something, which contributes to a particular result or situation, Kumar & Kumar 2020. Factors attributed to the outcomes of teaching and learning.

1.12 LAYOUT OF CHAPTERS

Chapter 1: Overview and background to the study

This chapter introduces the study and reports on the background of the study, the statement of the problem, the purpose of the study, the research question, the significance of the study, the delimitations and limitations of the study, and the ethical considerations.

Chapter 2: Review of related literature

This chapter focuses on the literature reviewed about this study and investigates factors affecting conducting practical lessons.

Chapter 3: Research Methodology

This chapter presents and explains the research design and methodology used in this study. It begins by focusing on the research paradigm that resonates with the purpose of this study, then describes and discusses the research approach, sample and sampling strategy, research setting, data collection methods and procedures, data analysis strategies, issues of trustworthiness, and ethical considerations.

Chapter 4: Data Analysis, Findings and Discussion

The findings gathered from the data analysis are presented in this chapter, and a detailed discussion of conclusions about the literature reviewed and theoretical framework is presented. The discussion is done for each research question.

Chapter 5: Conclusions and Recommendations

This chapter provides a summary of the findings that assist in answering the research question, conclusion of implications of findings to different stakeholders and recommendations, and recommendations for further study

1.13 CHAPTER SUMMARY

Chapter 1 presented the background of the study, Statement of the problem, aim, research objectives, significance of the study, ethical considerations, delimitations, and limitations. Key aspects of science teaching and learning are highlighted and discussed. In the next chapter, the literature review of the study is outlined

CHAPTER 2

2.1 INTRODUCTION

Practical lessons are vital to the learning process, allowing students to engage in experimental learning, develop practical skills, and apply theoretical concepts in real-world settings. However, the effectiveness of practical lessons is influenced by a complex array of factors, which can impact student learning outcomes, teacher instruction, and overall quality of education. This chapter comprehensively reviews the existing literature on the factors affecting conducting practical lessons.

2.2 LITERATURE REVIEW

According to Dambrăveanu (2007), teachers in France and Romania pointed out that there is limited time for practical lessons, which is a major factor in hindering conducting practical lessons in schools. In developing countries, many teachers indicate that lack of resources is a major contributing factor to not using practical work in science. For example, the lack of equipment in Nigeria is attributed to insufficient funds (Asokhia, 2009).

2.2.1 LABORATORY FACILITIES

Also, it has been reported that: “teachers have a myth that science teaching should take place in a laboratory as cooking belongs to the kitchen and gardening to the garden” (Fraser and Onwu, 2006: 70). Thus, teachers view lack of laboratories as a licence not to engage learners in practical activities. Research indicates that teachers in South Africa do not involve learners in practical activities, irrespective of whether they have laboratory equipment (Rogan, 2004, 2007: Muwanga-Zake, 2001). Since the 1960s laboratory activities have been an integral component of the science education curriculum, Ramsey et al 1969. A laboratory is the main place in school where a proper understanding of science concepts and skills development can occur. Laboratory activities are useful in enhancing students' understanding of science concepts and applications through attaining practical skills; developing a scientific mindset and stimulating interest, Freedman, 1998. A study by Hackling, 2009, found a significant correlation between students‟ laboratory learning and their performance in science. However, some studies have since emerged

questioning the effectiveness of school laboratories in improving science learning. It has particularly been reported that many schools especially in developing countries are struggling to conduct practical work due to poor state of science laboratories, Van den Berg& Giddings, 1992 .Van den and Giddings further revealed that majority of the laboratories were dilapidated with no proper supply of water, electricity and gas supplies. The other major barrier to proper implementation of practical lessons is the lack of laboratory apparatus and equipment. Another study has reported that in developing countries most of the laboratory infrastructure in public schools is too dilapidated to support proper learning. Motlhabane, 2013 lamented the poor state laboratory infrastructure in most African public schools.

2.2.2 SCIENCE EQUIPMENT

In Mpumalanga province, few teachers involve learners in practical work (Rogan, 2004; Hatting, Rogan, and Aldous, 2007). Teachers in the Eastern Cape Province had misconceptions about practical work as they continued to demand more science equipment despite evidence of unused ones packed in school stores (Muwanga-Zake, 2001). This suggests that the lack of science equipment cannot be the only factor hindering teachers from conducting practical work to develop learners' science process skills. In Turkey, Dikmenli (2009), found that all biology student teachers agreed that practical work (experiment) is important in the teaching and learning of science. Despite this, it was found that most student teachers thought that the purpose of practical work in class was to verify existing scientific theories. Practical work strengthens theoretical knowledge, develops psycho-motor and creative thinking skills, relates scientific knowledge to daily life, and develops manual dexterity using tools and equipment (Dikmenli, 2009; Dillion, 2008; SCORE, 2008). Science teachers in France and Romania also underlined that educational methods must enable learners to start with concrete problems concerning everyday life (Dumbrăveanu, 2007).

