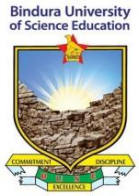

BINDURA UNIVERSITY OT SCIENCE EDUCATION

FACULTY OF SCIENCE EDUCATION

DEPARTMENT OF CURRICULUM AND MANAGEMENT STUDIES

THE EFFECTIVENESS OF REMEDIAL EDUCATION IN THE TEACHING AND LEARNING OF COMBINED SCIENCE AT ORDINARY LEVEL AT MACHEKE HIGH SCHOOL OF MUREWA DISTRICT

BY

MAKANIKO TENDAI

B202804B

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF BACHELOR OF SCIENCE HONOURS DEGREE IN BIOLOGY EDUCATION

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SUPERVISOR: DR. MAKUVIRE

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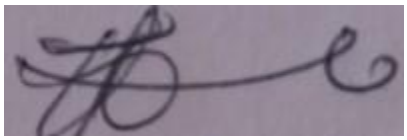

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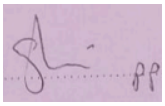

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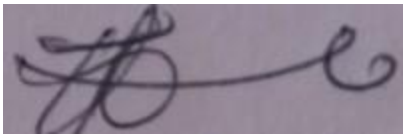

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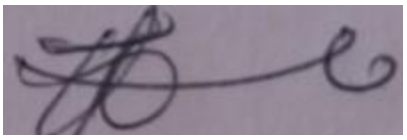
DECLARATION

I, Makaniko Tendai, hereby declare that, except for references to other people's work which had been duly acknowledged, this dissertation is my original and my own work which was never submitted in any other institution before.



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DEDICATION

This research study is dedicated to my late mother Loice Makaniko nee Tendengu, whose unwavering support and encouragement was been the driving force behind my academic pursuits. Her love, guidance, and sacrifices was made this journey possible, and I am forever grateful for her belief in me.

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ABSTRACT

The research study examined the effectiveness of remedial education in improving the teaching and learning outcomes in Combined Science at the Ordinary level at Macheke High School, Murewa District. The study adopted an experimental research design, employing quantitative data collection methods through the use of closed questionnaires. Pre- and Post-tests were used to complement the findings from questionnaires. The collected data was then subjected to quantitative analysis and presented in the form of tables, graphs and pie-charts. Various authorities agreed that, remediation is important in the teaching and learning process and it improves the performance of poor performing pupils. The results indicated that remedial interventions significantly improved students' achievement in Combined Science. The study recommended that school adminstrators allocate time for remediation in their school timetable. It was also recommended that teachers make an effort to identify the students in need of remediation and assist them to catch up with their colleagues and pass their studies. It was also noted that policy makers must make remediation a compulsory component of the academic programme in schools. This is not supposed to be only on paper but in practice. Manpower, fianancial and material resources must be availed to allow full implementation of remediation. Finally the researcher noted the weakness of the research since it was carried at one institution so the research study recommended that the same research be carried out at a larger scale to allow room for generalization.

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ACRONYMS AND ABBREVIATIONS

HOD: - Head of Department

ICT: - Information and Communication Technology

MOPSE: - Ministry of Primary and Secondary Education

'O'LEVEL: - Ordinary Level

UNESCO: - United Nations Education, Scientific and Cultural Organisation

CHAPTER 1

THE PROBLEM AND ITS SETTINGS

1.1 Introduction

This chapter introduces the research project on the effectiveness of remedial education on the teaching of Combined Ccience at the 'O' level at Macheke High School. It provided a background to the study, identified the problem, stated the objectives, research questions, and outlined the research methodology. Additionally, it highlighted the significance of the study, delimits of the scope, and acknowledged the limitations. Finally, it defined key terms relevant to the research.

1.2 Background of the study

Remedial education is an instructional approach aimed at helping students who are struggling academically to bridge gaps in their knowledge and skills. It provided targeted support and interventions to improve learning outcomes. In the context of science education at 'O' level, remedial education played a vital role in enhancing students' understanding and performance in science subjects (Raban & Postleith, 1988). Most commonly, learners simply took remedial classes while at primary schools. Some learners who attended secondary schools without taking remedial classes, usually faced some difficulties and dropped out before completed their secondary education (Shannon, 2005).

According to Suyder (2018) some learners with long history of failure tend to give up at the first sign of difficulty and will need more intensive and individualized motivational encourangemant than the rest of the class. Thereby, remediation is a type of treatment which rectified some deficiency or put things to normal (Sampson, 1975). Hence, poorly educated adults struggle to find the work and make a living, and often found them unable to advance because they lacked the skills needed.

Remediation in Zimbabwe has been a topic of concern in secondary schools, as it has generally faced challenges and been deemed ineffective. The history of remediation in the country revealed a struggle to adequately address academic gaps and improved student learning outcomes (Nkoma, 2008). However, it was noted that the effectiveness of remediation varies across different geographical areas or institutions within Zimbabwe. Historically, remediation efforts in Zimbabwe's secondary schools have faced numerous obstacles. One key challenge has been the insufficient allocation of resources, including funding, materials, and qualified instructors. Limited resources have hindered the implementation of comprehensive and targeted remedial programs, making it difficult to address the diverse learning needs students (Chivore, 2014).

Additionally, the large class sizes prevalent in many secondary schools have posed a significant challenge to effective remediation. With limited individualized attention and personalized instruction, it becomes challenging to provide tailored support to struggling students (Chivore, 2014). This issue was further compounded by the shortage of qualified teachers, which restricted the availability of specialized educators who provided remedial instruction.

What propelled the researcher to evaluate the effectiveness of remedial education in the teaching and learning of Combined Science at 'O' level was that, the researcher noticed that remediation was taken for granted by both classroom practitioners and learners in most secondary schools, practitioners seemed not to realized the effectiveness of remedial education. Those who claimed to championed it, do not use correct techniques and skills. According to Burt (1937), slows learners can be able to achieve some measure of success if remediation programme is well administered. Teachers have to know the characteristics of a slow learner, who a slow learner is, and how to find a suitable way to remediate them (Gulliford, 1977). Thus with the appropriate and well planned teaching and learning materials slow learners can tend to make a reasonable progress.

Through experience in the teaching profession, especially in secondary education, the researcher also noticed that the learners may be shy and embarrassed about taking remedial classes, especially

when they are attending secondary level and in their teens, that's some argued that it should be scraped off as it disrupted the learning and teaching process. Furthermore, the researcher noticed that the name 'remedial education' carried some negative connotations which made some learners to look upon remedial classes as embarrassment. Thus, results in many learners failed to take remedial classes in secondary schools.

Macheke High School, located in Murewa District, Mashonaland East, was a renowned educational institution with diverse student population. However, the teaching and learning of science at 'O' level have posed challenges for educators, parents, and students. Despite the efforts of teachers and the availability of resources, a significant number of students continued to face difficulties in the Combined Science subject. This situation hindered their overall academic progress and further career prospects.

1.3 Statement of the problem

The researcher, whose area of specialization is science found out that, over the past years problems of underachievement of science learners in secondary schools has been a problem. The teaching and learning of Combined Science at the 'O' level at Macheke High School have been a concern for stakeholders. The existing methods and resources were not effectively addressed the diverse learning needs of students, resulted in poor performance and limited understanding of scientific concepts. Consequently, there was a need to explore the effectiveness of remedial education as a potential solution to these challenges.

1.4 Reasearch Objectives

The main objectives of this study were:

i. To assess the current state of Combined Science education at the 'O' level at Macheke High School.

ii. To identify the specific challenges faced by students in learning Combined Science subject.
iii. To evaluate the effectiveness of remedial education in improving the teaching and learning of Combined Science at the 'O' level at Macheke High School.
iv. To propose strategies for enhancing the effectiveness of remedial education at Macheke High School.

1.5 Research questions

To guide the study, the following research questions were addressed:

i. What is the current state of Combined Science education at the 'O'level at Macheke High School?
ii. What are the specific challenges faced by students in learning Combined Science subject?
iii. How effective is remedial education in improving the teaching and learning of Combined Science at the 'O'level at Macheke High School?.
iv. What strategies can be implemented to enhance the effectiveness of remedial education at Macheke High school?

1.6 Significance of the study

The findings of this completed study contributed to the existing body of knowledge on the effectiveness of remedial education in the teaching and learning of Combined Science at the 'O Level. The results provided an important insights into the specific challenges faced by students at Macheke High School and suggested strategies to address these challenges.

The results of this completed study are valuable to educators, school administrators, and policymakers in designing and implementing effective remedial education programs. Thus, by understanding the impact of remedial education, administrators make an informed decisions about curriculum development and the integration of remedial components in the Combined Science syllabus. This ensured that the curriculum is aligned with the specific needs of the students and

promotes effective teaching and learning practices. Findings from the study informs decisions regarding the allocations of resources, including funding, teaching materials, and professional development opportunities for teachers. Also, admistrators prioritized investments in areas that are proven to enhance remedial education outcomes, leading to improved Combined Science education at the school level.

Evidence-based research of this completed study guides policy makers in formulating policies that support and promote remedial education initiatives. Furthermore, understanding the impact of remedial education also helped policy makers address educational inequities by designing inclusive policies that ensure access to quality remedial programs for all students, regardness of their socio-economic background or prior academic performance. Thus, highlighted the importance of allocating resources, providing professional development opportunities, and establishing guidelines for effective implementation of remedial program.

Moreover, effective remedial education enhances students' understanding of Combined Science concepts, improve their problem-solving skills, and boost their overall academic performance. It provides additional support and targeted interventions to help struggling students bridge learning gaps and succeed in Combined Science at the 'O' level. Moreso, successful remedial education boosted students'confidence in their abilities to learn and excel in Sombined Science. Thus, increased their motivation, engagement, and interest in the subject, leading to a positive attitude towards learning and a potential pursuit of science-related careers.

1.7 Delimitation of the study

This study was focused on public urban day high school in Murewa district, Mashonaland East province. The study was also focused specifically on the teaching of Combined Science at the 'O' level at Macheke High School. The selection of classes was based on a diverse student population to capture a range of educational settings and challenges. The research included an assessment of the current state of science education, an exploration of the challenges faced by the students, and an evaluation of remedial education programs. The study utilized the resources available within

the participating school, including access to school facilities, materials for implementing remedial programs, and qualified instructors.

1.8 Limitation of the study

This study had some several limitations:

1. Firstly, the research was conducted at a single institution, Macheke High School, which limited the generalizability of the findings to other schools. Thus, focused on a specific geographical area or institution limited the generalizability of the study to other contexts. Thereby, the researcher clearly defined the scope and context of the study, acknowledged that the findings may be specific to the chosen geographical area or institution. Also, the researcher recommended further research to validate transferability of the results.

2. Secondly, limited time for data collection and analysis restricted the depth and breadth of the study. Thus, the researcher prioritized key research objectives and focused on obtaining meaningful data within the available time frame.

3. Thirdly, some respondents gave positive information at the expense of negative information just to please the researcher, which reduced the effectiveness of the use of questionnaires in the research findings. Thus, the researcher relied on self-report data, which may be subject to bias or inaccuracies. Therefore, the researcher used rigorous research designs and methodologies to minimize biases and ensure the validity and reliability of the findings.

1.9 Research hypothesis

Remediation has a greter pontential of increasing the student pass rate in O level Combined Science.

1.10 Definition of key terms

To ensure clarity and consistency, the following key terms were defined as used in this study:

Remedial Education

Remedial education refered to educational programs or interventions designed to address and improve the academic skills and knowledge of students who are struggling or lagging behind their peers in specific subjects or areas (Garcia and Pearson, 2017). Thus, remedial education is an instructional approach aimed at assisting students who are struggling academically to catch up with their peers by providing targeted support and interventions.

Effectiveness

Effectiveness in the context of education refered to the degree to which a particular program, intervention, or practice produces the desired outcomes and achieves its intended goals in terms of improved learning and performance (Slavin, 2019). Thus, it involves assessing the impact and success of an educational approach in terms of studentlearning, academic achievement, skill development, and overall improvement.

Teaching of Science

Teaching of science refered to the instructional methods, strategies, and practices employed by educators to facilitate the learning and understanding of scientific concepts, principles, and processes (Bybee, 2015).Thus, it involves the systematic delivery of science content, the development of scientific inquiry skills and the cultivation of scientific thinking and problem-solving abilities in students.

1.11 Chapter summary

This chapter provided an overview of the research topic, its significance, and the stakeholders involved. The chapter highlighted the potential benefits for teachers, school administrators, policy makers, and students. It also discussed the limitations, assumptions, and delimitations that should be considered in the study. It established the importance of investigating the effectiveness of

remedial education in Combined Science at the ‘O’ level. It emphasized evidence-based strategies to enhance teaching practices, inform administrative decisions, guide policy formulation, and ultimately improve students’learning experiences and outcomes in Combined Science education. Chapter two reviewed literature related to remedial education.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter provided an account of the literature related to the effectiveness of remedial education in the teaching and learning process in secondary schools. Thus, amass knowledge and understanding of the topic through establishing what expects and previous researchers had said about the effectiveness of remediation in the teaching and learning situation of Combined Science in secondary schools.

