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An investigation in the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers at Dorset primary school in Shurugwi District in Midlands Province, Zimbabwe.

BY

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APPROVAL FORM

The undersigned certify that they have supervised, read and recommended to Bindura

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DECLARATION

I, Mabuto Happison, registration number B225810B do humbly declare that the research represents my own unaided work and has not been written for publication by others or for any degree program. All the materials used in the study have been fully acknowledged and cited accordingly in the study. The research is submitted for the Honours Bachelor of Science Education Degree in Mathematics at Bindura University of Science Education, Bindura, Zimbabwe.

MABUTO HAPPISON  (Signature) Date 03/01/25.

DEDICATION

I whole heartedly dedicate this project to my beloved wife Mabuto Tendai for giving me some unconditional love and support throughout the programme. Also the research is dedicated to my sons Sean, Shein and Shearer, for their steadfast backing towards the research. Without the support of these people, it was not going to be easy to present this validated and well supported research.

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ABSTRACT

Decimal numbers pose significant challenges to learners at Grade 5 level often leading to misconceptions and difficulties in solving problems with these mathematical numbers. This research is aimed at exploring specific challenges faced by learners in solving problems involving decimal numbers and to identify potential strategies to enhance their understanding and proficiency in this topic.

The research employed a mixed-methods approach, combining quantitative and qualitative data collection methods. Structured questionnaires were administered to a diverse sample of facilitators and Grade 5 learners to gather quantitative data on their difficulties, misconceptions and attitudes towards teaching and learning of decimal numbers. Additionally, in-depth interviews were conducted with a smaller subset of learners and facilitators to gain deeper insight into the challenges faced and potential solutions.

Data analysis involves the use of descriptive statistics to summarise questionnaire responses and inferential statistics to examine relationships between variables. Thematic analysis were applied to the interview transcripts to identify common challenges and potential strategies for improvement.

Furthermore, ethical considerations were upheld throughout the research process ensuring

participant confidentiality, informed consent and voluntary participation. The findings of this study will contribute to the existing body of knowledge on the challenges faced by learners in solving problems involving decimal numbers and provide practical recommendations for educators and curriculum developers to enhance teaching and learning strategies.

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Chapter 1: INTRODUCTION

1.1 Introduction

In daily practices, learners naturally encounter the situation which is called challenges. The teaching and learning challenges can be experienced by learners with various ability levels and groups. These challenges need to be identified, find out the ways to mitigate them and determine the strategies to reduce or minimize them. This chapter is going to outline background of the study, statement of the problem, research objectives, research questions, assumptions of the study, significance of the study, limitations of the study, delimitation of the study, definition of terms and summary.

1.2 BACKGROUND OF THE STUDY

Mathematics concepts are characterised by new discoveries, knowledge and growing number of unanswered questions. McMillan & Schumacher (2019) articulate that the growing of new mathematics solving methods has placed greater challenges on mathematics learners, the learning of mathematical concepts and skills with grasping. Solving problems with decimal numbers is one of the topics in the study of mathematics. Hence, its application in other topics and real-life scenarios has motivated the researcher to carry out a research on the challenges faced by learners in teaching and learning of solving addition problems involving decimal

numbers at Dorset primary school.

The researcher was approached by many learners at Dorset primary school on how best the topic of decimal numbers can be solved so that they can reduce the challenges faced. The researcher is a Dorset Primary School teacher who sometimes helps learners in many mathematics areas. The researcher's experience has shown that it is difficult for a Grade 5 learner who fails to grasp the concept of decimal numbers to properly tackle some of the challenging life problems.

The topic of solving decimals is a fundamental skill with significant real-life applications. Proficiency in this area is crucial for Grade 5 learners as it lays the foundation for advanced mathematical concepts and problem-solving abilities. Reys & Reys (2017), postulate that solving decimal problems is a fundamental mathematical concept taught at primary level solving as a building block for advanced mathematical topics. This inspired the researcher to carry out the research after he had discovered that mastering the skills required to solve decimal problems is crucial for learners' success in high-level mathematics and various STEM disciplines.

Furthermore, the researcher chose this topic of addition of decimal numbers because he feels that the learners will gain valuable problem-solving skills from this area of mathematics and that it will build on the skills they have already established from the introduction of decimal numbers.

The challenges faced by Grade Five learners when solving problems involving addition of decimal numbers can have a ripple effect their future academic performance in mathematics

and related fields. If learners struggle to understand decimal concepts, they may fall behind in subsequent Maths classes where decimal operations are built upon (Wiggins & McTighe, 2015). In addition to that learners will struggle with more advanced mathematics concepts such as fractions, algebra and geometry. Larkin (2016) advocates that if learners struggle to understand decimal concepts they lack confidence in their mathematics abilities, leading to anxiety and decreased motivation. This implies that learners will perform poorly in maths-related subjects such as science and technology impacting their future career prospects and opportunities, particularly in fields that require strong Maths skills.

Moreover, decimal numbers can be a cognitive and learning hurdle for many students. Burns (2016) articulates that students need to grasp the concepts of place value including the relationship between digits in different positions. In the same vein Kilpatrick et al (2016) posit that students often struggle with understanding the concept of place value particularly when dealing with decimal numbers leading to errors when adding decimal numbers as students may not properly align the digits to show an understanding of the relationships between the different place values. This implies that performing arithmetic operations with decimal numbers can be challenging due to the need to align digits correctly, for example, when adding 3,65 and 12,4; students may incorrectly align the digits resulting an incorrect answer. However, students may focus on memorising procedures rather than developing a deep understanding of decimal concepts leading to difficulties in applying decimals to real-world problems. Van de Walle (2015) posits that decimal notation can be confusing especially when dealing with repeating decimals, scientific notation or different decimal separators. Hence, students' prior knowledge and

experience with fractions, percentages and ratios can influence their understanding of decimals.

Moreover, decimal numbers play a crucial role in mathematics and have numerous real-life applications. In mathematics decimals help learners understand concepts like place value, rounding and estimation. Decimals are also used in various mathematical operations such as addition, subtraction, multiplication and division.