2.2.3 LABORATORY ASSISTANTS

It is widely acknowledged that laboratory assistants promote quality science education. According to Hackling, 2009, the functions of a laboratory assistant in school include preparing solutions and reagents, setting up equipment, and ensuring all the required materials are available before the practical. They are responsible for training science teachers on the usage of advanced

and newly acquired equipment. They also help in procurement materials, obtaining and caringfor live specimens to be used for practical science lessons. They are also charged with the responsibility of ensuring there is adherence to safety standards, ethics and health requirement during practical lessons. A number of concerns have been raised regarding the status of laboratory assistants in schools and these include lack of proper qualification, undefined roles, staffing levels and career structures as noted by Royal Associations of Science Education, 2001. A study by Hackling, 2009 found most laboratory assistants in Australian schools did not receive technical or professional training while those with qualification, where not adequately trained to handle science subjects in schools. Hackling, 2009 cited the school management's lack of understand of technician's role in school as a barrier to proper practical support to science teacher. The study further noted the lack of professional recognition and opportunity for career progression growth has frustrated a lot of laboratory assistant leading to a poor work culture in contribute little towards practical work in schools. Interestingly most of the literature available laboratory assistants in schools is from developed countries. It would be interesting to see whether some the concerns raised regarding laboratory assistants would also apply in an African country like Zambia.

2.2.4 SCIENCE TEACHERS' ATTITUDE

A study by Wilkenson &Ward, 1997 showed that teachers‟ attitude toward science has a significant influence on the method of instruction used in their lessons. A recent study evaluating science teaching in Nigerian secondary schools showed that most teachers had a negative attitude toward practical lessons. Most of their teaching was dominated by theory, Ajaja, 2009. Another study also found that traditional teacher-centered lessons are widespread among teachers, adversely affecting learners' participation (Goodrum, Hackling & Rennie, 2001). Despite most science teachers acknowledging the value of practical to students‟ understanding of science, their teaching practices remain dominated by theory teaching through "chalk and talk" and occasional teacher demonstrations Hodson,1993. Several studies have shown that many science teachers focus on teaching theory while neglecting practical lessons. It has been observed that despite some laboratories in school being well-stocked with apparatus and equipment, teachers rarely use them. These materials are gathering dust to a point of even deteriorating as noted by Wilkenson & Ward, 1997.

2.2.5 TEACHER TRAINING

In order effective inquiry teaching to take place a science teacher should possess the required knowledge and skills to successfully deliver practical lessons to the students. Science teachers can acquire knowledge and skills through appropriate pedagogical training and practice. Pre-service training at universities and colleges is the most common teacher training method in most education systems worldwide. Many developing countries have also adopted in-service teacher training programs as a cost-effective way of equipping teachers with knowledge and pedagogical skills to become more effective. Continuous professional development programmers (CPDs) have also been introduced to update the knowledge and skills of serving teachers to cope with today's‟ ever-changing education system, Arberoe & Tomi, 2014. Despite the widespread use of these training approaches, the effectiveness of pedagogical methods of practical science teaching in schools remains highly questionable. A study by the International Journal of Science and Engineering Invention ISSN: 2455-4286 Int J Sci Eng Inv| September 2019 138 Tobin ,1990 observed that despite science teachers undergoing professional training some cannot conduct practical lessons, Tobin 1990. It also noted that most science teachers cannot provide appropriate laboratory experiences that reinforce desired conceptual understanding amongst their learners. It has been found that some science teachers deliberately avoid practical lessons due to a lack of confidence in their ability to execute them as realized by Elvan, 2016 successfully.

2.2.6 SCIENCE TEACHERS' WORKLOAD

Workload can be defined as the amount of work in a workplace beyond a person's capabilities resulting in anxiety and frustration, Adeolu & Arinze, 2018. Dunham & Varma, 1998 noted that workload can be a direct source of stress, affecting an individual's physical and psychological well-being to handle an assigned task in an organization. Studies have found that workload has become quite a huge burden among teachers in schools as teaching is now characterized by overloads and ambiguity, Maslach & Leiter, 1997. Teachers assume a lot of responsibility, including lesson delivery, maintaining order, instilling discipline, and meeting high and sometimes conflicting demands of administrators, parents, and the community. All these

responsibilities can overload and overwhelm teachers leaving them with little time to accomplish their academic tasks Maslach &Leiter, 1997. Tamir, 1989 cited high workload as a big hindrance to conducting practical lessons. The study found that teachers in schools do not have enough time to prepare for practical lessons because they have too many responsibilities resorting to simple ritualistic practical demonstrations that are teacher-centered. Surprisingly very few studies have investigated the effect of workload on the teaching of sciences despite extensive research work in art-related subjects

A lot has been done in the promotion practical work especially in pure sciences in conducting experimental work. However, less effort has been brought forward in promoting practical lessons and looking at factors that affect science teachers in carrying out practical lessons in schools. Practical work helps in improvement of student understanding nature of science, by replicating the actions of science as propounded by, Sotirion *et al* (2017). Absence of practical work in schools will underestimate science education as proposed by Tsakeni (2018). A lot has been done in the past through projects like the Zimscience, which was put across to help and improve the teaching and learning of science through practical work. It helps in making low-cost equipment. Some manuals were developed and little has been done to look at a factor affecting practical work conducting.