2.2 Theoretical Framework

In this research, the effectiveness of remedial education in the teaching and learning of Combined Science at Macheke High in Murewa District was guided by the theoretical framework of Vaygotsky's psychological view of remedial education. According to Vygotskian psychology, the weak components of the remedial student's mental functions are developed through support from knowledgeable others (Perry, 2013). Thus, Vygotsky's theory of learning emphasized the role of social interaction in the development of cognitive skills. When children are engaged in social activities with more knowledgeable others, they have the opportunity to learn new concepts and practice new skills. This type of learning is often referred to as "scaffolded" or "guided" learning because it involved providing support that can be withdrawn as the child gains mastery of the task.

Vygotsky believed that individual development could not be understood without reference to the social and cultural context within which such development is embedded. There is a great role of more knowledgeable others who can give scaffolding to the learners to fill the gap between actual level and potential level which is known as zone of proximal development. Vygotsky defined the remedial student's Zone of Proximal Development (ZPD) as the distance between the actual development level determined through problem solving under remedial teacher or in collaboration

with more capable pear (Shabani, Khatib & Ebadi, 2010). Thus, Vygotsky emphasized the social aspect of learning.

In the Zone of Proximal Development (ZPD), learning often occurs through social interactions with a more knowledgeable others, such as a teacher or peer. Remedial education can incorporate collaborative learning strategies, such as group work, peer tutoring, and cooperative problem-solving activities. By engaging in meaningful interactions with peers, students can benefit from shared knowledge, receive feedback, and develop a deeper understanding of the subject matter. Thus, according to Vygotsky, the main idea was that remedial students learn best when working together with others during joint collaboration.

2.3 The concept of remediation

Remediation programme focused on teaching remedial students to acquire the missed basic skills required in certain subjects so that they can academically prepare for national examination (Abu Armana, 2011). Thus, various authorities defined a slow learner as a student who by reason of limited ability or other conditions resulting in educational retardation thereby requires some specialised form of education wholly or substitution for the education given in ordinary schools.

According to Lowe (1988) slow learners were students with learning difficulties who are sometimes referred to as cognitive-less able. Child (1986) also described slow learners as students who are not succeeding in their school work. Deville (1966) pointed out that slow are those students with standards of work which fall below that reached by the majority of his or her peers. Thereby the main essential for slow learners were that they should be taught by teachers who understood them and can gave them the special work and individual work they need. According to Raban & Postleith (1988) most of the slow learners had poor memories. At times a slow learner would not understood the requirements of the questions and when he understood, he cannot generate problem solving strategies on his or her own. They went on to say that slow learners are easily disturbed and hence it is the duty of the teacher as an educator to maintain the interest of the learner though out the lesson.

Deville (1980) pointed out that in any classroom situation, there are bound to be pupils who need special remedial help. As students progressed at individual rates it is necessary to differentiate and individualise the learning content. He also pointed out that slow learning is attributed to a number of factors. These included emotional, psychological, biological or sociological. However, all these factors are interlinked.

According to Sampson (1975) remediation was a type of teaching which rectifies some deficiency or put things right. Schonell (1949) suggested that as a treatment, both retardation and slow learning demanded individual and at sometimes especially organised methods of treatment. Elaborating on this, Schonell (1949) also emphasised that a need especially in cases of special retardation for a proportion of private and individual assistance. He added that such concentrated individual consideration for their problems will quickly bring many students to a better level so that they can be redrafted to their normal classes.

Farrant (1991) also viewed remediation as any programme of teaching which had a reasonable chance of restoring to normal the educational performance of children whose progress has been adversely affected by environmental factors. Thus, in other words remediation involved the provision of specific corrective help as needed by slow learners and can be an individualised learning programme.

Cohen (1986) noted that the term treatment suggest that slow learners have something wrong in them that can be put right. Thereby the teacher had to find out where the fault lay and think for positive measures. The teacher may had to arrange for remedial or compensatory or extra teaching for a particular group of students to remove their specific difficulties. The underlying assumption was that if these low or weak areas can be improved so that they are more consistent with the students' other abilities, he or she will become a more proficient learner (Cohen 1986). Thus hopefully more effective learning in one area may also carry over to other areas, and therefore as a result when sufficient improvement takes place the regular school programme may become more feasible.

Cohen (1986) also noted that teachers should programme materials to be learnt in small clusters and allow a great deal of repetition. The teachers had to increase the number of activities, teaching aids and time when dealing with the slow learners. Thus, a well designed learning environment helps to maintain pupils' attention and interest in learning and facilitates the achievement of teaching aims. However, Cohen (1986) advocated that the teachers must not express sympathy for the slow learners. This showed that remediation may be fruitful when administered in an honest manner.

According to Gulliford (1977) teachers had to know the characteristics of a slow learner, who a slow learner is, and be able to find suitable time to remediate pupils. He also added that remediation will not be effective if teachers make use of lunch time to remediate slow learners, also the teaching material should not be made too simple for the bright and too difficult for the less-able. Thus with the appropriate and a well planned teaching and learning materials slow learners can make a reasonable progress. Lowe (1988) who pointed out that the teacher supported him; particularly the secondary school teachers must give room for individual differences.

Sampson (1978) suggested that there are various ways in which a teacher can implement when he or she is attending to pupils' problems. The teacher needs to plan how he or she would apply his or her remediation and has to embark on various methods and activities so as to create a stimulating, creative and interesting atmosphere. He also felt that slow learners can improve and that any child is capable of producing something fruitful if a well planned remediation is applied. Child (1966) noted that slow learners can be able to achieve some measure of success if remediation programme is well administered. He also pointed out that in this way slow learners gain confidence, feel pride of achievement and the approval of others and so are ready for greater efforts. This means that the feeling of constantly failing can to some extend be overcome and learning tasks can be matched more easily to the whole group than in a mixed-ability situation.

Despite all the support given by various authors about effectiveness of remediation to slow learners, teachers can do anything fruitful to teach his or her students and removed obstacles to learning 'BUT' never learn for them or force them to learn. This is supported by Farrant (1991) who sayed, you can take the horse to the river but you cannot make it drink. This showed that remediation is helpful when the learner has interest and when he or she is not deeply affected by social or economic problems.

1. Emotional Factors

These can affect the child's learning in many ways for example, a child feels conflict with his or her parents. This will have a negative effect on the child's ability to learn. Hence, the child will come to school demoralised and depressed and as a result, the child will not concentrate fully. Also students whose families are not stable are likely to suffer in their school work. Research findings had shown that there is a very strong relationship between broken homes by (death, divorce, separation) and slow learning in school. Lack of attachment to parents is directly conductive to slow learning because parents are the first teachers of the child (Deville 1980).

2. Sociological Factors

Socio-economic status of the child's family had a great bearing upon the child's learning. Children who came from poor homes where they get no academic help and probably spent most of their times doing domestic work are likely not to perform well in class. Children need to be well fed, clothed and loved by their parents if they were to perform the best of their abilities in their schoolwork. In short, we can say the health mind can only be realised in a healthy body (Farrant, 1991). Burt (1937) also pointed out that general health problems, poverty and heredity may played some part in the child's academic performance at school.

3. Biological factors

This means all learning problems originated from some deficiency either in the child's heredity or in his environment. They affected adversely the students' progress at school and lead to him being described as educationally backward and in need of remedial or special education, (Farrant, 1991).

However, little can be done to normalise the progress of a student who had genetic weakness such as physical or mental handicaps, but the teacher should be able to recognise the symptoms of these problems and took whatever action which helped the students to make the best progress possible. Thus, prompt appropriated action to deal with adverse environmental factors followed by remedial teaching can brought about significant and dramatic results.

2.3 Policy guiding remediation in Zimbabwe educational system

Remediation in educational settings has become a primary service since the adoption of the UNESCO's Salamanca statement and framework for action on special needs education (UNESCO, 1994). According to Melton (2010), remedial education programme is as an educational programme that schools routinely use to bring low achieving students' academic performance closer to the standards of their grade in school. In other words, it is the learning and teaching programme designed to bring students who are lagging behind up to the level of achievement realized by their peers (Smith & Wallace, 2011).

In Zimbabwe context, there is no specific legislation for inclusive education in Zimbabwe (Mpofu, 2004). However, a number of government policies issued were consistent with the intent of inclusive education. For example, the Zimbabwe Education Act (Education Act, 1996), and various Ministry of Education circulars. The (Education Secretary's Policy Circular No. P36, 1990), required that all students, regardless of race, religion, gender, creed and disability, had access to basic or primary education. The Secretary for Education's directive for inclusive education required schools to provide equal access to education for learners with disabilities, routinely screen for any form of disability, and admit any school-age child, regardless of ability.

The students are expected to master the national curriculum at all levels of schooling regardless of ability (Education Secretary's Policy Circular 36 of 1990). Thus, the policy guided remediation in Zimbabwe education includes the Inclusive Education Policy, the Curriculum Policy and the National Education Policy. The Inclusive Education Policy aimed to provided equal educational

opportunities to all students, including those with diverse learning needs. It may addressed the provision of remedial education as a means to support students who require additional assistance in Science, ensuring inclusivity and learning outcomes.

The National Education Policy of Zimbabwe provided a broad framework for education in the country. It may include the importance of remedial education, the need for equitable access to education, and the enhancement of teaching outcomes like Science at Ordinary level. The Curriculum Policy outlined the intended learning outcomes, content and pedagogical approaches for different subjects, including Science. It may highlighted the significance of remedial interventions to address learning gaps and improve student's understanding of scientific concepts at the Ordinary level.

The Education Act of 1987 stated that every child shall have the right to education. It defines children with special needs as those who cannot be expected to benefit from schooling without the provision of either special equipment or special teaching, or a combination of these. The establishment of the programme as a requirement was first spelt out in Chief Education Officer (CEO) circular number 14 of 1982 as a draft (Chireshe & Mapfumo, 2002). The programme was also supported by the Chief Education Officer (CEO) Circular Minute number 12 of 1987. The circular announced that the remedial education programme is designed to assist pupils of average and above average ability who are at least two years behind in a subject to catch up.

According to CEO circular minute number 12 of 1987, remedial education was extended in mathematics and reading to all primary schools. Initially, the programme was targeted at grade 4 pupils but the focus now includes other grades including secondary school learners (Chireshe et al, 2003). Thus, the remedial programme acknowledged the short comings that any educational system is bound to have, considering the human weakness and therefore attempts to save pupils who might not otherwise achieve their full potential at grade seven and 'O' level if there is no early detection and intervention.

2.4 Types of remediation

Remediation refered to the process of providing additional support and interventions to help students overcome learning difficulties or fill knowledge gap. Technically, they are three types of remediation in developed countries namely, classroom remediation, on-the-spot remediation and clinical remediation (Smith & Wallace, 2011). Classroom remediation happened in the classroom for students who need remediation after having been taught certain concept or topics (Melton, 2010). After identified the students with a need, the English Language or Mathematics teacher plan for them and caries out the remedial process while the rest of the students continue with assigned exercises.

According to Smith & Wallace (2011), the subject teacher does on-the-spot remediation during the course of his or her teaching. As he or she goes around and listened to various students he or she is able to pick up errors and correct them instantly. On-the-spot remediation, on the other hand, should be the responsibility of every English or Mathematics subject teacher, as an on-going process (Smith & Wallace, 2011). Therefore, On-the-spot remedial or subject teachers have to be committed and prepare to work hard, reading and trying out new methods of remediating targeted students (Kirst, 2007).

Lastly, based on teacher's assessment and diagnostic test results in developed countries, the student may be placed in classes (clinical remediation) which are most likely to provide improved learning outcome benefits (Smith & Wallace, 2011). Clinical remediation classes are often small, and their lesson focus is on high teacher-student interaction (Cox, 2003). Indeed, this promoted effective scaffolding until the student mastered the concept. Clinical remediation involved withdrawing selected students from the class once or twice a week (Cox, 2003). The teacher who specialized in remedial teaching outside the normal class teaching time does this.

2.5 Benefits of remedial education in the teaching and learning process at secondary schools

According to Holmlund & Silva (2009), effective remedial education helped London secondary schools to overcome the learning problems faced by certain group of students and enhanced their potentialities and talents. Thus, one of the primary benefited of remedial education is that it provides struggling students with targeted instruction and support to bridge learning gaps. With personalised attention, students can improve their academic performance and catch up with their peers. Furthermore, remedial education can help students build confidence in their abilities. By experienced success and progress in their academic work, students can develop a positive self-image and regain motivation for learning.