In addition, in real-life applications, decimals are used when calculating finance interest rates, investment returns and currency exchange rates. They are also used in Science when measuring quantities like temperature, pH levels and chemical concentrations. In the same vein, Wiggins & McTighe (2015) reiterate that decimals are used in health to measure medication dosages, monitoring vital signs and calculating medical statistics. Also in commerce decimals are used for pricing goods and services, calculating discounts and taxes.

Therefore, understanding decimal numbers is vital for making informed decisions in various aspects of life. Burns (2016) articulates that, challenges faced in addition of decimal numbers highlight the need for a comprehensive and supportive learning environment that addresses the cognitive and learning difficulties associated with decimal numbers. Hence, it is essential to address challenges faced by learners early on to prevent a long-term negative impact on learners' mathematics education and future prospects.

1.3 STATEMENT OF THE PROBLEM

Understanding the challenges faced by Grade Five (5) learners when solving problems involving the addition of decimal numbers is crucial for refining educational approaches.

By examining these difficulties, educators can create targeted interventions to support student learning and enhance their mathematical skills. This study aims to identify and analyse the specific obstacles that Grade 5 learners encounter when working with decimal addition, ultimately seeking to improve teaching strategies and promote academic success in Mathematics for these students.

It however remains a fact that some learners still have a different perception regarding the solving of mathematics problems, with some ignoring Mathematics as a subject; hence this will affect learners leading to failure in the subject. Girit & Akyuz (2015) posit that decimal numbers pose a significant challenge for learners at Grade Five (5) level, leading to a lack of understanding and proficiency in solving them. Moreover, learners often encounter challenges in understanding and applying the methods involved in the teaching and learning of problems involving the addition of decimals. Hiebert & Grouws (2017) postulate that, if learners fail to grasp the concepts of solving decimal problems, it will be difficult for them to have a solid foundation for advanced mathematical concepts and problem-solving abilities. The need to assess the Dorset Primary School Grade Five (5) learners' perception on challenges faced in teaching and learning of solving problems involving the addition of decimal numbers is what prompted this study.

1.4 RESEARCH OBJECTIVES

By the end of the research study, the researcher and informants should be able to:

1.4.1 identify the specific types of challenges and misconceptions Grade 5 learners encounter

when solving problems involving addition of decimal numbers.

1.4.2 explore the factors that contribute to these challenges, such as conceptual misunderstandings, computational errors or lack of exposure to decimal number concepts.

1.4.3 examine the strategies that Grade 5 learners employ when solving problems involving addition of decimal numbers and evaluate their effectiveness.

1.5 RESEARCH QUESTIONS

The research seeks to answer the following questions

1.5.1 What are the challenges and misconceptions faced by Grade Five (5) learners in the learning of addition of decimal numbers?

1.5.2 What are the specific factors that contribute to conceptual challenges that Grade 5 learners encounter when adding decimal numbers?

1.5.3 What are possible strategies that Grade 5 learners can employ when solving problems involving addition of decimal numbers?

1.6 ASSUMPTION OF THE STUDY

Certain assumptions were taken into consideration for the findings to be valid. One of the assumptions is that Grade 5 learners have been introduced to the concept of decimal numbers and have a basic understanding of addition. In addition, Schoenfeld (2016) articulates that, the

challenges faced by Grade 5 learners in teaching and learning of adding decimal numbers may stem from misconceptions, lack of practice or difficulties in applying mathematical procedures. Apart from that, the study assumes that Grade 5 learners' performance in decimal addition problems can provide insights into their overall mathematical proficiency and the effectiveness of current teaching methods. However, there may be variations in the challenges faced by learners based on factors such as prior maths achievement, teaching methodologies and individual learning styles.

1.7 SIGNIFICANCE OF THE STUDY

The significance of studying the challenges faced by Grade Five (5) learners when solving problems involving the addition of decimal numbers lies in its potential to inform educational practices and improve student learning outcomes. By identifying and addressing these challenges, educators can tailor instructional strategies to better support students' mathematical development and enhance their problem-solving skills.

Moreover, the study seeks to establish the challenges that learners face in the mastery of the concepts in teaching and learning of solving addition problems involving decimal numbers and find effective and ever-lasting solutions. The study could be significant to many stakeholders.

In support to the idea, the study will help facilitators to plan and facilitate lessons that clearly bring out to learners the understanding of solving addition problems involving decimal numbers. Facilitators will also identify grey areas in the teaching and learning of adding decimal numbers and strategies to clear these grey areas. Understanding the specific difficulties that Grade Five

(5) learners face in adding decimal numbers can help teachers adjust their teaching methods to target these areas of need (Van de Walle, Karp & Bay-Williams, 2020). Through this research, insights gained can contribute to more effective teaching strategies, improved student outcomes and a more equitable mathematics education system.

Moreover, the study could be important to learners as it helps them in identification of practical applications of decimal numbers in real-life scenarios such as STEM subjects and optimisation problems. In addition, learners will benefit on how the process of solving decimal problems requires learners to analyse and manipulate multiple variables, fostering higher-order thinking skills. The study will demonstrate the positive correlation between mastery of addition of decimal numbers and overall achievement in Mathematics at Grade Five (5) learners. In a nutshell, learners will have strong mathematics foundations, real-life applications, problem-solving skills and academic performance. Addressing the challenges identified in this study can lead to improved student performance in Mathematics, potentially increasing overall academic achievement and confidence in mathematical problem-solving (Boaler, 2016).

Furthermore, the school heads and administration could benefit from the study through understanding the challenges being faced by Grade Five (5) learners when solving addition of decimal numbers. This might help the school heads and administration to access both the learners' and facilitators' teaching and learning activities accordingly. In the same vein, Gutiérrez and Boaler (2021) postulate that, by investigating and addressing decimal challenges early in students' academic journeys, educators can work towards reducing disparities in maths achievement among diverse student populations.

In addition to that, the study could be significant for the Ministry of Primary and Secondary Education as it might reveal the long-term benefits and implications of developing proficiency in solving of addition problems involving decimal numbers beyond O' level, including future educational and career prospects. This could help these policy makers to take corrective measures like devoting more time and funds to mathematics education so that learners can understand the benefits and importance of engaging in mathematics activities. Findings from this study can contribute to the refinement of maths curricula to ensure that they adequately address the challenges students encounter when working with decimal numbers (National Council of Teachers of Mathematics, 2021).