Gadzirayi et al (2016) realized that no system was in place for monitoring the conduction of practical lessons and the improvement of STEM subjects. Graduates who lacked Science practical skills, and technical and investigative skills were found to be ill-equipped for progression to higher education in Sciences, employment in Science related fields, and solving real-life problems, Ta, (2018). Recent studies advocate for changes in teaching methods so that students participate fully and understand difficult science concepts as stated by Millar (2010). Students should realize processes and structures to develop skills in manipulating, processing scientific information, and conducting scientific investigations. Tuysuz (2010) added that animations and simulations should be collaboratively included in learning science as they cement understanding like practical work. This was seen to motivate learners positively. The use of realia was seen to contribute significantly to science and it eliminates distortation in students. Ruffato, 2012) also studied that in developed countries students were more engaged when they did practical work than when they did not. Practical work strengthens theoretical knowledge,

develops psychomotor skills, helps learners develop thinking skills, and relates them to daily life, as noted by Dikmenli (2009). Much work has been done to narrow the achievement gap between boys and girls in Science.

Nyagura 2011, lamented shortage of qualified science teachers and further stress the need for holistic understanding of problems encountered by science teachers in schools. If there is empirical evidence solution to be proposed in a more informed manner. Reiss *et al* 2012 identified two distinct ways in which practical work can be conducted and assessed. There is direct assessment where the learner asses as they manipulate real objects to show their level of competence. In direct assessment, learners' competency is inferred from their practical reports. Kirshor 2003 proposed that for effective practical work, science teachers are encouraged to use realia, virtual laboratories, models, phenomena materials, and manipulative materials. A study by Bhukuvhani et al 2012, in Zimbabwe likewise points out practical work as an important and integral component of science teaching and learning. Unfortunately, practical work is ignored in many countries, including Zimbabwe. In South Africa, Hattingh *et al* (2007) and Rogan (2004) found that many teachers did not involve learners in practical activities, which could explain the low learner enrolment in sciences. Code et al., (2020) in British Columbia state that through Technology Education, learners advance meaningful specialized understanding by applying creative, critical thinking, and problem-solving in the tangible world to address real-world challenges that have broad applications across many sectors of the economy. In Zambia, the research was carried out and the researchers came out with many factors including teacher attitude, which negatively affected the conducting of practical lessons and the methodology that is teacher-centred as noted by Wilkerson & Ward 1997. In addition, it was pointed out that most teachers were neglecting practical lessons in favour of the theory. Science teacher training was another factor noted where appropriate pedagogical training practices were required to be able to conduct practical lessons as realized by Arberoe & Tomi 2014. It was reported by other researchers that there is a significant correlation between learners' laboratory learning and their performance in science, Henderson *et al* 1998. Another factor mentioned was teacher workload which other researchers noted resulted in anxiety and frustration that contributed to the failure of teachers to conduct practical lessons as pointed out by Adeolu, Arinze 2018 & Elvan 2016.

2.3 RESEARCH GAP

Despite the research being carried out in different parts of the country, most studies mainly focus on urban areas, neglecting rural areas, hence the need for the study. Furthermore, most studies that were carried out mainly focused on pure sciences (Biology, Chemistry, and Physics) which were done by a few students. This study looked at combined science done by most learners in schools. Some longitudinal factors were left out in previous studies. This study addresses these gaps by investigating factors affecting practical lessons in remote areas of Nyanga district. The study also addressed longitudinal factors such as teacher experience, teacher-pupil ratio, and technological advancement.

2.4 SUMMARY

The literature review has highlighted the complex interplay of factors that influence conducting practical lessons. Teacher-related, student-related, resource-related, and institutional factors all contribute to the effectiveness of practical lessons, and a comprehensive understanding of these factors is essential for improving teaching and learning outcomes

CHAPTER 3

3.1 INTRODUCTION

In the earlier chapter of this research, studies by different researchers were described and analyzed to highlight similarities and differences in their findings. This chapter mainly looks at how data for the study was collected and the data analysis methods. It presents and explains the research design and methodology by focusing on the research paradigm that resonates with the purpose of this study, then describes and discusses the research approach, sample and sampling strategy, research setting, data collection methods and procedures, data analysis strategies, issues of trustworthiness and as well as ethical considerations.