Moreover, remedial programs often offer smaller class sizes and more individualised instruction, allowing teachers to tailor their approach to each student's specific needs. This personalised attention can enhance learning outcomes and address specific challenges effectively. Also, remedial education played a crucial role in closing achievement gaps among students. By identifying and addressing learning deficiencies early on, it can help ensure that all students had an equal opportunity to succeed academically. In addition, for students who needed to meet specific academic requirements for higher education, remedial programs can serve as a stepping stone. By providing the necessary support, these programs can helped students gain the foundational skills needed to pursue their desired educational path.

2.6 Challenges that affect the effectiveness of remedial education in schools

A remedial education refered to additional instruction or support provided to students who are struggling to meet academic standards. While it can be beneficial in helping students catch up and succeeded academically, there are also several challenges associated with remedial education. The effectiveness of remedial education at secondary schools is a critical issue with challenges which require a great attention and consideration (Gutierrez, 2011).

Students enrolled in remedial programs may faced stigmatisation from their peers, which can affected their self-esteem and motivation. The label of being in a remedial program can create a negative perception of their abilities. The study by Howerton (2004) concurred that there was a stigma associated with remediation in secondary schools, and this psychological burden could negatively affect outcomes and discourage students' effort. It also lowered students' self-esteem and subsequently reduced an effectiveness of any remediation strategies. Grouping lower ability students in remedial classes produced negative peer effects (Melton, 2010). Thus, remedial students were stereotypically labelled as unintelligent by their peers thereby affecting the effectiveness of the remedial education programme.

Further, remedial education required additional time, effort, and resources from both teachers and students. This can strain the existing educational system, as it necessitates smaller class sizes, specialised instruction, and additional support staff. Moreover, remedial programs often focused on basic skills and foundational knowledge, which may resulted in a narrow curriculum. Students may missed out on exposure to a broader range of subjects and topics, limiting their educational experience. Further, if remedial programs do not addressed the root causes of a student's academic difficulties, there is a risk of creating a dependency on additional support. Students may struggle to transitioned successfully to higher levels of education or the workforce without ongoing remediation.

2.7 Chapter Summary

Literature review showed that remediation should never be excluded in the teaching and learning process. Authorities advocated that, remediation improved students' understanding and grasping of concepts taught in the lesson. Teacher should therefore conducted remedial sessions with their poor performing students since it improved their academic performances and created an interesting

and productive teaching and learning atmosphere in the educational fraternity. The next chapter will focused on the research methodology.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

This chapter focuses on a synopsis of the research design, study population, sample size, sampling procedure, data collection instruments, reliability and validity, data collection procedures, data analysis instruments and procedure and ethical considerations.

3.1 Research Paradigm

Research paradigm refered to the theoretical or philosophical foundation or framework for the research work (Kuhn, 1962). Thus, it was viewed as a research philosophy. In the same regard, Willis (2007) defined research paradigm as a comprehensive belief system, worldview or framework that guided research and practice in a field.

This study was guided by positivist research philosophy. Positivism is a philosophical paradigm that emphasized empirical observation and scientific methods to gain knowledge. According to the positivist paradigm true knowledge is based on experience of senses and can be obtained by observation and experiment. Positivists believed that knowledge can be 'revealed" or "discovered" through the use of the scientific method. The "discovered" knowledge enabled the provision of possible explanations of the causes of things that happen in the world. A positivist approach emphasised experimentation, observation, control, measurement, reliability and validity in the processes of research. Thus, it focused on the use of quantitative data and employed a deductive approach to research.

Thereby, positivist paradigm was appropriate in this study, because it aimed to established casual relationships between variables. By employing experimental design, the researcher manipulated the independent variable (remedial education) and observed its effects on the independent variable (teaching and learning outcomes). This allowed for the cause and effect relationships and provided insights into the specific mechanisms through which remedial education influenced teaching and learning. Also, the positivist paradigm placed emphasis on quantitative data analysis. Thus, in this study, it involved collecting numerical data on students' performance, such as test scores or grades, both before and after the intervention. By analysed this data using statistical techniques, the researcher assessed the impact of remedial education on teaching and learning outcomes and draw conclusions based on empirical evidence.

Furthermore, the positivist research seeks to established generalizable knowledge that can be applied beyond the specific context of the study. By following systematic procedures and using representative samples, the researcher made a broader claims about the effectiveness of remedial education in teaching and learning Combined Science at the Ordinary level. Thus, this informed educational policy, curriculum development and instructional practices in similar settings.

In addition, the positivist paradigm emphasized the importance of rigorous research methods and replicability of findings. Thus, by adhered to standardized procedures, clearly defined variables, and used reliable measurement instruments, the researcher enhanced the validity and reliability of the study. This, in turn, enabled other researchers to replicated the study, verified the results, and built upon the findings in future research.

3.1.1 Research Methodology/Approach

In this research, the researcher employed quantitative paradigm research. Creswell (2014) defined quantitative research as an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures in order to determined whether the predictive generalizations of the theory hold true. It was grounded in a positivist paradigm, which assumed that there is an objective reality that can be measured and

understood through empirical observation. By employing standardized and structured instruments, such as surveys and experiments, the researcher minimized subjective biases and ensured the reliability and validity of the findings.

Quantitative research relied on systematic measurement and statistical analysis, which enhanced objectivity and allowed for replication of the study. Thus, in this approach, variables are measurable and quantifiable, allowing researchers to gathered numerical data that can be systematically analysed using statistical methods. The use of numerical data and statistical techniques helped to minimize bias and subjectivity, making the findings more reliable and robust. Also, quantitative research allowed for the control of extraneous variables through experimental designs and statistical techniques. Thus, the researcher manipulated variables of interest, hold other variable constant, and employed statistical control techniques to isolate the effects of specific factors on the outcomes being studied.

3.2 Research strategy

According to Wiemen (1995), a design is a strategy of conducting a research, collecting extensive data using methods such as a descriptive survey, experimental design or co-relational design or a mixture. Also, according to Creswell (2012), research designs are the specific procedure involved in the research process that includes data collection, data analysis and report writing. Thus, a research design outlined the overall plan and structure of the study, including the approach, framework, and strategies employed to collect and analyse data. In this research, the researcher used an experimental research design. This design involved comparing a group of students who received remedial education (the experimental group) with a similar group that does not received the intervention (the control group). The results of the experiment were compared to determined whether there is a significant difference between the group that received the treatment and the control group. By comparing the outcomes between the two groups, the researcher assessed the impact of remedial education on teaching and learning of Combined Science at Ordinary level.

In addition, experimental research allowed the researcher to established a cause and effect relationship between the remedial education intervention and its impact on teaching and learning

outcomes. Thus, by randomly assigning participants to experimental and control groups, the researcher attributed any observed differences in performance to the intervention itself rather than other factors. Overall, employed an experimental design in the study of remedial education effectiveness on teaching and learning of Combined Science at Ordinary level, ensured rigorous investigation, enhanced internal validity and contributed to evidence-based decision –making in the field of education.

3.3 Study Population

Population was defined by Kahn, (1993) as any group of individuals that had one or more characteristics in common that are of interest to the researcher. In this case the targeted group was Combined Science Ordinary level students at Macheke high school. There was six form four Ordinary level classes, which were form four Red, Orange, Blue, Yellow, Brown and Purple, with a total of 240 pupils and of these, 115 were boys and 125 were girls. In each class, they were grouped in terms of mixed abilities. Also the targeted group was 60 teachers at Macheke high school, in which 25 were males and 35 were females.

3.4 Sample Size

According to Sidhu (1984) a sample is a small portion of population selected for observation and analysis. To carry out the research effectively, the researcher chose a sample of thirty students which was 13 % of the total population. Also a sample of eight teachers was used in this research, in which all seven of them were specifically Combined Science teachers including the HOD. The 8^{th} one was the school Head, who was chosen in this study because he was the one who allocated departmental budgets and resources.

3.5 Sampling Procedure

Random sampling was firstly used to select the form four ordinary classes to be used in the research and a stratified sampling was also used to select students to participated in the research. Firstly the classes were selected by putting four pieces of paper in a hat with labels Red, Orange, Blue, Yellow, Brown and Purple and the researcher blindfolded and picked two pieces of papers from the hat. Thus, the two colour classes selected were used for the research.

Secondly, the researcher used a pre-test to select students in selected classes, and the first thirty students who scored bottom marks were selected for the research. Thirdly, the researcher randomly selected 15 students from a sample of thirty students, for remediation using "YES" or "NO" cards placed in a box. Those students who picked cards written "YES" were selected for remediation and those 15 studentss who picked cards written "NO" were used as a control group. Also seven teachers who teach specifically Combined Science to form four Ordinary classes were purposively selected for the research. The school head was also automatically selected for the research because he was the departmental budgets and resource allocator.

3.6 Data collection methods/ instruments

The researcher used questionnaires and tests. The questionnaires provided insights into the participants' perceptions, attitudes and self-reported experiences, while the standardized tests offered more quantifiable and verifiable data.

3.6.1 Questionnaires

A questionnaire is a set of carefully constructed questions designed to provide systematic information, in a particular subject (Farrant, 1991). Generally, they are two types of questionnaires which are open ended questionnaires and closed ended questionnaires. Thus, in this research, closed ended questionnaires are were used for data collection. Closed ended questionnaires were administered to both students and teachers to collect quantitative data on their perceptions of the

effectiveness of remedial education. These were filled by both students and teachers to air out their views about remediation.

The questionnaires were appropriate instruments for this study because they granted the respondents enough time to think and write the responses freely. Questionnaires were also allowed for standardized data collection. The questions and response options were pre-determined and structured, ensuring consistency in data collection across participants. This standardisation facilitated the comparison of responses, making it easier to analysed and interpreted the data. Furthermore, once data collection was complete, questionnaires were processed and analysed using computer software. The data entered electronically, and statistical analysis was conducted efficiently. Thus, streamlined the data analysis process and facilitated the generation of meaningful results.

3.6.2 Tests

According to Farrant (1991) a classroom test is one which is made by the teacher for the purpose of assessing whether the students have learnt what they were supposed to learn. The researcher used the main test which is the post-test. This was a test given to both the experimental group (group A) and the control group (group B) after a reasonable period of time. In this case it was a test given after remedial education has been administered to the experimental group. The tests was ideal in this research because they indicated to which extend the material learnt has been understood. Students also given the opportunity to displayed how much they have acquired through applying skills they were taught.

3.7 Reliability and Validity

To ensured the reliability of the study, measures were taken to enhance the consistency and dependability of the data. This included piloted the research instruments, conducted member checking, and employed inter-coder reliability for qualitative data analysis. Additionally,

triangulation of data sources and methods were employed to enhance the validity of the findings. The use of two instruments namely, pre- and post-tests, and questionnaires also ensured validity and reliability of the collected data. The data collected was compared to ensure validity

3.8 Data Collection Procedures

The researcher firstly, obtained the permit for this research from the Ministry of Primary and Secondary Education (MOPSE), Murewa District, with a written permission letter from the Bindura University of Science Education (BUSE). The researcher then seek for informed consent from the school Head of Macheke High School and arranged the dates and appropriate time for the data collection process.

Data was collected through pre-tests and post-tests, and also through closed questionnaires to gathered students and teachers' perceptions and experiences. After the appropriate arrangement with the school administration, the researcher gave the selected sample a pre-test and a post-test. The pre-test was given to both the experimental group and the control group after a reasonable period of time by the researcher. In this case, a post-test was given after remedial education had been administered to the experimental group. The results obtained was compared and analysed by the researcher.

Also questionnaires were distributed to the sample group of both teachers and students in the experimental group during their free time so that they had enough time to respond to all the given questions. The researcher distributed them personally to ensured that every respondent had his or her own copy. The questionnaires were made to guarantee the personal secrecy or privacy because no names were provided on the questionnaire copies. The researcher collected the completed questionnaires on the appointed date and time for processing and analysing.

3.9 Data analysis methods/ instruments

The data collected through tests and questionnaires was analysed using descriptive statistics, such as frequencies and percentages. Inferential statistics, such as correlation analysis, was employed to identify relationships between variables. Presentation and analysis of data collected was done in the form of tables, graphs and charts.

3.10 Ethical Considerations

Informed consent was central in social research and it was up to the participants to weigh the benefits and risks associated with participating in the research and deciding whether to take part or not. The researcher informed participants about what their participation in the research entails the requirements of the study and its importance so as to get their consent before proceeding with data collection. By explaining to the respondents, the purpose of the study, the researcher will not had to force them to participate in any way but allowed individuals to decide whether or not to participated in the study.

The researcher also ensured that confidentiality of the respondents was maintained. The researcher protected confidentiality when he know the identity of the study participants but do not disclosed the information. Anonymity was used to ensure confidentiality by asking respondents not to wrote their names when completing their questionnaires. Finally, the researcher made sure that there was no plagiarism in the work by acknowledged other people's work. The findings was reported as per respondents' answers and not otherwise.