Furthermore, the researcher could benefit from this study through adding knowledge to the academic body regarding the impacts of decimal numbers in education. This knowledge would then be used by academics conducting research on the same topic or related topics.

Moreover, the he community could benefit from the study through understanding the importance and evidence of the positive impact of proficiency in solving addition problems involving decimal numbers, on learners' problem-solving skills, critical thinking abilities and mathematical reasoning

1.8 LIMITATIONS OF THE STUDY

This study might encounter some various constraints. One of the limitation could be that, some of the participants may not be willing to participate in the study as they might think it is meant to expose their truancy and academic performance. To mitigate this limitation, the researcher

will explain to the learners that this study is for academic purposes and that their identities will not be revealed as strict confidentiality and anonymity will be maintained throughout the study. This might make them more comfortable to participate in the study.

Another limitation that might be encountered in the study is the issue of the time since learners involved in the study may also be having their normal school lessons with fully packed timetables. This might delay the study as it renders accessing the participants difficulties. Limited time for data collection may restrict the depth of the study and the ability to explore all aspects of the challenges faced by Grade Five (5) learners (Boaler, 2016). To mitigate this limitation, the researcher will have to approach the school administrators and inform them of his study.

The study will use a sample of 25 participants since it will be a qualitative study and this might make generalisation of the findings to the entire population difficult. The sample size may not be representative of the entire population of Grade 5 learners. This can limit the generalisability of the findings. To mitigate this limitation, the study will also use data collected from primary sources such as various literature sources like journals, text books and other publications. Furthermore, if the sample is not randomly selected, there is a risk of sampling bias, which can affect the validity of the study. However, the constraints of the study range from factors such as time, finance, sample size, lack of much co-operation from some of both the learners and facilitators.

Financial constraints can also disrupt some of the study activities which may be lined up. In support to the idea, Johnson & Christensen (2019) reiterate that, due to financial constraints,

lack of teaching and learning materials pose a threat to the study. Furthermore, learners' performance and understanding of addition of decimal numbers can be influenced by various external factors such as home environment, socio-economic status and previous educational experiences. In the same veins, Creswell (2014) echoes that, external factors such as classroom environment, teaching methods and home support can influence how learners perform in problem-solving tasks. These factors should be controlled or accounted for in the study. However, they may not be fully controlled or accounted for in the research, potentially impacting the accuracy and completeness of the findings.

On the other hand, the validity and reliability of the research instrument used to assess the challenges faced by learners need to be considered. If the instrument is not well-designed, it may not accurately capture the difficulties experienced by the learners.

The language used in the study and cultural differences among learners may impact their understanding of decimal addition problems. Leedy & Ormrod (2014) posit that, the influence of facilitators on learners' problem-solving abilities cannot be ignored when carrying out a research. This implies that facilitators' proficiency in teaching decimal addition and their approach to problem-solving can affect the results of the study.

Moreover, the researcher should ensure that ethical guidelines are followed when conducting research involving children. Informed consent, privacy and confidentiality should be carefully considered.

However, to overcome these limitations, researchers can use appropriate sampling techniques,

carefully design research instruments, control for external factors, conduct a thorough literature review and ensure transparency in reporting the study findings. Additionally, researchers should consider collaborating with educators and stakeholders to gain a comprehensive understanding of the challenges faced by Grade Five (5) learners in solving decimal addition problems.

1.9 DELIMITATIONS OF THE STUDY

This study will be carried out focusing at Dorset Primary School in Shurugwi district, Midlands province, 67km South-east of Gweru. The school in situated in the resettlement area of Dorset. This geographical area was chosen because it is convenient to carry out a research at this level since the researcher is one of the facilitators at Dorset Primary school and has observed the Grade 5 learners showing different attitudes towards teaching and learning of mathematics. Furthermore, learners and facilitators are likely to provide true and useful information since the researcher is familiar to them. The researcher is going to work with 25 out of 40 Grade 5 learners at Dorset Primary School.

This study will adopt the qualitative research techniques, using semi-structured questionnaire as the research instrument. This will be done in order to get a detailed account of the learners' perceptions and attitudes towards decimal numbers. Data collection will be contacted during school days of academic third term of the year 2024 to ensure consistency in the data collection process. The specific assessment methods or tools that will be used to evaluate the challenges faced by Grade 5 could include tests, questionnaires, observations or a combination of methods.

1.10 DEFINITION OF KEY TERMS

1.10.1 Learning

McMillan & Schumacher (2019) defines learning as the process of gaining knowledge and experience, for example by studying

1.10.2 Teaching

Mishra & Koehler (2017) posit that teaching is the process of propagation of ideas in the development of skills that enables any society subsists. According to Burns (2014), teaching is the process of imparting knowledge, skills and attitudes to others. Therefore teaching is a process that facilitates learning.

1.10.3 Challenges

According to www.igi-global.com, challenges refer to something that by nature or character serves challenges to make a special effort, a demand to explain or difficulty in a undertaking that is stimulating to one engaged in challenges can therefore be defined as difficulties or problems that tend to retard progress.

1.11 Summary

This chapter highlighted the background of the study, statement of the problem, research objectives, and importance of the study, delimitation, limitations and definition of key terms. The chapter also opens a piece of research involving. challenges faced by Grade Five (5) learners in dealing with directed numbers. The next chapter will dwell on the literature review.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter reviews some challenges encountered by pupils in teaching and learning of mathematics especially in the study of decimal numbers. Literature review is a piece of academic writing demonstrating knowledge and understanding of the academic literature on a specific topic placed in context. A literature review also includes critical evaluation of the materials. This is why it is called literature review rather than literature report.