3.2 PHILOSOPHICAL FRAMEWORK

The constructivism theory

Constructivism is an epistemological view of knowledge acquisition emphasizing knowledge construction rather than knowledge transmission and recording information conveyed by others. Constructivism is the theory that closely unpacks the different notions of the nature of knowledge and the knowledge-constructing process. It posits that learners construct their understanding of the world by connecting new information to their existing knowledge and experiences. Bruner, 1990 noted that constructivism emphasizes the importance of context, culture, and social interactions in shaping knowledge and understanding. Moshman (1982) has identified three types of constructivism, exogenous, endogenous, and dialectical constructivism. Endogenous constructivism deals with the philosophy of reality, which means an external reality is reconstructed as knowledge is formed. Constructivism in research focuses on understanding how individuals construct meaning and knowledge in different contexts as highlighted by Guba & Lincoln, 1994. In the context of teaching, constructivism suggests that teachers' approaches to conducting practical lessons are shaped by their own constructed knowledge and beliefs, influenced by factors such as their subject matter expertise as noted by Ball et *al*, 2008. Penuel *et al*, 2017 also posit that teachers experience, beliefs, and attitudes towards practical work and

their school cultures and resources also impact their conduct of practical lessons. This approach emphasizes the importance of qualitative methods, such as case studies, ethnography, and phenomenology to explore the complexities of human experience, Denzin &Lincoln, 2000. The constructivists' researchers also recognize the role of power and privilege in shaping knowledge and understanding. Dewey 1916, noted that constructivism is influential in various fields including education. Constructivism theory was adopted in the study because it considers the learning context including social, cultural, and environmental factors crucial for understanding practical lessons. Constructivism focuses on student-centered learning, aligning with emphasis on student engagement in practical lessons.

3.3 RESEARCH METHODOLOGY

The research methodology employed in this study is a mixed-method approach, combining both qualitative and quantitative methods. Research methodology refers to the systematic and logical process used to develop a research study's framework, plan, and structure, Creswell, 2014. It encompasses the research design, methods and procedures used to collect, analyze, and interpret data as noted by Kothari, 2004. Research methodology aims to ensure the quality, validity and reliability of the research findings, Bryman, 2016. The manner by which data is collected and analyzed has a bearing on the conclusion reached. This is why it was of paramount importance that this research be conducted in the best possible way to come up with reliable trustworthy and credible results.

This study has used both qualitative and quantitative research methods. Data was collected using a mixed method questionnaire. A mixed method questionnaire was chosen because it offers opportunities for the exploration and deeper explanation of participants' views about what affects conducting of the practical activities (Raborife & Phasha, 2010). The mixed approach was most suitable since the study sought participants' views and beliefs concerning factors that affect practical work in teaching science (Lincoln & Guba, 2000). Data was collected from the science teachers who were given a mixed method questionnaire and the questionnaire was collected after one hour.

3.4 POPULATION

The study population consisted of Science teachers in Nyanga district. Population refers to the entire group that you want to draw conclusions about as noted, Gravetter & Forzano 2019.In this case the population belongs to all science teachers in Nyanga district. The estimated size of this population is approximately sixty science teachers. The inclusion criteria are science teachers who taught combined science as well as pure sciences (Biology, Chemistry and Physics) in Nyanga district. The exclusion criteria include teachers from private schools, teachers with less than two years of teaching in schools, and teachers who are teaching science but not trained to teach science. The demographic characteristics of interest include, the gender of participants, the educational level of teachers, teaching experience as well as the school type.

3.5 SAMPLING

Kumar, 2019, defines sampling as a process of selecting individuals or cases from a larger population, allowing researchers to make inferences about the population based on the sample as highlighted. Hamed (2016) stated that time and resources are some of the limiting factors for researchers when analyzing the entire population. Therefore, researchers should employ sampling techniques that correspond to the type of research. This study sample consisted of fifteen teachers selected from six secondary schools in the district. In this respect, purposive sampling was more applicable in qualitative research where an in-depth study was conducted based on previous research. Hence, this enables the researcher to obtain the exact target of participants and saves time. Teachers were purposively selected based on the subjects they teach: Chemistry, Biology, Physics, and Combined Science. Purposive sampling is a representative sample of the whole population, created to provide precise and needed data that the researcher passionately sought. Purposive sampling was used in this study to select participants who are qualified and experienced as well as those who are knowledgeable in conducting practical lessons. In addition, a sampling technique was used to gather in-depth detailed information from a targeted group of experts. Finally, purposive sampling acts as a representative sample of the whole population, created to provide precise and needed data that the researcher passionately sought. The research is not concerned with generalizing issues using a large population in such a situation. Still, there is to be the elimination of some sources of bias at these selected schools, Saunders, 2012).

3.6 DATA ANALYSIS/PRESENTATION

Effective data presentation is crucial for conveying insights and findings to stakeholders, decision makers and other relevant audiences. The goal of data presentation is to communicate complex data insights in a clear, concise manner and visually appealing manner, facilitating understanding and action, Wilks, 2019. The data was analysed and presented using pie charts, table and bar graphs. Quantitative and qualitative data were integrated to provide a comprehensive understanding of the research questions.