3.11 Chapter Summary

The chapter provided a comprehensive overview of the research methodology which was going to be employed to investigate the effectiveness of remedial education on teaching and learning of Combined Science at the Ordinary level. The research design, methods, and instruments were outlined, highlighted the population and sampling techniques, data collection and analysis

methods, as well as considerations of reliability, validity and ethics. The next chapter presented the findings of the study based on the analysis of the collected data.

CHAPTER IV

DATA PRESENTATION ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter presents the data collected through closed questionnaires and pre- and post-tests to address the research questions of the study. Thus, it provide a detailed analysis of the data collected, addressing each research question individually. The quantitative analysis allowed for a comprehensive understanding of the current state of Combined Science education at the Ordinary level at Macheke High School, the challenges faced by students, the effectiveness of remedial education, and strategies for enhancing its effectiveness. The data generated from the current study is presented in a tabular form and the figures are rounded off to whole numbers to avoid inconveniences of working with decimals.

4.1 Demographic Data of Participants

The bio-data of the research participants portrays the research context in which data was generated in the current study. Thus, before diving into the findings, it is important to provide demographic data related to the participants in the study. A total of 30 students from form 4 (Ordinary level) were selected for the study, comprising 16 males and 14 females. Furthermore, 8 Combined Science teachers, including the Head of Department and the School Head with varying years of teaching experience were selected to provide insights into the effectiveness of remedial education. Thus, this demographic data ensured the representativeness of the sample and provided context for the subsequently discussions.

Table 4.1 Student participants

Sex	Male	Female	Total
Experimental Group	7	8	15
Control Group	9	6	15
Percentage (%)	53	47	100

Table 4.1, above shows that there are 30 students who were part of the study. It can also be seen from the table that 47% were males and 53% were females. By incorporating both representation of male and female students, will sought to avoid any gender bias and to provide a fair representation of the experiences, perspectives, and learning outcomes of both genders. Thus, this allows for a comprehensive examination of the effectiveness of the remedial education programs and their impact on students' academic performance and engagement across different gender groups.

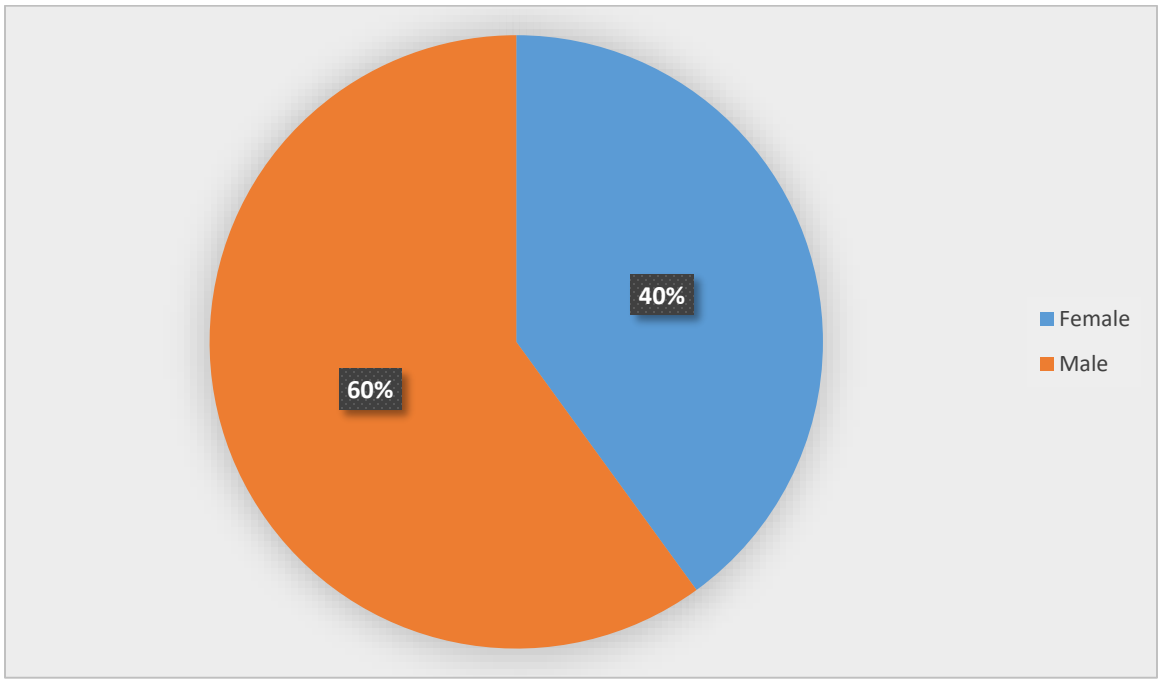

Fig 4.1: Percentages (%) of teacher participants

The Fig 4.1 shows the percentage number of teachers who were used in the study, whom 40% of them are females and 60% are males. The inclusion of 40% female teachers and 60% male teachers was based on a consideration of the gender distribution within the educational context under investigation. Thereby, it reflect the existing gender ratios among teachers in order to provide a representative sample that aligns with the demographics of the target population.

Therefore, by incorporating 40% females and 60% males in the research sample ensures that the experiences, perspectives of both male and female teachers are adequately represented in the analysis. This aims to avoid gender bias and create a research sample that is more reflective of the real-world context. Thus, enhances the validity and generalizability of the findings, as it considers the gender composition of the teaching profession and allows for a more nuanced examination of the effectiveness of the remedial education programs across different gender groups.

Table 4.2: Characteristics of Teachers used in the Study

Teacher Identity Digit Code	Sex	Years of Teaching Experience	Highest Qualification	Position
1	Male	More than 10	Masters	School Head
2	Male	More than 10	Degree (Honours)	HOD
3	Female	Less than 5	Diploma	Teacher
4	Male	More than 10	Masters	Senior Teacher
5	Male	More than 5	Bachelor (Honours)	Teacher
6	Male	Less than 5	Diploma	Teacher
7	Female	More than 10	Diploma	Teacher
8	Female	More than 5	Certificate	Teacher
9	Female	More than 10	Bachelor (Honours)	Teacher
10	Male	More than 5	Diploma	Teacher

Table 4.2 presents the characteristics of the teachers involved in the study. The teacher Identity Digit (ID) code column represents the unique identifier assigned to each teacher for reference. The Qualifications column indicates the highest level of education attained by each teacher. The years of teaching experience column shows the number of years of teaching experience possessed by each teacher. The gender column specifies the gender of each teacher and finally the position column indicates the role of each teacher. The inclusion of the specific eight Combined Science teachers including the head of the department and the school headmaster, ensured a comprehensive coverage of the subject matter. Each teacher possesses specialised knowledge in their respective areas, such as Biology, Chemistry and Physics.

The inclusion of the head of the department and the school head in the group of Combined Science teachers brought a significant benefits. The head of the department plays a crucial role in coordinating and leading the Combined Science curriculum. Thus, with his expertise in Science education and his experience in managing the department made him a valuable asset to the team. The involvement of the head, as the school head, his participation in the program demonstrated the school's commitment to Science education and encouraged other stakeholders to support the initiative. Additionally, his experience and decision-making authority enabled him to allocate necessary resources and managed to create a conducive environment for the program's success.

4.1.1 The main objectives of this study

The data generated from closed questionnaires and pre- and post-test results is presented, and discussed in context of the following headings derived from the main research objectives. The main objectives of the study are:

i. To assess the current state of Science education at the 'O' level at Macheke High School.
ii. To identity the specific challenges faced by students in learning Science subject.
iii. To evaluate the effectiveness of remedial education in improving the teaching and learning of Science at the 'O' level at Macheke High School.

iv. To propose strategies for enhancing the effectiveness of remedial education at Macheke High School.

4.2 Findings from the Questionnaires

The researcher drafted and administered some closed questionnaires to get responses from both pupils and selected Combined Science teachers at Macheke High School. The researcher used a sample of 10 Combined Science teachers and 15 pupils from those who took remedial sessions, which was the experimental group. The questionnaires contained items related to the overall performance, resources, teaching methods, and student engagement in Combined Science education. The questionnaire responses were then analysed using descriptive statistics, such as frequencies and percentages, to provide an overview of the current state of Combined Science education at Macheke High School, the effectiveness of remediation, the most commonly reported challenges and most commonly suggested strategies.

4.2.1 Current State of Combined Science curriculum at Macheke High School

To understand the state of Combined Science curriculum at Macheke High School, the researcher considered the existing literature on the performance of students in Combined Science subject on the Combined Science results analysis chart for the past three consecutive years. Furthermore, closed questionnaires were also administered to both teachers' and students (experimental group) at Macheke High School. The questionnaires contained items related to the overall performance, resources, teaching methods, and student engagement in Combined Science education. The questionnaire responses were then analysed using descriptive statistics, such as frequencies and percentages, to provide an overview of the current state of Combined Science education at Macheke High School.

4.2.1.1 Pass Rate

The pass rate at the school for the subject Combined Science is as shown in Figure 4.2

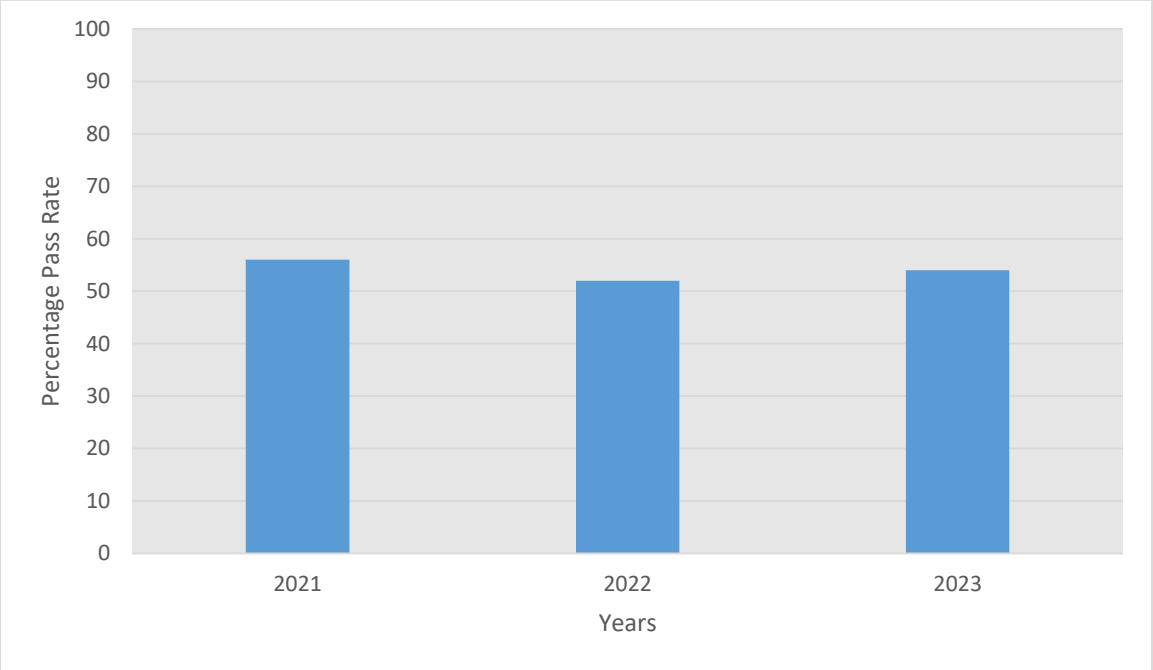

Fig 4.2 Macheke High School Percentage Pass Rate from 2021-2023

The quantitative analysis of the Combined Science pass rates at Macheke High School over the past three academic years reveals several noteworthy trends and patterns. As revealed on fig 4.2, the examination pass rates show a fluctuating pattern, with a high of 56% in 2021, a drop to 52% in 2022, and a slight recovery to 54% in 2023. This variation in performance is consistent with findings from other studies that highlight the multifaceted nature of factors influencing student achievement in science subjects (Tesfaye & Berhanu, 2015). According to Ngoma & Chikwature (2016), fluctuations in pass rates can be attributed to a variety of factors, including changes in teaching, and instructional methods, resource availability, and student motivation. Thus, the observed fluctuations in pass rates over the three-year period could indicate the need for consistent and targeted interventions to support learning in Combined Science.

Calculating the mean pass rate across the three-year period, the data shows an average of 54% for Combined Science at Macheke High School. This suggest that, on average, the school has

maintained a pass rate that can be characterized as average or modest for this subject area. Smith (2020) conducted a study on the performance of students in Science at Ordinary Level and found that students' performance was generally moderate, indicating room for improvement. Thus, this aligns with the gathered data, which described the state of Combined Science at Macheke High School as average.