2.2 Importance of literature review in this research

Literature review plays a crucial role when investigating challenges faced by Grade Five learners when solving problems involving addition of decimal numbers. A literature review helps to identify gaps in existing research, allowing investigators to focus on areas that require further exploration. Van de Walle (2014) postulates that, a literature review provides insight into theoretical frameworks and models that have been used to explain challenges faced by learners in decimal addition. Furthermore, a literature review informs the development of a research methodology including the selection of data collection tools and procedures. In addition, it helps establish the validity of research findings by demonstrating that the results are consistent with existing research. In the same vein, Radatz (2018) reiterates that literature review also guides the development of recommendations for teaching and learning decimal addition ensuring that these recommendations are grounded in existing research.

Moreover, a literature review facilitates collaboration among researchers, educators and

policymakers by providing a common language and framework for understanding challenges faced by learners in dealing with decimal numbers. By conducting a comprehensive literature review, investigators can develop a nuanced understanding of the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers, ultimately informing the development of effective solutions to support teaching and learning.

2.3 Theories on challenges and misconceptions in solving problems involving addition of decimal numbers

Several educational theories were discovered to address challenges and misconceptions in learners when solving problems involving addition of decimal numbers. Among these theories are Cognitive Load Theory (CLT), Schema theory and Mathematical Cognitive model, Error analysis framework and Social-Cultural Theory.

According to Sweller (2014) cognitive load theory (CLT) is a theoretical framework that articulates how the human cognitive system processes and retains information. This implies that cognitive load refers to the amount of mental effort required to complete a task. It was developed by John Sweller, an Australian educational psychologist, in 1980s who argued that the working memory has limited capacity and learning is influenced by the cognitive load imposed on the learner. Sweller's work built on the earlier research of psychologists such as Miller (1956) and Bruner (1966). Sweller et al (2015) reiterate that, Cognitive capacity for processing information is limited and that excessive cognitive load can impede learning. In the context of decimal number addition, cognitive load theory, (CLT) can help explain why learners

may struggle with complex calculations. The theory is particularly relevant since research has shown that decimal numbers can be a challenging concept for many students to grasp, particularly when it comes to performing arithmetic operations such as addition (Bay-Williams & Martini, 2015).

The cognitive load associated with adding decimal numbers can be attributed to several factors including intrinsic, extraneous and germane cognitive load. The inherent complexity of the task which requires learners to understand the concept of decimal numbers and arithmetic operations is intrinsic cognitive load. In addition of decimal numbers, extraneous cognitive load is the unnecessary mental effort required to complete the task which can be caused by factors such as poor instructions or confusing notation. Furthermore germane cognitive load is the mental effort required to complete the task which can be influenced by factors such as prior knowledge and experience. Overally, according to Cognitive Load Theory, working memory has a limited capacity for processing information and cognitive load affects the efficiency of learning. By understanding the cognitive load associated with adding decimal numbers, facilitators can design instructional strategies that minimise extraneous cognitive load and maximise germane cognitive load, ultimately supporting learners in developing a deeper understanding of decimal numbers.

Moreover, CLT emphasises the importance of constructing schemas, which are mental frameworks that organize and integrate knowledge. Schema theory, also known as schema-based learning is a cognitive theory that explains how learners organise and process information. The theory was first introduced by psychologist Frederic Bartlett in 1932, but it

was later developed and popularised by cognitive psychologist David Rumelhart in the 1970s and 1980s (Rumelhart, 2017). Schema theory proposes that learners organise knowledge into mental frameworks or schemas to organise and make sense of new information. Rumelhart (2017) reviews that, in decimal number addition, schema theory can help explain how learners' prior knowledge and experiences influence their understanding of decimal concepts. Therefore, when learners lack prior knowledge, they may not have a well-developed schema for decimal numbers, making it difficult for them to understand and apply decimal addition concepts. This implies that, teaching and learning is more effective when learners can relate new concepts and experiences to existing schemas, reducing cognitive load and facilitating the acquisition and retention of knowledge.

In addition, Larkin (2018) asserts that, learners may not have had sufficient practice in applying decimal addition concepts, making it difficult for them to reinforce their schema and develop fluency. Additionally , learners may have developed misconceptions about decimal numbers, such as thinking that decimals are always smaller whole numbers. These misconceptions can interfere with the development of an accurate schema for decimal addition. Kilpatrick et al (2016) articulate that, by understanding schema theory and its implications for learning, facilitators can design instruction that helps learners develop a robust and accurate schema for decimal addition.

In the same vein, Mathematical cognitive model is another model that describes the cognitive processes involved in mathematical problem-solving including encoding, working memory and retrieval. The Mathematical cognitive model was developed by John Anderson (1983), an

American psychologist and computer scientist. Andersons' model describes the cognitive processes involved in mathmetical problem-solving, including the role of working memory, long-term memory and problem-solving, strategies (Larkin, 2018). Therefore, the mathematical cognitive model is highly relevant to understanding the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers. The model highlights the importance of working memory in mathematical problem-solving. Grade Five learners may struggle with decimal addition problems due to limitations in their working memory capacity. Larkin (2018) reiterates that in the context of decimal numbers, mathematical cognitive model can help identify specific cognitive challenges that learners may face.The model emphasises the role of long-term memory in storing and retrieving mathematical knowledge. Grade Five learners may struggle decimal addition facts and procedures from long-term memory leading to errors and difficulties. Wiggins & McTighe (2016) articulate that, the mathematical cognitive model describes the importance of problem-solving strategies such as decomposition and recomposition in mathematical problem-solving. Therefore, Grade Five learners may struggle to apply these strategies when solving decimal addition. By understanding the mathematical cognitive model, facilitators can develop targeted interventions to support Grade Five learners in overcoming challenges related to decimal addition.

Apart from that, Radatz (2018) argues that Error analysis framework provides a structured approach to analysing errors in mathematical problem-solving. The error analysis framework was developed by Herbert Ginsburg, a renowned mathematics educator and researcher. Wiggins & McTighe (2014) posit that Ginsburg's work focused on understanding how learners think

about mathematics and how they develop mathematical concepts. This implies that in decimal number addition, error analysis framework can help identify common error patterns and underlying cognitive difficulties. The error analysis framework is particularly relevant to the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers. In support, Radatz (2018) reiterates that, by analysing learners' errors, facilitators can identify common misconceptions and difficulties such as difficulty with regrouping carrying digits and confusion between decimal and fraction concepts. Hence, by using the error analysis framework, facilitators can develop targeted interventions to address these challenges and provide learners with the support they need to succeed in decimal addition.