3.7 CREDIBILITY AND TRUSTWORTHINESS

In order to ensure credibility and trustworthiness several measures were taken .A mixed methods approach was used, combining both qualitative and quantitative data collection method by use of mixed approach questionnaire. This allowed for a triangulation of data and increased the validity of the findings. Data was carefully cleaned and pre-processed to ensure accuracy and completeness. Participants were selected through purposive sampling ensuring a diverse range perspectives and experiences. In addition, participants were selected based on their experience in the field, ensuring that the data collected was rich and informative. The researcher collaborated with peers and mentors to review and comment on the research process thereby increasing the credibility and trustworthiness of the data collected. Finally, a detailed record of the research process was maintained, including data collection and analysis procedures and is available for transparency and verification process.

3.8 DATA COLLECTION

Data collection is a process of gathering and measuring data from various sources to answer research questions or test hypothesis .It is a crucial step in the research process as it determines the quality and validity of the findings, Kumar, 2020. According to Bertram and Christiansen (2014), data collection methods refer to how data or information required to answer research questions was obtained. This study employed a mixed method approach combining both qualitative and quantitative data collection method. A mixed questionnaires were distributed to a sample of 15 teachers for a period of thirty minutes and then collected. The questionnaires were

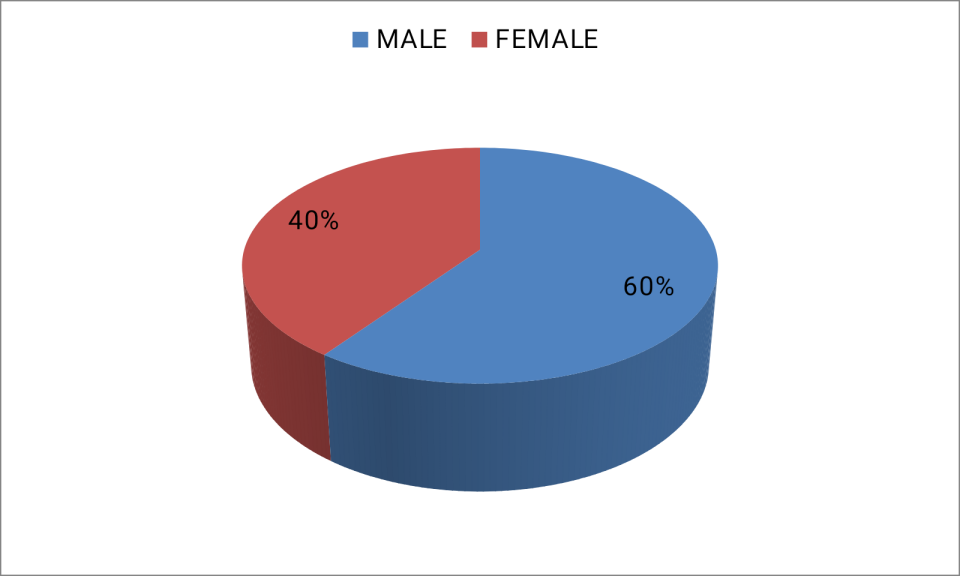
distributed to a group of science teachers conducting district science panel workshop. Ethical considerations were taken into account .Informed consent was obtained from all the participants and they were assured of their right to withdraw from anytime .This study was approved by the Ministry of Primary and Secondary Education prior to data collection.

3.9 ETHICAL ISSUES

There are ethical issues that have to be observed in any study. According to Bertram and Christiansen, 2014, "ethics has to do with behavior that is considered right or wrong". The researcher strived to work for the integrity and quality of the research through different reviews and by abiding by all ethical issues. It is a requirement in the Research Ethics Framework that participants be fully informed of all information relating to the research. The participants were therefore made aware of what was expected of them in the research study and had to decide whether they wanted to participate. The purpose of the study was explained to participants in the introductory part of the questionnaire and their consent was secured before the study began. Confidentiality is another element within the scope of the Research Ethics Framework that must be observed (Dowling & Brown, 2010). Therefore, participants were promised confidentiality regarding all information they supplied and the researcher insisted on anonymity. The questionnaire contained the same clause to inform a participant of their rights in the study. It was ascertained already that this study would not harm participants. The researcher tried his best to be honest in the collection and analysis of data as this may influence future studies. In the survey, honesty in data collection and analysis was vital as the conclusion of this study could influence future actions. All the preceding ethical concerns were thus observed and addressed.

3.10 CHAPTER SUMMARY

This chapter focused on research methodology and touched on a variety of subjects aimed at providing an overview of the research design, research participants, data collection instruments, sampling procedures as well as validity and reliability of data. The following chapter will be based on the presentation and analysis of the findings that were obtained through the research



methodology. The analysis and presentation will be in form of graphs, tables, pie charts as well as bar graphs

CHAPTER 4

DATA, PRESENTATION AND ANALYSIS

4.1 CHAPTER INTRODUCTION

This chapter presents the results of the study, including the findings from data analysis and the implications of these findings. Data was presented according to the research questions using tables, pie charts and bar graphs .The chapter is organized into several sections, starting with an overview of the results followed by discussions of the findings, and ending with conclusions and recommendations.(This part is for Chapter 5)

4.2 PARTICIPANTS

A total of 15 teachers from 15 schools were involved in the research; each teacher was given a questionnaire filled out and then collected after one hour. The response rate was 100%. Data collected was analyzed using pie charts, tables, and descriptive statistics. The results have shown that most respondents were all science with five years or more of teaching science.