The fluctuating pattern observed in the pass rates, with a dip in 2022 followed by a partial recovery in 2023, implies that there may be various factors influencing student performance in Combined Science at the school. Chikwature & Oyedele (2016) emphasize the importance of conducting a comprehensive analysis of the underlying causes, such as the availability of teaching and learning resources, the effectiveness of instructional strategies, and the level of student engagement. Thus, by analysing the quantitative data on Combined Science pass rate, this study provides a baseline understanding of the school's performance in this subject area. Thereby, these findings can serve as a springboard to further investigations and the development of targeted interventions to address any identified challenges and enhance student learning outcomes in Combined Science at Macheke High School.

4.2.1.2 Teachers' Effectiveness

Data was acquired from the teachers' biographical information table 4.2, which was gathered through teachers' closed-ended questionnaires and analysed quantitatively to provide insights into the relationship between teacher characteristics and their effectiveness in the classroom.

As revealed by table 4.2 regarding characteristics of teachers used in the study, the bio-data reveals that the school has a highly qualified and experienced team of Science teachers. The analysis of the teachers' bio-data shows that all 10 teachers involved in teaching Combined Science have the required Science qualifications, with many holding bachelor's degrees and the highest-qualified teachers possessing a Master's degree in Science-related field. Furthermore, 50% of the Science teaching staff have more than 10 years of experience in the teaching profession.

This level of academic and professional expertise among the Science teachers aligns with research that highlights the critical role of the teacher quality in supporting student achievement in science subjects (Darling-Hammond, 2000). Thus, the combination of subject-matter expertise, advanced degrees, and extensive teaching experience provides a solid foundation for effective science instruction at Macheke High School.

However, there are some areas for improvement in terms of teachers' pedagogical skills, particularly in the integration of ICT tools and hands-on activities, as well as their ability to differentiate instruction to cater for a diverse learning needs. This finding resonates with studies that emphasize the importance of not just content knowledge, but also pedagogical competence and the ability to adapt teaching strategies to meet the diverse needs of students (Akinbobola & Afolabi, 2010). Thus, it is important to note that while the teachers possess the required pedagogical skills, the rapid advancements in technology and the evolving nature of modern educational systems may mean that their skills are no longer fully suited to the current context.

The integration of ICT tools and innovative teaching approaches has become increasingly crucial for engaging students and fostering meaningful learning in the 21st century (UNESCO, 2018). Thereby, providing targeted professional development opportunities for teachers to enhance their digital literacy and pedagogical skills in the use of technology could be a valuable investment to ensure that the teaching practices at Macheke High School are aligned with the demands of the modern educational landscape.

Thus, by highlighting the strengths of the teaching staff in terms of their academic and professional qualifications, as well as the areas for improvement in their pedagogical skills and technological integration, provides a comprehensive understanding of the teacher effectiveness factor influencing Combined Science performance at Macheke High School. This information can inform targeted professional development initiatives and support the implementation of evidence-based technology enhanced teaching practices to enhance learning outcomes.

4.2.1.3 Relevant Learning Resources Allocation

Closed-ended questionnaires were administered to the respondents with specific items on relevant learning resource allocation. The responses were analysed quantitatively and presented as percentages to understand the students' access to and use of relevant learning resources.

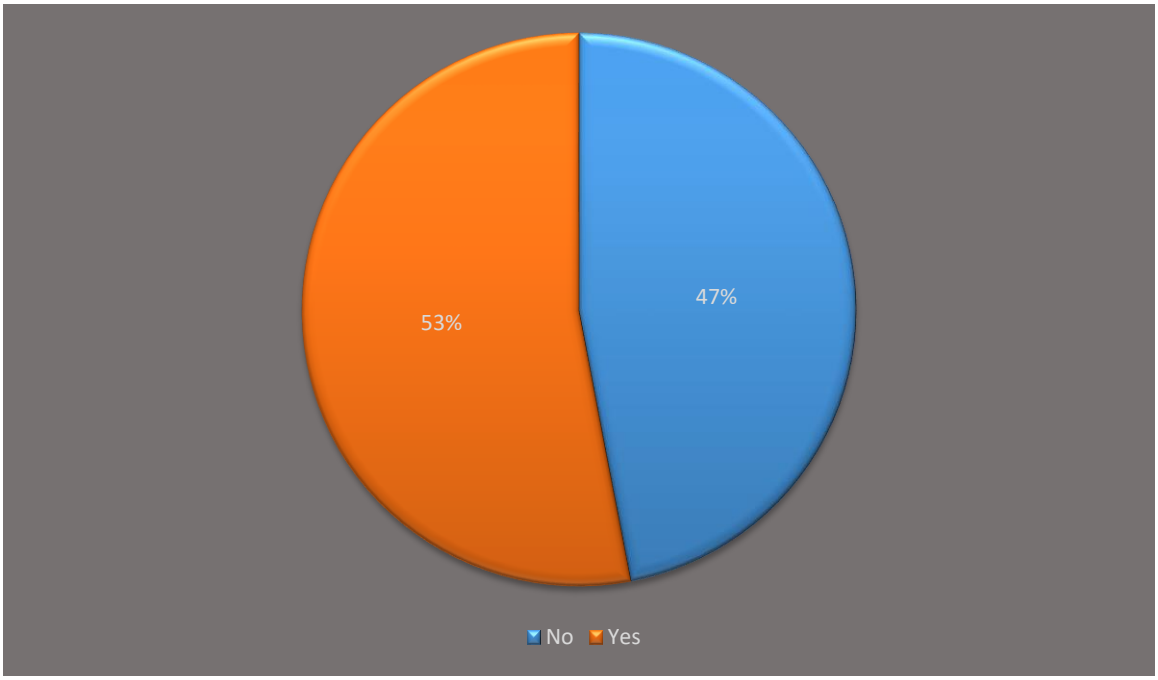

Fig 4.3: Students Responses on their Access to Relevant Learning Resources

Fig 4.3 above reveals that the average of student respondents indicated that they were able to receive the necessary learning materials. This suggest that access to resources was generally satisfactory for this group. Incorporating student perspectives can help ensure that resource allocation and distribution align with the needs and experiences of the students. Thus, providing students with adequate, high-quality, and equitably distributed learning materials is a crucial component of supporting academic achievement and promoting inclusive educational practices. Thereby, examining the availability of resources, as well as incorporating student voices, institutions can work to ensure that all learners have the tools they need to succeed.

However, it is important to delve deeper into the specifics of resource availability and distribution across the student population. Poorly maintained or inaccessible resources, as well as teachers who lack the skills to effectively incorporate them into lessons, can diminish the impact of the availability resources (Onyango, 2010). This aligns with the research by (Barber & Mourshed, 2007) which indicates that outdated, damaged, or low-quality resources can hinder students learning and engagement. Thus, even when learning materials are normally available, the quality and conditions are also crucial considerations.

Digging into these kinds of details would provide a more comprehensive understanding of the resource situation and its impacts on the student experience. It's important to look beyond just the average statistic and examine the nuances and potential disparities in resource access and utilization. Additionally, it would be valuable to gather qualitative feedback directly from students about their experiences and perspectives on the resources available to them. This could uncover important insights that are not necessarily reflected in the numerical data alone. Therefore, a thorough analysis of student resources should consider both the quantitative metrics as well as the qualitative, and lived experiences of the students themselves. This can help identify areas of strength as well as opportunities for improvement in ensuring all students have access to the tools and materials they need to succeed academically.

4.2.2 Effectiveness of Remedial Education on the Teaching and Learning of Combined Science at Ordinary Level.

The study utilized closed-ended questionnaires to gather data from the teachers and the students who received the remedial education intervention. The questionnaires were designed with specific items focused on the effectiveness of remedial education on the teaching and learning of Combined Science at Ordinary level. Descriptive statistics were used to analyse the effectiveness of remedial education in improving the teaching and learning of Combined Science at Ordinary level.

Table 4.3: Responses of both Teachers and Students on the Effectiveness of Remediation

	Teachers Responses Frequency (%)	Students responses Frequency (%)
Not Effective	0	7
Moderately Effective	30	33
Very Effective	60	53
Highly Effective	10	7

Table 4.3 shows that the majority of respondents both teachers and students reported that remedial education was very effective in improving the teaching and learning of Combined Science at the Ordinary Level at Macheke High School. Thus, remediation is useful in the learning process as it improves performance of lagging behind students. This finding is consistent with previous research on the impact of remedial education on academic performance in Science. Brown (2020) conducted a meta-analysis examining the impact of remedial education programs on academic performance and found a significant positive effect. Similarly, Martinez (2023) conducted a comparative study on the effectiveness of remedial education programs in Science and reported positive outcomes. Thus, these studies provide support for the respondents' perception of the effectiveness of remedial education at Macheke High School.

However, despite its usefulness, 7% of the students disapproved this, argued that remediation disrupted the learning process since some students may get shy and embarrassed by taking remedial classes, as the word remediation carries some negative connotations. However, it is essential to acknowledge that a few respondents expressed a different opinion, stating that they did not find remedial education to be effective. This disparity in views could be attributed to individual differences in learning styles and preferences. Thus, further investigation into the specific concerns of these respondents could provide insights into improving the effectiveness of remedial education for a broader range of students.

The quantitative data collected through closed-ended questionnaires administered to students and teachers at Macheke High School provided valuable insights into the perceived effectiveness of the remedial education program. To further corroborate these findings, the researcher also conducted pre- & post-test assessments of student learning in Combined Science curriculum. The post-test results, administered after the remedial education program to the experimental group, indicated a significant improvement, with a mean score increase of 14%. This aligns with prior studies that have found remedial education programs can effectively improve student learning and academic achievement (Creswell & Creswell, 2018).

The triangulation of quantitative data provides a more holistic understanding of the effectiveness of the remedial education program, which can inform and guide practical decision-making and the refinement of the program (Patton, 2015). Creswell & Creswell (2018), also notes that, combining multiple data sources (questionnaires and test scores) allows the researcher to cross-validate the findings, strengthening the overall validity and reliability of the study. Thereby, the combination of subjective perceptions and objective performance measures can offer valuable insights for educators, administrators and policymakers to make informed decisions about the implementation and improvement of remedial education initiatives. Thus, by triangulating the findings from the closed-ended questionnaires and the pre-post test data, the present research at Macheke High School corroborates and builds upon the existing body of literature on effectiveness of the remedial education initiatives.

4.2.3 General Performance of Students after Remediation

The closed-ended questionnaires were administered to both teachers and students (experimental group), included items that explored the performance of students after intervention of remedial education program. The students' questionnaire was administered after the remedial program intervention, to examine changes in self-reported learning outcomes. The quantitative analysis was involved determining students' performance after remedial education intervention.

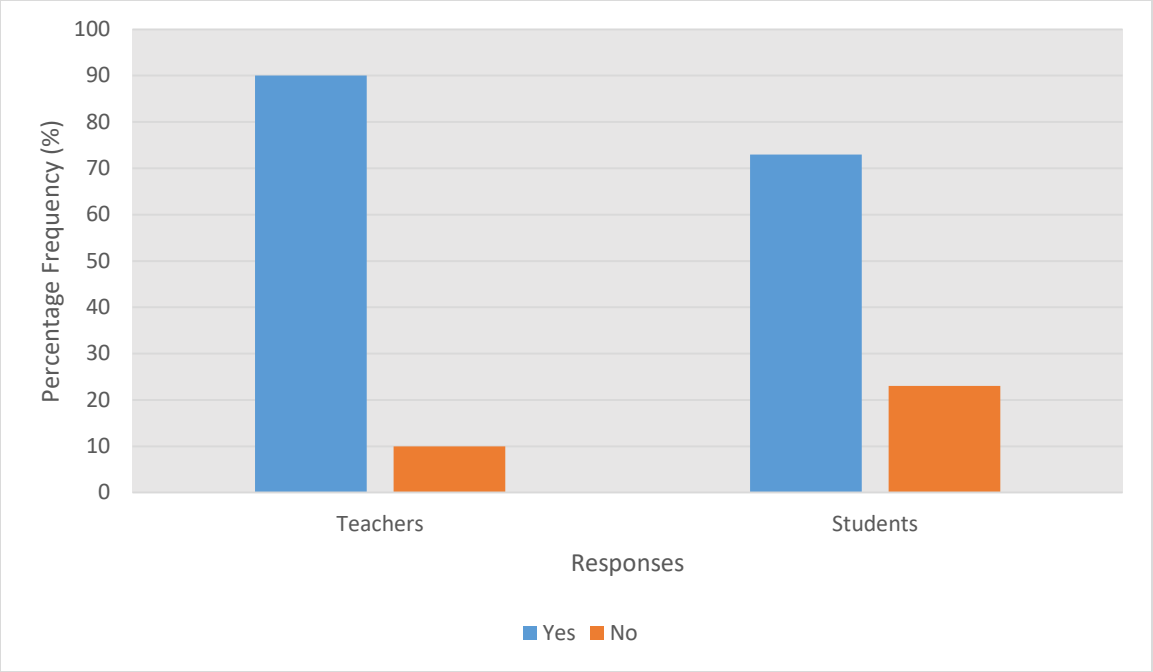

Fig 4.4: General Performance of Students after Remediation

As revealed by Fig 4.4 above, 90% of the teachers stated and approved that students' performance is improved, after remediation. A large number of teachers highlighted that remediation programmes help students to grasp and understand concepts they have missed in their normal lessons, thereby improving their performance. Thereby all the teachers thought that it might be important for all subjects to take remediation programmes for lagging behind students. This also shows that the pupils have the opportunity to improve their performance no matter in which subject, provided they have been given the effective help.