Apart from that, Social-cultural theory emphasises the role of social and cultural factors in shaping learners' understanding and performance. Socio-cultural theory, developed by Lev Vygotsky, emphasises the role of social and cultural in shaping learners' understanding and performance in mathematics(Vygotsky, 2018). This implies that in decimal number addition, socio-cultural theory can help explain how learners' cultural backgrounds and social interactions influence their learning. Socio-cultural theory highlights the importance of language and communication in mathematics teaching and learning. Learners' ability to communicate their thinking and understand mathematics concepts is influenced by their linguistic and cultural backgrounds (Moschkovich, 2014).In support, in decimal number addition learners may struggle to understand and use mathematical vocabulary such as "tenths" and "hundredths" which can lead to confusion and errors. Moreover, socio-cultural theory also emphasises the impact of cultural backgrounds on learners' understanding of mathematical concepts. Civil (2016) posits

that learners from diverse cultural backgrounds may bring different mathematical knowledge and experiences to the classroom, which can influence their understanding of decimal addition. This implies that learners from cultures that use different number systems or notation may struggle to adapt to the decimal system used in mathematics.

Moreover, socio-cultural theory highlights the importance of social interactions in mathematics teaching and learning. Learners learn mathematics through interactions with their teachers, peers and cultural artifacts (Vygotsky, 2018). In decimal addition, learners may benefit from collaborative learning activities such as working in pairs or small groups to solve problems which can help them develop their understanding of decimal concepts.

Overally, by integrating these theoretical frameworks, researchers can develop a comprehensive understanding of the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers.

2.4 Challenges faced by learners in the addition of decimal numbers from other authors

Students may struggle with understanding the concept of decimal place value, especially when adding numbers with different decimal places. They may have difficulty identifying the decimal places correctly. Kilpatrick et al (2016) articulate that learners often struggle with understanding the concept of place value, particularly when dealing with decimal numbers.

Furthermore, carrying over when adding decimal numbers can be a challenge for learners. Gall et al (2017) reiterates that learners may forget to carry over the digit from the tenths place to the next place value when the sum exceeds nine (9). In the same vein, Burns (2014) asserts that

learners often struggle with regrouping and carrying digits when adding decimals. Therefore, research has shown that learners may have difficulty understanding when to regroup and carry digits leading to errors.

Moreover, maintaining the alignment of decimal points while adding can be tricky for some students. Misalignment can also lead to errors in the final sum. Boaler (2016) articulates that, learners may forget to include the decimal point in the sum or place it incorrectly, resulting in inaccurate answers. In support to that, Van de Walle (2014) mentioned that learners often struggle with understanding the concept of decimal point, particularly when dealing with addition problems. This implies that research has shown that learners may have difficulty understanding the relationship between the decimal point and the digits that follow it.

Misinterpreting the notation of decimal numbers (e.g. mistaking 0.5 for 5) can lead to errors when adding decimal number. In the same vein Gutierrez & Boaler (2021) reiterate that, with any mathematical skill or practice is essential for mastering addition of decimal numbers. Hence, students who lack practice may struggle to perform decimal calculations accurately and efficiently. In support to that Radatz (2018) argues that learners may have difficulty reinforcing their understanding of decimal addition concepts without adequate practice.

Apart from that, Wiggins & McTighe (2015) reiterate that learners often struggle to see the relevance of decimal addition to real-world applications. One can deduce that learners may have difficulty understanding on how decimal addition is used in everyday life, leading to a lack of motivation and engagement. Furthermore, studies show that learners may have trouble using visual aids like numberlines and hundreds charts to represent decimal numbers (Bruce et al,

2014). Additionally, some authors note that learners may struggle to analyse problems involving decimal addition leading to difficulties in selecting the correct operation or algorithm.

Overally, some emphasis that students should comprehend the concept of place value including the importance of understanding place value and the use of visual aids to facilitate teaching and learning. In terms of specific strategies for adding decimal numbers, authors recommend methods like the column method or counting on method which can help students align digits correctly and perform calculations efficiently. Apart from that, some emphasise the importance of building a strong foundation in decimal arithmetic including addition to support students' future mathematics learning and problem-solving abilities.

2.5 Factors related to students' attitudes and resources

Students' attitudes towards mathematics can influence their motivation, engagement and persistence when solving problems involving the addition of decimal numbers. In support, Hiebert & Grouws (2017) reiterate that, positive attitudes can lead to better problem-solving skills, while negative attitudes can hinder learning progress. Therefore, negative attitudes towards decimal numbers can hinder learners' understanding and performance in mathematics. Girit & Akyuz (2015) assert that, research has shown that learners who hold negative attitudes towards including decimal numbers tend to perform poorly in mathematics. Furthermore, negative attitudes can lead to decreased motivation and engagement making it even more challenging for learners to understand and apply decimal concepts.

However, access to appropriate resources such as manipulative, worksheets, textbooks, online

tutorials and interactive tools can support students in understanding and practising addition of decimal numbers. In the same vein, Schoenfeld (2016) posits that, lack of resources or inadequate resources can impede students' ability to master this skill.

Furthermore, students' perceptions of the difficulty of adding decimal numbers can shape their approach to problem-solving. Those who view decimal addition as challenging may be more likely to experience anxiety and frustration, affecting their performance.

Moreover, students' beliefs in their own capabilities to solve problems involving decimal addition can impact their willingness to persist through challenges and seek help when needed. Cohen et al (2018) reiterate that, high self-efficacy can lead to greater problem-solving success.

Apart from that, the support and guidance provided by facilitators can also influence students' attitudes and resource utilisation when solving problems involving decimal addition. Mill (2014) reiterates that, research suggests that facilitator bahaviors, teaching methods and even teacher attitudes can sometimes hinder learners' progress. Therefore, encouraging a positive learning environment and providing effective instruction are key factors in fostering student success. Additionally, learners who do not develop a strong foundation in decimal numbers may struggle with more advanced mathematical concepts, further exacerbating performance issues. Rice et al (2018) argue that, learners who struggle with decimal numbers may experience decreased confidence and motivation leading to poor performance in mathematics. Effective teaching and learning strategies can significantly impact learners' understanding and performance in decimal numbers. Hence, the impact of ineffective teaching and learning strategies and negative attitudes on learners' performance in mathematics can be significant.