The pie chart shows the gender of the participants.

Fig.1

The pie chart shows that most respondents were males, 60%, compared to females, 40% of teachers who participated in the study. These statistics suggest that there are more male science teachers than females in the secondary schools.

Fig.2 Qualification of Science Teacher

QUALIFICATION	FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
Diploma	10	66,6	66.6	67
BSc	4	26.6	26.6	94
MSc	1	6,6	6.6	100
Total	15	100	100	

Fig.2 Indicates that the largest proportion of the science teachers who participated in the study were diploma holders 67% compared to 27% and 6% for science teachers with a Bachelor of Science degree and Master's Degree respectively. This suggests that most science teachers in public secondary schools have the minimum qualifications to teach science.

Work experience	Frequency	Percent	Valid Percent	Cumulative Percent
1-5 years	4	26,7	26.7	26.7
5-10	4	26,7	26.7	53.4
10 years and above	7	46,7	46.7	100
TOTAL	15	100	100	

Fig.3 work experience of the teachers

Fig.3 shows that most of the participants have more than five experience in teaching science and about 26, 7% have less than five years' experience, giving it a balanced science teaching workforce.

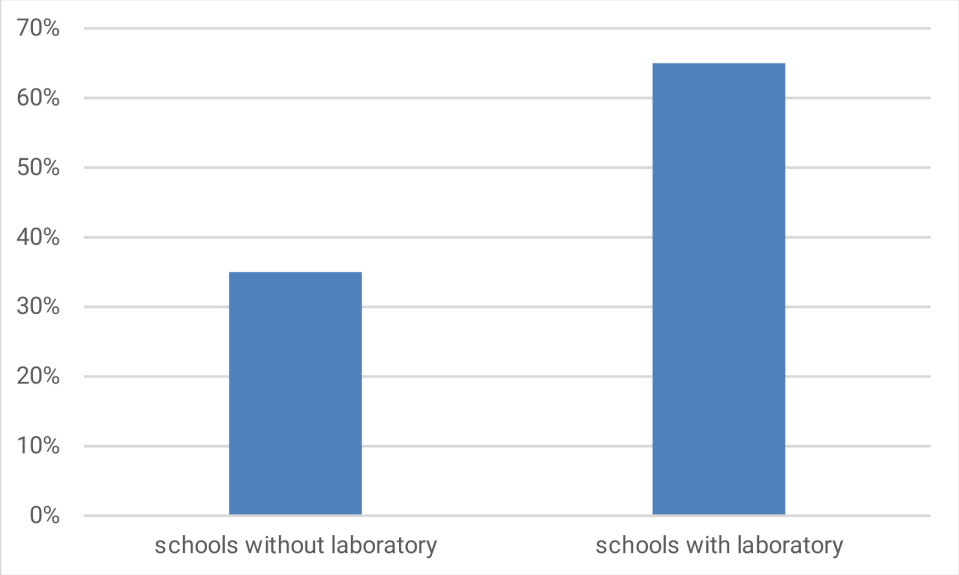


Fig.4 Shows the percentage of schools with and without science laboratories.

The graph shows the percentage of respondents' schools with science laboratories versus those without. The study has established that most schools do not have science laboratories, making it difficult for teachers to conduct practical lessons in classrooms as the time allocated is insufficient to cater for experiments in classes.

4.3 RESEARCH QUESTION 1

What are the major challenges science teachers face in conducting practical lessons in secondary schools?

- Shortage of resources and equipment such as chemicals for conducting practical lessons results from limited budgets.
- Large classes.
- Lack of fully equipped, well-maintained, and modern science laboratory.
- Absence of laboratory technicians.
- Shortage of enough time allocated on timetables to conduct practical lessons.
- Lack of interest and know-how by teachers to conduct practical lessons.
- Lack of training and expertise to deliver practical lessons.
- Language barriers where learners encounter difficulties in comprehending complex scientific concepts.

- Technological advancement, where new equipment is purchased and the teacher should be taught how to use the equipment.

Similar research has been carried out in South Africa and Ramsey *et al* 1969 noted with concern that Laboratory facilities played an integral part in science education in the early 1960s and there was a shortage of laboratory facilities. Hackling, 2009, found significant correlations between hands in the laboratory and student's performance in science. Furthermore, Motlhabane, 2013 also lamented the poor laboratory infrastructure in most African schools. On the shortage of resources, Muwanga–Zake noted concern that equipment shortage hinders conducting practical lessons. Hackling, 2009 also found out that laboratory technicians are major drivers in conducting practical lessons in schools. In addition, they are involved in staff development for teachers on the usage of advanced and newly acquired equipment. In Australia, research was carried out, and it was found that laboratory technicians were fully equipped with relevant training in most schools. as noted by, Hackling 2009.