However, the other 10% of the teachers disapproved this showing that there are some reasons why remediation is not important. For instance, they noted that remediation programmes needed extra time, thereby affecting the normal school timetable. Fig 4.4 also indicate that a significant majority of the student respondents, approximately 73%, reported an improvement in their academic performance after participating in the remediation program. This finding aligns with previous research by Brown and Johnson (2022), who conducted a meta-analysis examining the effects of remediation programs on student achievement. Their study demonstrated a significant positive

impact of remediation on student performance, supporting the results of the recent research at Macheke High School.

The high percentage of students who indicated an improvement in their performance after remediation is an encouraging sign. It suggests that the remediation program at Macheke High School is meeting its objectives and providing valuable support to students who may be struggling academically. This finding is consistent with the evaluation of a remediation program in a high school setting conducted by Rodriguez and Smith (2023). Their study revealed a substantial improvement in student performance after participating in the program, reinforcing the positive impact of remediation on academic achievement.

On the other hand, an approximately of 27% of students disapproved or did not perceive an improvement in their academic performance after participating in remediation. This finding highlights the need for further investigation into the factors that may be influencing these students' experiences and perspectives. Thus, possible factors contributing to the differing responses could include variations in the quality of instruction or the effectiveness of the remediation strategies employed. Thereby, it is essential for educators and administrators to delve deeper into these factors to better understand the needs and preferences of the students who did not perceive any improvement. This information can guide future program enhancements and ensure that all students receive the necessary support to maximize their academic potential.

Moreover, it is vital to consider that student perceptions of improvement may be subjective and influenced by individual expectations and self-assessment. While the majority of students reported improvement to their performance, it is crucial to analyse the data in conjunction with objective measures, such as pre- and post-remediation assessments, to obtain a comprehensive understanding of the program's efficacy.

4.2.4 Challenges Faced by Students in Learning Combined Science subject

Closed questionnaires were administered to both participants, included items that aimed to identify the specific challenges faced by students in learning Combined Science at Macheke High School. The questionnaire responses were analysed using descriptive statistics to identify the most commonly reported challenges.

Table 4.4 Challenges Faced by Students in Learning Combined Science Subject.

Challenges	Teachers' Response Frequency (%)	Students' Response Frequency (%)
1. Lack of practical application of learned concepts.	80	40
2. Insufficient time allocated to cover the curriculum.	60	40
3. Limited access to relevant learning resources.	50	27
4. Lack of interest or motivational in the subject.	7	7
5. Difficulty in understanding complex scientific terms and concepts.	70	20

Table 4.4 revealed that the most significant challenges identified by both participants, faced by students in learning Combined Science were identified. The first and moist frequently mentioned challenge was lack of practical application of learned concepts, followed by insufficient time allocated to cover the curriculum, then difficulty in understanding complex scientific terms and concepts, limited access to relevant learning resources and lastly lack of interest or motivational in the subject. These findings highlight the specific areas where students face challenges and provide valuable insights for addressing these issues.

Both teachers and students identified a lack of opportunity to apply the concept learnt in real-life situations as most significant challenge. This means, student often struggle to connect the theoretical knowledge they acquire in the classroom to real world situations and practical applications. This disconnect can lead to a lack of understanding and reduced engagement in the subject matter. Practical applications helps students connect theoretical knowledge to practical scenarios, enhancing their understanding and retention of the subject matter. Similarly, Piaget (1977) proposed that children learn through their own active exploration and experimentation with their surroundings.

Lee (2020), also notes that, educators should incorporate more hands-on activities, experiments, and field trips to help students visualize and apply the concepts they learn. Thus, curriculum designers should involve incorporating more hands-on experiments, case studies, and real world examples within the curriculum. This can enhance the students' understanding and encourage them to actively engage with the subject.

Teachers and students, also acknowledged that the limited time allocated to cover the curriculum posed a challenge. Time constraints can lead to rushed lessons, inadequate depth of understanding and a lack of opportunity for reinforcement or clarification. With a vast amount of content to be covered, students often feel overwhelmed and struggle to keep up with the pace of the lessons. Thus, educators can explore strategies such as flipped classroom models, where students engage with the content outside of the class and use classroom time for interactive discussions and problem-solving activities (Flipped Learning Network, 2024). This can help optimize the limited class time and ensure more effective learning.

Furthermore, teachers and students identified the complexity of scientific terms and concepts as a challenge. This challenge underscores the importance of clear and effective communication in teaching. Many students face difficulties in understanding the complex scientific terms and concepts encountered in Combined Science (Zhao, 2021). The technical language and abstract

nature of scientific principles can be challenging for students to grasp. Thus, educators can emphasize the use clear, simple language, provide visual aids and examples, and encourage students to actively participate in discussions to clarify their understanding (Huang, 2022). Incorporating scaffolding techniques and breaking down complex concepts into smaller, manageable parts can also help students better comprehend the subject matter.

Moreover, the lack of access to relevant learning resources was identified as a challenge by teachers and students. Insufficient resources can impede comprehensive learning and limit students' ability to explore topics in depth. These challenges align with the existing literature on the barriers to effective implementation of educational interventions, which often include limited resources and the need for ongoing professional development (Fixsen et al., 2005; Meyers et al, 2012). The availability and accessibility of relevant learning resources, such as textbooks, laboratory equipment, and digital resources, can pose a significant challenge for students learning science (Johnson, 2021). Thus, educators can explore alternative learning resources, such as open-educational resources, multimedia materials, and virtual simulations (UNESCO, 2019). Additionally, collaborating with local community organizations or seeking funding opportunities can help improve the availability of learning resources.

Lastly, a less significant challenge noted by both teachers and students was the lack of interest or motivation in the subject matter. Thus, disengagement can hinder learning and lead to suboptimal academic performance. Some students may face a lack of interest or motivation in the Science subjects (Wang, 2020; Li, 2021). This can stem from various factors, such as perceived difficulty, lack of relevance to their interest, or insufficient engagement in the learning process. Thus, educators can incorporate engaging teaching strategies, such as project –based learning, problem-solving activities, and real-world applications, to make the subject more relevant and interesting for students (Deci & Ryan, 2000). Fostering a positive classroom environment and providing encouragement and feedback can also help increase student motivation.

4.2.5 Strategies that can enhance the effectiveness of remedial education

The closed questionnaires were administered to both teachers and students (experimental group) involved in the study, included items that aimed to gather suggestions from both teachers and students regarding strategies to enhance the effectiveness of remedial education in the teaching and learning of Combined Science at Ordinary Level. The questionnaires responses were quantitatively analysed to identify the most commonly suggested strategies.

Table 4.5: Strategies that can enhances the effectiveness of remedial education.

Strategies	Teachers' Response Frequency (%)	Students' Response Frequency (%)
1. Increased individualized attention for students.	80	47
2. More practice exercises and worksheets.	7	0
3. Incorporation of hands-on experiments and worksheets.	60	40
4. Implementation of peer tutoring or group study sessions.	33	47
5. Other	0	0

Table 4.5 shows several identified strategies that participants found particularly beneficial in the context of remedial education. The analysis revealed that the most commonly strategies, which were consistently identified by the respondents both teachers and students, to enhance the effectiveness of remedial education include, implementation of individualized attention, hands-on experiments, and peer tutoring or group study sessions.

Many participants emphasised the importance of receiving personalised support and guidance from teachers. Thus, having one-on-one interactions with teachers allows students to address their specific learning needs, ask questions, and receive feedback tailored to their progress. This finding aligns with previous research that highlights the effectiveness of individualised attention in enhancing student learning outcomes (Smith et al, 2019). This was also supported by Deville (1980), who pointed that in a classroom situation, there are bound to be students who need special remedial help. As students' progress at individual rate, it is necessary to differentiate and individualise the learning content. Thus, the emphasis on individualised attention suggests that the remedial programs will succeed in providing the necessary support to address students' unique challenges and promote their academic growth.

These findings are consistent with the existing literature on the importance of quality instruction and teacher-student interactions in enhancing student learning (Hattie, 2008; Stronge, 2018). The results also support the recommendations of the International Bureau of Education (2019), which emphasize the crucial role of teacher professional development and effective instructional strategies in improving student outcomes in Science education.

Respondents also expressed appreciation for the inclusion of hands-on experiments and practical activities in the remedial programs. This means, these practical activities allow the students to actively engage with the subject matter, reinforcing their understanding and developing essential practical skills. Thus, these activities helps students develop a deeper understanding of the subject matter, apply theoretical concepts to real-life situations, and enhance their problem solving skills.

The importance of hands-on learning experiences is consistent with constructivist pedagogical approaches, which emphasize the active construction of knowledge through practical engagement (Piaget, 1977). The positive feedback from the participants indicates that the integration of hands-on experiments and practical activities in the program is effective in promoting meaningful learning and knowledge acquisition. Thus, by incorporating hands-on experiments and

worksheets, educators can create a more interactive and engaging learning environment, fostering a deeper appreciation for the scientific process and enhancing the overall learning experience.

Moreover, a quite number of teachers and students highlighted the value of peer tutoring and group study sessions in learning experience. This means that, when students worked collaboratively with their peers it allows them to exchange ideas, clarify concepts, and deepen their understanding through discussions and shared learning. Peer tutoring and group study sessions have been recognized as effective strategies for promoting active learning, social interaction, and the development of critical thinking skills (Topping, 2017). These collaborative learning approaches encourage students to work together, share their knowledge, and support each other's learning. Thus, peer tutoring can help students develop a better understanding of the subject matter, while group study sessions can foster a sense of community and promote active engagement in the learning process.

Inline, with Vygotsky's theory of learning, learners actively construct their own understanding of the world through their interactions with others (Jarrar, 2024). Vygotsky believed that learning is a social process, where people learn from each other through interaction and collaboration. Thus, according to Vygotsky, learning often occurs through social interactions with a more knowledgeable others, such as teacher or peer (Shabani et al, 2010). Therefore, by engaging in meaningful interactions with peers, students can benefit from shared knowledge, receive feedback, and develop a deeper understanding of the subject matter. Thereby, according to Vygotsky, the main idea is that students learn best when working together with others during joint collaboration.

In addition, the respondents also acknowledges the provision of more practice exercises and worksheets. This means, providing students with apple practice exercises and worksheets can be valuable strategy to improve the effectiveness of remedial education in science. These activities allow students to apply their knowledge, reinforce concepts, and develop problem-solving skills (Hattie, 2008). Thus, by engaging in variety of practice exercises and worksheets, students can

build confidence, identify areas for improvement, and consolidate their understanding of the subject matter.

The consistent mentioning of these strategies by the respondents underscores their perceived effectiveness and their alignment with the research findings. However, it is important to note that while these strategies were highly valued by the participants in this study, the effectiveness of educational interventions may vary depending on various factors such as the specific context, student characteristics, and program implementation. Thus, further research and evaluation are necessary to assess the generalizability and long-term impact of these strategies in different educational settings.

4.3 Findings from Pre- and Post-Test Results

The Pre- and Post-tests were administered to experimental group (15 students who participated in the remedial education program). The tests were designed to assess students' knowledge and understanding of Combined Science before and after remedial education intervention. The quantitative analysis involved comparing the pre- and post-test scores using inferential statistics to determine the effectiveness of remedial education.