2.6 Causes of challenges faced when dealing with decimal numbers

Some Grade Five (5) learners may struggle with a lack of foundational understanding of decimal numbers and place value concepts, which are essential for adding decimals accurately. In addition, Grade 5 learners may find mental addition of decimal numbers challenging, especially when dealing with multiple decimal places and carrying over.

Furthermore, learners may have misconceptions about decimal notation or make errors in aligning decimal points, carrying over digits or placing the decimal point in the sum. On the other hand Johnson & Christensen (2019) articulate that, insufficient practice with adding decimal numbers can hinder students' ability to develop fluency and confidence in performing these calculations.

Moreover, some students may experience maths anxiety when faced with problems involving decimals, leading to decreased performance and avoidance of such tasks. Fraentel et al (2019) postulate that adding decimal numbers requires attention to detail, memory and computational skills, which can overload some learners, especially if they have weak working memory or executive function skills.

Moreover, facilitators play a significant role in shaping learners' understanding of decimal concepts. Research suggests that facilitators' behaviors, teaching methods and even facilitator attitudes can sometimes hinder learners' progress.

2.7 Strategies and interventions

To address these challenges, educators can employ various teaching strategies such as hands-

on activities, visual aids, real-world examples and practice problems. Encouraging students to explain their thought process when adding decimal numbers can also help identify and correct misconceptions.

In addition, utilising concrete manipulative such as digital scales, decimal grids or place value disks can help students visualise and understand the concept of decimal addition. Encouraging the use of visual representations like number lines or grids help students see the relationship between decimal numbers and support their understanding of addition (Boaler, 2016). In support to this, Van de Walle (2014) articulates that, utilise base-ten blocks number lines and hundreds to help learners visualise decimal concepts and relationships. Therefore, it is of paramount importance to incorporate real-world examples and applications such as measuring lengths and weights to illustrate the relevance and importance of decimal addition. Start with concrete objects, then move to representation models and finally abstract representations to help students understand decimal concepts (Van de Walle, 2014).

Moreover, learners are encouraged to engage in a collaborative teaching and learning environment where they can discuss and share their knowledge or understanding of decimal concepts. Present students with real-world problems involving decimals to demonstrate the practical application of decimal addition and enhance student engagement (Hiebert & Grouws, 2017). In the same vein Schoenfeld (2016) reiterates that foster peer collaboration and group work to encourage discussion, problem-solving and explanation of strategies for adding decimal numbers. This implies that learners are provided with differentiated instruction to cater to learners' varying levels of understanding and pace of learning, offering additional support or

challenges as needed. In support, Tomlinson (2018) posits that, cater to diverse learning styles and abilities by providing various teaching strategies such as visual, auditory and kinesthetic approaches. This implies that, it is essential to incoperate real-world examples and applications to help learners see the relevance and importance of decimal addition.

Hiebert & Grouws (2017) postulate that, when in teaching and learning of decimal numbers, facilitators may offer explicit instruction on decimal addition strategies, emphasis the steps involved, common errors to avoid and effective problem-solving techniques. Hence, providing explicit instruction and step-by-step guidance on decimal addition procedures, including lining up decimal points and carrying digits can help learners build confidence and fluency.

Provide timely feedback on student work, highlighting strengths and areas for improvement and encourage students to reflect on their problem-solving processes (Schoenfeld, 2016). Additionally, encouraging practice and constructive feedback can help learners reinforce their understanding of decimal addition concepts. Encourage learners to view challenges as opportunities for growth and learning, rather than as threats to their ego or self-worth (Dweck, 2016).

Furthermore, when learners have a growth mindset, they can utilise online resources, mathematics applications and games to engage in interactive learning experiences for decimal addition. When teaching decimals at primary level, it is essential to use media that is engaging, interactive and easy to understand. Fosnot & Dolk (2014) articulate that, by incorporating media types into your lessons, you can create an engaging and interactive learning environment that supports students' understanding of decimals. Therefore, by implementing these strategies,

facilitators can provide targeted support to Grade five learners who struggle with decimal addition challenges. Additionally, research showed that the best approach to teaching and learning of decimal numbers involves a combination of conceptual understanding, procedural fluency and real-world applications.

2.8 Discursive skills that can help students

Encouraging students to explain their thought processes and strategies for adding decimal numbers. This can help them clarify their understanding and make their problem-solving methods explicit to themselves and others (NGA Center & CCSSO, 2021).

Furthermore, teaching students to justify their answers and explain why a particular method or solution is correct is a essential. Justifying answers fosters critical thinking and helps students develop a deeper understanding of the concepts involved in adding decimal numbers (Boaler, 2016).

Moreover, it is of paramount importance to promote argumentation and discussion among students, where they can compare and evaluate different approaches to adding decimal numbers. Also encouraging them to defend their reasoning and critique the strategies of their peers.

In addition, encouraging students to ask questions when they encounter challenges or uncertainties while adding decimal numbers can help learners. Encouraging learners to ask questions help them identify areas of confusion and deepen their understanding through inquiry (Hiebert and Grouws, 2017).

Furthermore, fostering collaborative problem-solving activities where students work together to solve problems involving decimal addition improve learners' communication and retention skills. In the same vein, Schoenfeld (2016) postulates that, collaboration can enhance communication skills and provide opportunities for peer learning and support.

Overally, encouraging students to reflect on their problem-solving experiences, identify strategies that were effective or ineffective and consider how they can be implemented, improve their approaches in the future.

2.9 Summary

In an overview of this chapter there is evidence that there is existing content produced by authors and researchers in their work involving decimal numbers. We noted from various writers that the difficulties involved when learners carry out operations with decimal numbers can be traced to as far as the invention of decimals. The aspects of teaching and learning methods and learners` attitude towards mathematics were also reviewed. The next chapter will focus on the methodology.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Methodology is a systematic theoretical analysis of methods applied to a field of study. This chapter presents the study paradigm, the research design, the research population and sampling, sampling technique and procedures, data collection methods, data analysis methods, data presentation and the trustworthiness of the study.