4.4 RESEARCH QUESTION 2

What factors contribute to difficulties in conducting science practical lessons and how do these factors interact?

- Large classes – large classes are difficult to manage and make it difficult for learners to concentrate.
- Shortage of equipment and chemicals for conducting practical lessons, and this affected the success of practical lessons.
- Shortage of specialised rooms such as the Laboratory for conducting practical lessons.
- Shortage of enough time as allocated on the syllabus for science lessons which forces teachers to prioritise theory over experiments.
- Teachers attitude and workload

The results above agrees with what other researchers have noted by Ajaja,2009 who noted that science teachers have negative attitude towards practical lessons. Tamir 1989 posits that workload can be direct source of stress and big hindrances for conducting practical lessons. In addition shortage of equipment and resources are another difficulties faced by teachers as well in Zambia as it was researched by Ndioho& Chukwu 2017.

4.5RESEARCH QUESTION 3

What strategies should be in place to overcome the challenges they face in conducting practical lessons and how effective are these strategies?

- Improve the teacher-pupil ratio which will ensure effective supervision.
- Construction of Science Laboratories in schools and equipping them.
- The school should prioritize teaching and learning science as a core subject by providing laboratory equipment and chemicals.
- The use of alternatives instead of the laboratory
- Employment of Laboratory technicians in schools.
- Staff development of teachers on how to conduct practical lessons.
- Provision of laboratory manuals in schools.

Findings are in total agreement with what was observed by researchers in other researches in many countries who came up with the same strategies listed above. In Rwanda, Vilaythong, 2011 noted that practical work should be conducted in different areas without restricting it to the classroom or laboratory since it is one of the teaching and learning methods that oblige learners' participation rather than passive with the confidence of doing practices. The other studies also concur with the use of virtual laboratories.

4.6 DISCUSSION.

Conducting practical lessons is crucial aspect of science teaching and learning. However science teachers encountered various challenges that affect the effective implementation of practical lessons. As noted by, Anza *et al* 2016 there are no Laboratory technicians in schools. The laboratory technicians have been found to play a pivotal role in conducting of practical lessons by teachers. In cases where the teacher has a lot work, the laboratory technician can prepare the apparatus and assist the learners in conducting science practicals while the teacher is teaching other classes. The study has also revealed that about 85% of the respondent has indicated the importance of the Laboratory technician in conducting of practical lessons as well as the general management of chemicals, apparatus and day to day activities in the lab. This is one of the chief reason why majority of science teachers fail to successfully conduct practical lessons as well as attending to other classes with many learners.

Secondly the equipped and well maintained and functional Laboratory is second major factor which significantly contribute to affecting conduct of practical lessons. About 60% of the respondents have indicated the unavailability of Science Laboratories in their respective schools as a major setback on conducting of practical lessons. Motlhabane, (2013) also lamented the absence and poor laboratory infrastructure in many African countries as another factor which have great impact on conducting of practical lessons. This can limit types of experiments that require the laboratory and makes it difficult for the learners to be engaged in hands on experience and the teachers will be relying on other alternatives such as simulations which lack hands on.

Shortage of resources and equipment is another which follows and negatively affect conducting of practical lessons as some of the chemicals cannot be improvised hence they are needed for successful conducting of practical lessons. Another factor is of time allocation for practical lesson which is needed to balance theory and practical in order to meet curriculum requirements. There is need for support from school administration through allocation of adequate funds to procure much needed equipment and chemicals for use in experiments. By paying attention to these challenges science teachers, administration and other relevant stake holders can work together to create a conducive environment that foster effective practical lesson learning experiences.

4.7 CHAPTER SUMMARY

In this chapter the researcher has presented the collected data and further analyzed and interpreted the data. In the next chapter, the researcher will look at the research summary, conclusions of the study and recommendations

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter summarized the research findings, conclusions, and recommendations. It presents a summary of the study on the investigation of factors affecting science teachers in conducting practical lessons in Nyanga district and further gives the conclusion of findings, areas of further studies, and recommendations to all stakeholders.

5.2 SUMMARY

This study has identified several factors that affect the conducting of practical lessons which include, shortage of specialized rooms such as the laboratories, shortage of resources and equipment, Shortage of resources and equipment such as chemicals for conducting practical lessons which is as a result of limited budgets, large classes, and absence of laboratory technicians are very common in most schools. Shortage of enough time allocated on timetables to conduct practical lessons, lack of interest and know-how by teachers to conduct practical lessons and lack of training and expertise to deliver practical lessons are most common in day schools. The findings of this study pointed out the need for schools, and relevant stakeholders to prioritize conducting practical lessons by providing necessary resources and support.