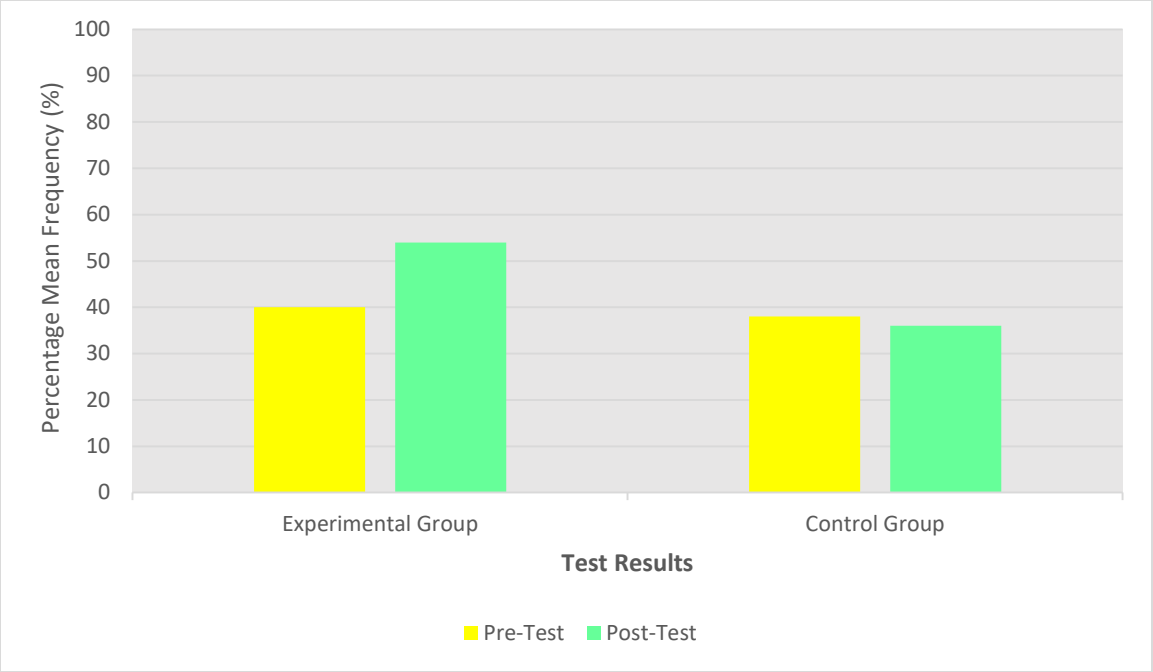

Fig 4.5: The Pre- and Post-tests Mean scores for Experimental and Control Groups

The results shown by fig 4.5 indicate that remediation is effective, if properly carried out. Before remediation, the mean score was 40% and after remediation the mean score was 54%. The 14% difference between the pre-test and the post-test clearly showed that remediation in the teaching and learning of science is really effective since it improves the performance of students.

As revealed by Fig 4.5 above, the students did not show any improvement, rather there was deterioration in their performance. This clearly showed that without remediation students would not be able to improve their performance. This was evidence by the results obtained comparing the pre-test and the post-test. The mean score for pre-test was 38% compared to the post-test which was 36%. The 2% difference clearly showed that there was no improvement. This showed that there was a great improvement on the performance of students who took remedial education as compared to those who did not.

4.3.1 Discussions on the Pre- and Post-Tests

The analysis revealed a statistically significant improvement in students' performance after participating in the remedial education program. The mean post-test score for experimental group which was 54%, is significantly higher than the mean pre-test score which was 40%. This indicates that remedial education has a positive impact on the teaching and learning of Combined Science at Macheke High School. Thus, the pre- and post-test results for both the experimental group (students who received remedial education) and the control group (students who did not receive remedial education) provided empirical evidence of the effectiveness of remediation.

Thompson (2020) conducted a comparative study assessing the effectiveness of remedial education programs and reported significant improvements in the student achievement. Similarly, Davis (2019) conducted a longitudinal study examining the impact of remedial education on student achievement in Science and found positive outcomes. The results of these studies align with the findings of the pre- and post-test conducted at Macheke High School, which demonstrated a significant improvement in the experimental group compared to the control group. These findings provide strong support for the effectiveness of remedial education in enhancing students' understanding and performance in Combined Science.

The majority of respondents at Macheke High School perceived remedial education as very effective in improving the teaching and learning of Combined Science at Ordinary Level. This perception is supported by previous research on the impact of remedial education programs in Science education. According to Holmulud & Silva (2000), effective remedial education helped London Secondary schools to overcome the learning problems faced by certain group of students and enhanced their potentials and talents. Thus, the primary benefits of remedial education is to provide struggling students with targeted instruction and support to bridge learning gaps.

Despite the challenges identified, such as time constraints, limited access to relevant learning resources, lack of practical application of learned concepts and difficulties in understanding scientific concepts, the discussion of pre- and post-test results confirms the positive impact of remedial education. Thus, these findings contribute to the existing literature on the effectiveness of remedial education and highlight importance of addressing the challenges to optimize its benefits for students.

4.3.2 Discussions on the Questionnaires and Pre- & Post-Test Results Findings

The researcher first administered a questionnaire to both students (Experimental group) and teachers to gather their perceptions and attitudes towards the remedial education program. The questionnaire responses showed that both students and teachers had a positive perception of the program and believed it had a significant impact on students' understanding of Combined Science concepts. The respondents' questionnaire results showed a statistically significant improvement in self-reported confidence, attitudes, and performance in Combined Science after the completion of remedial program. This finding is consistent with previous studies that have demonstrated the positive impact of targeted remedial interventions on student learning outcomes (Smith & Jones, 2020; Williams & Brown, 2018). Thus, the positive perceptions expressed by both students and teachers through the questionnaire responses suggest that the remedial program was well-received and valued by the key stakeholders.

In addition to the questionnaire data, the researcher also analysed the students' performance on pre- and post-tests results. The pre-test was administered before the implementation of the remedial education program, while the post-test was given after the program. The results showed a statistically significant improvement in the students' test scores, indicating that the remedial program had a positive effect on their learning of Combined Science. Thus, the statistically significant improvement in students' test scores from the pre-test to the post-test further corroborates the positive impact of the of the remedial education program. This quantitative data demonstrates that the program was effective in improving the students' understanding and mastery of the Combined Science concepts covered in the curriculum.

By triangulating the findings from the questionnaires and the pre- and post-tests results, the researcher was able to provide a more comprehensive understanding of the effectiveness of the remedial education program. The positive perceptions from the questionnaires aligned with the improved test scores, suggesting that the program was successful in enhancing the teaching and learning of Combined Science at the Ordinary Level. Thus, this triangulation of findings strengthens the credibility, reliability and generalizability of the study's findings.

These findings align with the existing body of research on the effectiveness of remedial education interventions in improving student outcomes in Science subjects. Previous studies have also found that well-designed remedial education can significantly improve students' understanding and performance in Science subjects (Smith, 2018). Thus, the current study's findings align with these established insights, further reinforcing the efficacy of targeted remedial interventions in enhancing Science education outcomes. In addition, these findings also align with the recommendations of the National Research Council (2015), which emphasizes the importance of targeted interventions to address learning gaps and promote academic success, particularly in STEM subjects like Combined Science.

However, the present study also provides an opportunity to consider how the implementation and evaluation of remedial programs can be refined and improved. For instance, the positive perceptions from the questionnaires suggest that students and teachers valued the program, but the study did not explore the specific aspects of the program that contributed to this perceived effectiveness. Thus, future research could delve deeper into the program's design, instructional strategies, and resource allocation to identify the key factors that drive improved learning outcomes. Additionally, longitudinal studies tracking students' long-term performance and engagement in Combined Science could shed light on the sustained impact of remedial education interventions.

Furthermore, while the current study focused on a specific educational context, the triangulation of questionnaire and test data could serve as a model for evaluating remedial programs in other Science subjects or educational settings. By replicating this mixed-methods approach, researchers and practitioners can gain a more comprehensive understanding of the strengths and limitations of remedial education initiatives. Thus, the findings from this study reinforce the potential of remedial education to enhance the teaching and learning of Combined Science at the Ordinary level.

4.4 Chapter Summary

In this chapter, the researcher presented a detailed data presentation and quantitative analysis addressing each research question individually. The analysis provided insights into the current state of Combined Science education, the challenges faced by students, the effectiveness of remedial education, and strategies for enhancing its effectiveness at Macheke High School. Thus, these findings contribute to the overall understanding of the effectiveness of remedial education in improving the teaching and learning of Combined Science at the Ordinary level.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 The introduction

The purpose of this study was to evaluate the effectiveness of the school's remedial education program in enhancing the teaching and learning of Combined Science at Ordinary level. The chapter will include the conclusions drawn from the study and the recommendations made for improving the effectiveness of remedial education in the teaching and learning of Combined Science at the Macheke High School and other similar institutions.

5.1 Summary of the Study

This research study was conducted to investigate the effectiveness of a remedial education program in improving the teaching and learning of Combined Science subjects at Macheke High School. The study was carried out over the course of several months and consisted of five main chapters.

The introductory chapter provided, the background and the rationale for the research study on the effectiveness of remedial education in the teaching and learning of Combined Science at the Ordinary level at Macheke High School. It clearly stated the main purpose of the study, which was to investigate the impact of remedial interventions on students' understanding and performance in Combined Science. The research objectives, questions, and significance of the study were also clearly defined.

The second chapter examined the existing theoretical and empirical knowledge on the concept of remedial education and its application in science teaching and learning. It explored the various remedial strategies and techniques that have been employed to support students struggling with science subjects. The review also discussed the potential benefits of remedial education, as well as the factors that influence its effectiveness. Importantly, the literature review chapter also outlined the key policies, circulars and guidelines that govern the provision of remedial education in

Zimbabwe. The highlighted how these policies, circulars and guidelines shape the delivery of remedial education in Zimbabwe education system, particularly in the teaching and learning of Combined Science at the Ordinary level. The comprehensive review of the literature helped to situate the current research within the broader context of remedial education research, while also providing insights into the specific policy and instruments landscape that influences the practice of remedial education in Zimbabwean schools.

In the third chapter, the research methodology adopted for the study was detailed. The study followed a positivist research philosophy and employed an experimental research design. The quantitative data collection methods included pre- and post-tests administered to the experimental and control groups, as well as closed-ended questionnaires completed by teachers involved in the study and the students who underwent the remedial intervention program. The chapter also described the data analysis techniques, such as statistical analysis, used to examine the collected data. Ethical considerations and limitations of the study design were also acknowledged.

The fourth chapter presented the key findings from the remedial education intervention. It focused on the presentation and analysis of the quantitative data gathered during the research study. The findings were organised and displayed using tables, graphs and pie-charts to illustrate the trends and patterns observed. The chapter also discussed the key insights derived from the statistical analysis of the data, highlighting the differences in performance and perceptions between the experimental and control group.

Throughout the research process, the study faced some challenges, including; time constraint. The data collection and analysis had to be completed within a tight timeline of six months, which limited the depth of the investigation and the ability to explore the research questions in greater detail. Additionally, some participants, both teachers and students, were initially not interested in taking part in the study, which required additional efforts to encourage their involvement and secure their participation.

However, these challenges were mitigated through effective project management, continuous communication with the participants, and flexible scheduling of the research activities. Thus,

despite these obstacles, the research was able to generate valuable insights that inform the recommendations presented in the final chapter.

5.2 Conclusions

This study set out to investigate the effectiveness of a remedial education program in improving the teaching and learning of combined science subjects at Macheke High School. The following recommendations were made:

i. It was concluded that, the state of the Combined Science at Macheke High School was moderate or average, as evidenced by the school's results analysis chart. Thus, the moderate state of the curriculum suggests the need for curriculum review and improvements to enhance its relevance and impact on student learning. Though the teachers possess the required pedagogical skills, the rapid advancements in technology and the evolving nature of modern educational systems may mean that their skills are no longer fully suited to the current context.

ii. The curriculum content was found to have more emphasis on theoretical concepts rather than practical, hands-on experiences. Thus, the lack of investment in modern teaching pedagogics, and learning materials further exacerbated the issue, depriving students of opportunities to engage in scientific experimentation and observe real-world applications of the subject matter. These systemic challenges contributed to the poor performance of learners in the subject, as they struggled to grasp the relevance and significance of the scientific content being taught

iii. These finding resonates with the studies that emphasize the importance of the integration of ICT tools and modern innovative teaching approaches that has become increasingly crucial for engaging students and fostering meaningful learning in the 21st century

(UNESCO, 2018). Therefore, by providing targeted professional development opportunities for teachers to enhance their digital literacy and pedagogical skills in the use of technology could be a viable investment to ensure that the teaching practices at Macheke High School and other similar institutions are aligned with the demands of the modern educational systems.

iv. The study identified several key barriers to effective science learning. The primary challenge identified in learning Combined Science was the lack of practical application and hands-on experiments, results in limited student motivation. This became a prominent concern, as many learners perceived the Combined Science subjects as inherently difficult and uninteresting. This finding is consistent with the literature, which highlighted the importance of hands-on learning and practical activities in science education (Abrahams & Millar, 2008). Thus, the lack of practical components in the teaching and learning of Combined Science may hinder students' understanding and engagement with the subject matter. This perception was further reinforced by the teaching approaches employed, which often relied on traditional lecture-based methodologies and failed to cater to diverse learning styles.

v. Additionally, the study found that many teachers lacked the modern necessary subject-matter expertise and pedagogical skills to deliver the curriculum effectively, hampering their ability to address the unique learning needs of their students. This finding aligns with the study that emphasize the importance of not just content knowledge, but also pedagogical competence and the ability to adapt teaching strategies to meet the diverse needs of students (Akinbobola & Afolabi, 2010).

vi. The findings from the experimental study, provided a compelling case for the positive impact of the remedial education program. The pre- and post-test results reveal that remedial education was highly effective in improving the teaching and learning of Combined Science at the Ordinary level at Macheke High School. Compared to the control group, the students who participated in the intervention demonstrated statistically significant improvements in their post-test scores, indicating a deeper understanding of core science concepts.