3.2 The study paradigm

The research is guided by the interpretivists paradigm. This paradigm is based on the idea that the methods used to understand information related to humans and social sciences cannot be the same as its usage in physical sciences. This is mainly because humans explain their world and then act on this explanation, even if others do not agree (Bragg and Herbert, 2017).Therefore, interpretivists adopt a relativistic ontology, in which a single phenomenon may have multiple explanations, rather than a truth that can be determined through a measurement process. In fact, from the perspective of interpretivism, researchers can gain a deeper understanding of the research phenomenon and the complexity of its unique context, instead of trying to generalise the understanding of the entire population (Cohen et al, 2018).Therefore, the interpretivism paradigm helps in providing an in-depth analysis of the challenges faced by Grade Five (5) learners in solving problems involving addition of decimal numbers, from the different perspectives of Grade Five (5) learners.

3.3 Research designs

This design involves observing, describing and documenting the challenges faced by Grade Five

(5) learners when solving problems involving decimal numbers. Questionnaires, interviews and tests were used to gather information about students' experiences and difficulties. The research uses mixed research design.

Quantitative research uses tables and graphs to present data while qualitative research gets information on personal experience on how they view the teaching and learning of addition of decimals.This design involves implementing interventions or teaching strategies aimed at addressing the challenges faced by Grade Five (5) learners when working with decimal numbers. The effectiveness of different approaches were compared through pre-test and post-test or control groups.

Creswell (2014) postulates that qualitative research design refers to a research approach that focuses on collecting and analysing non-numerical data to gain a deeper understanding of a particular phenomenon or research question. Therefore, qualitative research design is characterised by exploratory nature, non-numerical data, in-depth analysis and flexibility and adaptability. Moreover, qualitative research provides contextual understanding of the research topic, rich and detailed data which can be used to develop theories, models and frameworks. Denzin (2017) reiterates that qualitative research is ideal for generating theories, models and frameworks that can be used to explain complex phenomena. In addition, qualitative research design requires a small sample size which can be beneficial for researchers who are working with limited resources. In the same vein Patton (2015) articulates that, qualitative research design allows data triangulation and researchers to gather data from the perspectives of participants. This implies that that qualitative research enables researchers to gain insight into

learners' perspectives, attitudes and beliefs about decimal numbers and mathematics in general.

Hence, this mixed design combines quantitative and qualitative research methods to provide a comprehensive understanding of the challenges faced by Grade 5 learners. Quantitative data was collected through assessments, while qualitative data was gathered through observations, interviews or focus groups.

Moreover, this design involves studying Grade Five (5) learners over an extended period to track changes in their understanding and proficiency in adding decimal numbers. Longitudinal studies can provide insights into the progression of challenges and learning difficulties over time. Therefore, this design involves in-depth investigation of specific individuals or groups of Grade Five (5) learners to understand their unique challenges and experiences when working with decimal numbers. Case studies can provide rich, detailed insights into the complexities of the learning process.

3.4 Population

The target population is the collective set from which the research attracts participants are collected (Bragg and Herbert, 2017). The learners research population for this study was forty (40) Grade Five (5) learners from Dorset Primary School. Grade Five (5) learners were chosen as the targeted population because the study sought to assess the challenges faced by Grade Five (5) learners in solving problems involving addition of decimal numbers, hence they were considered in a better position to provide the required data. The research population for facilitators was eight(8) junior class facilitators. The junior class facilitators were chosen as

targeted population because they have the knowhow of challenges faced in decimals since the concept is taught at junior level. The school is in the rural area of Shurugwi District of Midlands Province.

3.5 Sampling technique

In quantitative sample, a stratified random sampling technique will be employed to select participants from diverse range of Grade Five (5) classes. The sample size will be determined using appropriate statistical calculations to ensure adequate representation. In qualitative sample, a purposive sample will be used to select learners and facilitators who have experience with decimal numbers. A small subset of participants will be chosen to provide rich and in-depth insights.

This study will use convenience sampling to select participants. Fellows and Liu (2015) define convenience sampling as a non-probability sampling technique that involves selecting research participants based on their availability and willingness to participate. Because the target population is relatively homogeneous, the researcher will work with participants who are readily available to participate in the research at any time. However, the researcher will make sure that when approaching the participants, he determines that they are Grade 5 learners from Dorset Primary School .The researcher will use the register of Grade 5 learners provided by Grade 5 facilitator from the school as the sample framework. This register contain the names of the forty (40) Grade 5 learners.

3.6 Sample and sampling method

A sample is the portion of subjects selected from the target population to participate in the study. In this case, a sample of 25 participants was selected from the target population. The random sampling method was used in the study. Grade Five (5) learners were selected from the population without any specific criteria. This method helps to reduce bias and ensures each student has an equal chance of being selected. The respondents were selected of the basis that they were once teachers in the area of study. For learners, the researcher cut 40 small pieces of papers. The papers were written yes and no and they were placed in the box. 25 of them were written yes and 15 were written no. Each learner was given chance to pick one paper from the box. Those who picked yes were considered for the experiment. For facilitators, the researcher cut 8 small pieces of papers and placed them again in the boxes. Among the papers 3 were written agree and the other 5 were written disagree. Those who picked agree were considered for the study.

3.7 Data collection instruments

Creswell (2014) asserts that, research instruments are tools used to collect data to find solutions to problems under investigation. This study employed observation, pre-tests and post -tests, interviews and questionnaires as data collection instruments.

3.7.1 Observation

Researchers observed Grade Five (5) learners as they work on addition problems involving decimal numbers in a natural classroom setting. This method allows for the direct observation

of student behaviors, strategies, and challenges. In the same vein, Yin (2014) postulate that observation allows researchers to directly observe the behavior and actions of Grade 5 learners as they solve problems involving addition of decimal numbers. Additionally observation method can provide rich and detailed data about the challenges faced by Grade 5 learners including their thought processes, problem-solving strategies and emotional responses.