5.3 CONCLUSIONS

In conclusion this study has revealed that the conducting of practical lessons in schools is influenced by various factors which include resource related, school related factors as well as teacher related factors. The findings suggest that addressing these factors is important to enhance the effectiveness of practical lessons and the improvement of student learning outcome.

5.4 RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made to improve conducting of practical lessons. Teachers need to attend staff development workshop at cluster or district level in order to sharpen or improve their practical skills. Schools should allocate adequate resources to science department to support practical lessons, allocate resources for construction and equipping the laboratories and employ laboratory technicians. Policy makers and other relevant stake holders should provide funding for research and of innovative practical learning methods. Furthermore the government should develop and implement policies that support conducting of practical lessons as well as encouraging collaboration between schools and industries to provide real learning world.

5.5 RECOMMENDATIONS FOR FURTHER STUDY

The results from the study cannot be generalised as the results were carried out in Nyanga district only. However there is need to gain deeper understanding of the complex factors affecting conducting of practical lessons. Further studies should be carried in schools in both rural and urban schools and in most provinces of Zimbabwe to have identified similarities and differences in factors affecting practical lessons. Relevant stakeholders, administrators and industry experts should be included in further studies to ensure practical and relevant findings. Technological integration should be explored to find how the use of simulations and virtual labs can be used to hinder practical lessons or support.

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APPENDICES

This section contains examples of all instruments that were used in this research.

Appendix 1: Cover Letter requesting for permission to carry out the Research

DEPARTMENT OF EDUCATION P Bag 1020

BINDURA

ZIMBABWE

Tel: 0271-7531 ext. 1038

Fax: 263-71-7616

BINDURA UNIVERSITY OF SCIENCE EDUCATION

TO WHOM IT MAY CONCERN

NAME: CHIROMBE JONATHAN REG NUMBER B1336740

PROGRAMME: HBScEdBz PART: 2.2

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

The student has to undertake research and thereafter present a Research Thesis in partial fulfillment of the Bachelor of Science Education Honors Degree. The research topic is: *An investigation into challenges that affect Science Teachers in conducting practical lessons.*

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

Your co-operation and assistance is greatly appreciated.

Thank you

_____

Z Ndemo (Dr.)

CHAIRPERSON- SAMED.

Appendix 2: Teachers' Cover Letter

Dear Sir/ Madam

I am a second year student at the above mentioned institution, studying towards a Bachelor of Education Degree

As required by the statutes of the university, I am carrying out a research project in partial fulfillment of my studies. My research topic is titled, "An investigation into factors affecting science teachers in conducting practical lessons. *A case study of schools in Nyanga District of Manicaland Province."* I kindly ask you to assist me by answering the questionnaire attached to this letter as honestly as possible. The information that you provide will be treated with utmost confidentiality and will be used solely for academic purposes. Please do not write your name on the questionnaire.

Your completion and the subsequent forwarding of this questionnaire to the undersigned will reflect your willingness to participate in this study.

Your time and cooperation is genuinely appreciated.

Yours faithfully

Jonathan Chirombe

Appendix 3 Teachers Questionnaire

TEACHERS QUESTIONAIRE

My name is Jonathan Chirombe a student with Bindura University of Science Education studying towards BACHELOR OF SCIENCE EDUCATION HONOURS DEGREE IN BIOLOGY. Thank you for participating in this research study. The purpose of this questionnaire is to gather information about, *An investigation into factors affecting conducting of practical lessons by science teachers.* Your responses will help me better understand to identify factors affecting Science teachers in conducting practical lessons. And can contribute to the development of practical solutions.

Please note that your participation is involuntary and anonymous. All responses will be kept confidential and used solely for research purposes. The questionnaire should take up to twenty minutes to complete. Please answer the questions honestly and to the best of your ability. If you have any information feel free to ask.

Thank you again for your participation.

DEMOGRAPHIC INFORMATION

1) Gender Male [ ] Female [ ]

2) What is your highest qualification?

Diploma [ ] Degree [ ] Masters Degree [ ]

3) Your position in the department

Teacher [ ] HOD [ ] Subject Head [ ]

3) How long have been teaching sciences?

years [ ] 5-10 years [ ] 10 years and above [ ]

4) The teacher pupil ratio is

25 [ ] 30-40 [ ] 40-50 [ ] 50 and above [ ]

5) Does your school have a science laboratory Yes [ ] No [ ]

6) Do you have a laboratory assistant Yes [ ] No [ ]

7) Do your school laboratory fully equipped Yes [ ] No [ ]

8) Are there adequate textbooks and instructional materials

Adequate [ ] Inadequate [ ]

If inadequate does this affect conducting of practical lessons Yes [ ] No [ ]

9) How often do you conduct practical lessons?

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10) What are the major challenges faced by teachers in conducting practical lessons in secondary schools?

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11) What factors contribute to difficulties in conducting practical lessons and how do these factors interact?

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12 What strategies do science teachers use to overcome the challenges they face and how effective are the strategies?