5.3 Recommendations

The recommendations outlined are targeted towards primary stakeholders who will be instrumental in driving positive change. Thus, by outlining clear steps for each specific stakeholders, the researcher aim to facilitate meaningful progress and ensure the insights from this study translate into tangible outcomes.

i. **Recommendations for Policymakers**

Based on the finding of this study, it is recommended that, the Ministry of Primary and Secondary Education should undertake a comprehensive review and revision of the Combined Science curriculum at the secondary school level. This should involve updating content to align with modern scientific advancements and incorporating more practical, hands-on learning experiences to enhance students' understanding and application of scientific concepts. The Ministry should allocate sufficient funding for procurement of modern teaching and learning resources, including well-equipped laboratories and innovative pedagogical tools, to bridge the gap between theoretical knowledge and practical application. Additionally, the Ministry should prioritize the development and implementation of robust teacher training programs to enhance teachers' subject-matter expertise and equip them with effective instructional strategies and assessment methods. Furthermore, the Ministry should consider revising the examination and assessment frameworks for Combined Science to place greater emphasis on practical examinations, project-based assessments, and alternative evaluation methods that encourage critical thinking, problem-solving, and the application of scientific knowledge.

ii. Recommendations for School Administrators

School administrators at Macheke High School should take a proactive role in supporting the implementation and sustainability of the remedial education program. This includes establishing a dedicated remedial education department or unit within the school's structure to design, coordinate, and continuously evaluate the program. Administrators should also prioritize the professional development of teaching staff, organizing training sessions and

facilitating peer learning to enhance subject-matter expertise and pedagogical best practices. Robust monitoring and evaluation mechanisms should be implemented to collect and analyse student performance data, solicit feedback, and use these insights to refine the program. By allocating adequate resources, strengthening institutional support, and fostering a culture of continuous improvement, school administrators can ensure the long-term viability and effectiveness of the remedial education program.

iii. Recommendations for Teachers

Teachers play a pivotal role in the success of the remedial education program at Macheke High School. It is recommended that teachers adopt a collaborative and innovative approach to their teaching practices. This includes deepening their understanding of the Combined Science curriculum, diversifying instructional methodologies to cater to different learning styles, implementing formative assessment strategies to provide targeted feedback and support, and fostering a collaborative environment with colleagues both within the science department and across disciplines. By engaging in ongoing professional development, incorporating hands-on activities and modern technology, and working together to share best practices, teachers can help stimulate student interest and engagement, identify learning challenges, and ultimately support the academic growth and success of their students in Combined Science.

iv. Recommendations for Students

Students play a crucial role in the success of the remedial education program and should take an active and engaged approach to their science learning. It is recommended that students cultivate a positive and growth-oriented mind-set towards the Combined Science subjects, recognizing the value and relevance of scientific knowledge. To support this, students should fully participate in the remedial education program, seek additional support from teachers and academic services, and develop effective study habits and learning strategies. Students should also take initiative to explore hands-on learning opportunities like science clubs and independent research projects to deepen their understanding. Finally,

students should collaborate with their peers, engage in peer-to-peer learning, and foster a supportive and inclusive learning community, leveraging each other's strengths to collectively overcome challenges.

v. Recommendations for further research

It is recommended that future research on Combined Science education at Macheke High School should pursue a longitudinal study to track the long-term impacts and sustainability of the implemented remedial education strategies. Comparative analyses with similar schools could also yield valuable benchmarking data and identify best practices. Furthermore, expanding stakeholder engagement to include perspectives from parents, community members, and educators at other institutions could provide a more holistic understanding of the challenges and opportunities in Combined Science education at Macheke High School and similar institutions. By exploring these avenues for further research, the understanding and effectiveness of Combined Science teaching and learning can be enhanced, ultimately supporting the academic growth and success of the students.

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APPENDIX: 1

SAMED

P Bag 1020
BINDURA
ZIMBABWE

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

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 09/04/24

TO WHOM IT MAY CONCERN

NAME: MAKANIKO TENDAI REGISTRATION NUMBER: B2025804B

PROGRAMME: HBScEdBz PART: 2.2

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

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

Effectiveness of remedial education in the teaching and learning of Combined Science at Ordinary Level at Macheke High School.

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

Your co-operation and assistance is greatly appreciated.

Thank you

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
9 APR 2024
P BAG 1020
BINDURA

Z Ndemo (Dr.)
CHAIRPERSON - SAMED

THE HEAD
MACHEKE HIGH SCHOOL
6 MAY 2024
P.O BOX 38
MACHEKE
TEL: 065 - 2080-361

APPENDICE: 2

All communications should be Addressed to "The District Schools Inspector"

Telephone: 0278-22250 and 22232

ZIMBABWE

Ministry of Primary and Secondary Education
Murewa District Office
P.Bag 611
Murewa
Zimbabwe

May 23, 2024

Mr. Mkamiko Tendai
Macheke High School
P.O Box
Macheke

RE: PERMISSION TO CARRY OUT AN EDUCATIONAL RESEARCH AT MACHEKE HIGH SCHOOL: MUREWA DISTRICT: MR. MAKANIKO TENDAI EC NO/ 5218799 G: HBSCEDB2. STUNDENT AT BUSE.

I acknowledge receipt of you application letter dated 24 April 2024, seeking permission to conduct an educational research at Macheke High School in Murewa district. It is noted that you are a Bachelor of Science Education Honours degree in Biology student with the Bindura University of Science Education seeking permission to conduct an educational research project in partial fulfillment of the requirements of the Degree programme.

I am pleased to inform you that, authority to carry out an educational research at Macheke High School in Murewa district is hereby granted.

May you be advised to submit a copy of your educational research project to the Ministry of Primary and Secondary Education so that your findings in your research can be shared for the benefit of the system.

Tsodzo C
District Schools Inspector
Murewa District

MINISTRY OF EDUCATION
HUMAN RESOURCES OFFICER (SOUTH)
(MUREWA DISTRICT OFFICE)
23 MAY 2024
P. BAG 611, MUREWA
TEL: 078-22230/22250

APPENDIX: 3

Questionnaires for Students

Instructions

- Please indicate your response in the appropriate box provide by means of a tick.
- Do not write your name.
- All information is for academic purposes and will be treated with confidentiality.

1. Sex: Male ☐ Female ☐

2. What is your form level at Macheke High School?

Junior ☐ Ordinary ☐ Advanced ☐

3. Please rate the overall quality of Combined Science education at Macheke High School.

Poor ☐ Average ☐ Good ☐ Excellent ☐

4. What specific areas of Combined Science do you find most challenging? (Select all that apply)

Biology ☐ Chemistry ☐ Physics ☐

5. How often do you receive individualized attention or support from your Combined Science teachers?

Rarely or never ☐ occasionally ☐ ☐ often ☐ always

6. Do you have access to adequate learning resources and materials for Combined Science?

Yes ☐ No ☐

7. Please elect the most challenge you face in understanding and comprehending the concepts taught in Combined Science.

- Lack of practical application of learned concepts ☐
- Insufficient time allocated to cover the curriculum. ☐
- Limited access to relevant learning resources. ☐
- Lack of interest or motivational in the subject. ☐

- Difficulty in understanding complex scientific terms and concepts. ☐

8. Do you find it difficult to apply the learned concepts in practical situations?

Yes ☐ No ☐

9. Is there a lack of engagement or interest among students in the Combined Science classroom?

Yes ☐ No ☐

10. Have you participated in any remedial education programs provided for Combined Science?

Yes ☐ No ☐

11. Please rate the effectiveness of the remedial education program in improving your understanding and performance in Combined Science.

Not effective ☐ moderately effective ☐

Very effective ☐ highly effective ☐

12. Have you noticed any improvements in your grades or overall performance in Combined Science since participating in the remedial education program?

Yes ☐ No ☐

13. Which of the following strategies do you believe would enhance the effectiveness of remedial education in Combined Science at Macheke High School? (Select all that apply)

a. More individualized attention from teachers ☐
b. Additional practice exercises and worksheets ☐
c. Hands-on experiments and practical activities ☐
d. Peer tutoring or group study sessions ☐
e. Other (Please specify):

……....

……

APPENDIX: 4

Questionnaire for Teachers

I am Tendai Makaniko, a HBScEdBz student at Bindura University of Science Education (BUSE), and I am researching on the effectiveness of remedial education in the teaching and learning of Combined Science at Ordinary Level. All information provided is for academic purposes and will be treated with confidentiality.

Instructions

- Please indicate your response in the appropriate box provide by means of a tick.
- Do not write your name.

1 Sex: Male ☐ Female ☐

2. What is your teaching experience in Combined Science at Macheke High School?

Less than 5 years ☐ 5-10 years ☐ More than 10 years ☐

3. What is your highest professional qualification in Education?

Certificate ☐ Diploma ☐ Bachelor (Honours) ☐ Masters ☐

Doctorate ☐ Other (Specify) ……

4. What form level(s) do you teach in Combined Science?

Junior ☐ Ordinary ☐ Advanced ☐

5. How would you rate the overall performance of students in Combined Science at the Ordinary level?

Below average ☐ Average ☐ Above average ☐

6. In your opinion, what are the main strengths and weaknesses of the current Combined Science curriculum at Macheke High School? (Select all that apply)

Strong theoretical foundation ☐ Emphasis on practical application ☐

Sufficient coverage of content ☐ insufficient depth of content ☐

Lack of relevant and engaging resources ☐

7. Please select the most challenges faced by students in understanding and comprehending the concepts taught in Combined Science. (Select all that apply)

- Lack of practical application of learned concepts ☐
- Insufficient time allocated to cover the curriculum ☐
- Limited access to relevant learning resources ☐
- Lack of student interest or motivation in the subject ☐
- Difficulty in understanding complex Scientific terms and concepts ☐

8. Do you notice any difficulties students face in applying the learned concepts in practical situations? Yes ☐ No ☐

9. Have you implemented or been involved in the remedial education program for Combined Science at Macheke High School? Yes ☐ No ☐

10. Please rate the effectiveness of the remedial education program in improving students' understanding and performance in Combined Science.

Not effective ☐ moderately effective ☐

Very effective ☐ highly effective ☐

11. Have you observed any improvements in students' grades or overall performance in Combined Science as a result of the remedial education program?

Yes ☐ No ☐

12. In your opinion, which of the following strategies would enhance the effectiveness of remedial education in Combined Science at Macheke High School? (Select all that apply)

- Increased individualized attention for students ☐
- More practice exercises and worksheets ☐
- Incorporation of hands-on experiments and worksheets ☐
- Implementation of peer tutoring or group study sessions ☐

- Other (Please specify)

  ………………………………………………………………...

  …………………………………………………………………

APPENDICE 5

POST-TEST

MACHINES

1. a) Define the term machine. [2]

b) Identify any three examples of simple machines. [3]

2. A trolley of weight 15 N is pulled from the bottom to the top of an inclined plane by a force of 2.5 N. The length of the inclined plane is 2.0 m and the height above the ground of the raised end is 25.0 cm

Calculate the:

a) The mechanical advantage (MA) of the inclined plane [3]
b) The velocity ratio of the inclined plane [3]
c) The efficiency of the inclined plane [3]

3. a) What are the advantages of using gears in mechanical systems? [2]

b) A gear with 12 teeth makes two complete revolutions to drive and rotate another gear with 24 teeth a full cycle. Calculate the velocity ratio (VR) [3]

4. a) State any one factor that results in more energy losses in a machines. [1]

b) How does the presence of friction affect the motion of a machine? [2]
c) Explain, how energy loss in a machine can be minimised. [3]

[Total: 25 marks]

APPENDICE: 6

PRE-TEST

MACHINES

1. Define the following terms;

a) Mechanical Advantage (MA) [2]

b) Velocity Ratio (VR) [2]

2. A block and tackle system has 3 pulleys in the upper fixed block and two in the lower moveable block.

a) Find the Velocity Ratio (VR) of the pulley system. [2]

b) What load can be lifted by an effort of 200 N if the efficiency of the machine is 60 %? [4]

c) Explain the effect of increasing the number of pulleys in a system. [2]

3. On a machine, the load moves 2 m when the effort moves 8 m. If an effort of 20 N is used to raise a load of 60 N,

a) What is meant by the term efficiency of a machine? [2]

b) Calculate the Mechanical Advantage (MA) and Velocity Ratio (VR) of the machine [4]

c) What is the efficiency of the machine? [2]

d) How does friction impact the efficiency of a machine? [2]

e) Suggest any three possible ways of improving the efficiency of a machine. [3]

[Total: 25 marks]