Moreover, observation allows researchers to gain a deeper understanding of the context in which grade 5 learners are solving problems involving addition of decimal numbers. In support to the idea, Patton (2015) perpetuates that observation allows researchers to collect data without disrupting the natural behavior of the learners and gain a deeper understanding of the context. In addition, observations provide an opportunity for researchers to ask follow-up questions to clarify or seek additional information about the challenges faced by Grade Five learners. Creswell (2014) articulates that observation can provide insight into the learning process of Grade 5 learners including their strengths, weaknesses and areas of difficulty. Hence, observation can provide valuable information for informing instruction and developing targeted interventions to support learners who struggle. Additionally, Yin (2014) argues that, observation can be used in conjunction with other research methods such as surveys and interviews to triangulate data and increase the validity of the findings.

3.7.2 Interviews

Interviews were also conducted with Grade Five (5) learners who provided in-depth information about their experiences, thought processes and difficulties when adding decimal numbers. According to Kvale (2017) an interview is a qualitative research method used to collect data

through a conversation between the researcher and the participant. Therefore, an interview can be conducted in various settings such as face-to-face, phone, video conferencing or online. Patton (2015) articulates that it is semi-structured or unstructured conversation that aims to gather in-depth, detailed information about participants thoughts, feelings, perspectives and experiences. Structured, semi-structured or even one-on-one interviews can be used to gather qualitative data. Structured interviews follow a predetermined set of questions while unstructured interviews allow for flexible and spontaneous conversation. On the other hand, semi-structured interviews use mix of open-ended and closed questions. Bernard (2017) perpetuates that the researcher typically prepares an interview guide or protocol with open-ended questions to facilitate the conversation.

Furthermore, interviews offer several advantages when collecting data particularly in qualitative research. They provide rich, detailed information about participants' thoughts feelings and experiences (Kvale, 2017). This implies that interviews allow researchers to gain insight into participants' personal experiences, perspectives and contexts that enable opportunities for follow up and probing for more information. In addition, interviews allow researchers to establish a rapport with participants, building trust and encourage open communication. Patton (2015) elucidates that interviews can be adopted to suit the research question, participant and context. Therefore, semi-structured interviews were created for this research study in such a way that they can capture the nuances and complexities of participants' experiences which might be lost in other data collection methods.

3.7.3 Questionnaires

Administering questionnaires to Grade Five (5) learners and facilitators can help collect quantitative data on their perceptions, attitudes and challenges related to adding decimal numbers. Creswell (2014) defines a questionnaire as a research instrument used to collect data from respondents through a series of questions. One can deduce that a questionnaire is a self-report measure that allows respondents to provide information about their attitudes, beliefs, behaviors and demographics. Questionnaires can be administered in various formats including paper-and-pencil, online or telephone survey (Dillman, 2017). The researcher of this study used paper-and-pencil questionnaires that consist of a set of multiple-choice questions and open-ended response options. The format is relatively inexpensive and allow for standard data collection researchers to generalise their findings to large population.

Moreover, questionnaires can be administered quickly and effeciently allowing researchers to collect data from large number of participants in a short amount of time. They ensure that data is collected in a standardised way, reducing the risk of bias and increasing the reliability of data. Creswell (2014) argues that questionnaires can provide participants with anonymity which can increase the likelihood of honest and accurate. Additionally, questionnaires can provide quantitative data which can be used to identify real trends and patterns in the challenges faced by Grade Five learners. Fowler (2014) reiterates that questionnaires can provide valuable information for informing instruction and developing targeted interventions to support students who are struggling. Hence, questionnaires were administered in a classroom setting, making it easy to collect data from a number of students helping to identify common challenges

faced by Grade Five learners when solving problems involving addition of decimal numbers.

3.7. 4 Problem-Solving Tasks

Presenting Grade Five (5) learners with specific problem-solving tasks involving the addition of decimal numbers can help researchers assess their skills, approaches, and difficulties in real-life . Problem-solving tasks are activities that require learners to apply mathematical concepts and skills to solve real-world problems (Schoenfeld 2014). In the context of Grade 5 learners solving problems involving addition of decimal numbers, problem-solving tasks may include real-world scenarios, word problems and open-ended problems. This implies that learners are presented with real-world scenarios that require them to add decimal numbers such as calculating the total cost of items purchased at a store. In addition, learners are also presented with word problems that require them to add decimal numbers such as calculating the distance travelled by a lorry. In the same vein, learners are presented with open-ended problems that require them to add decimal numbers such as calculating the total amount of money earned by a person.

Moreover, problem-solving tasks provide an authentic assessment of learners' ability to apply mathematical concepts and skills to real-world problems. Van de Walle & Karp (2019) assert that problem-solving tasks require learners to think critically and develop problem-solving skills which are essential for success in mathematics and other subjects. In addition to that, problem-solving tasks can help researchers identify misconceptions and areas of difficulty that learners may have when solving problems involving addition of decimal numbers. They can enhance learner engagement and motivation as learners are presented with real-world scenarios that require them to apply mathematical concepts and skills. Kilpatrick & Swafford (2014) reiterate

that problem-solving tasks can help learners develop mathematical modeling skills which involve using mathematical concepts and skills to model and solve real-world problems. Hence, problem-solving tasks can promote deep understanding of mathematical concepts and skills as learners are required to apply them to solve real-world problems. In a nutshell, problem-solving tasks can provide valuable information for informing instruction and developing targeted interventions to support learners who are struggling.

3.7.5 Think-Aloud Protocols:

Ericsson (2015) asserts that think-aloud protocols are a research method used to gather data on individuals thought processes, problem-solving strategies decision-making while performing a task. In the context of investigating challenges faced by Grade Five learners when solving problems involving addition of decimal numbers, think-aloud protocols involve asking learners to verbalise their thoughts, feelings and problem-solving strategies while solving mathematics problems.

Asking Grade Five (5) learners to verbalise their thought processes as they solve addition problems with decimal numbers provides insights into their reasoning, strategies and decision-making during problem-solving. Fonteyn & Kuipers (2016) articulate that think-aloud protocols provide a unique window into the cognitive process of Grade 5 learners allowing researchers to understand how they think, reason and solve problems. This implies that think-aloud protocols can help researchers identify specific challenges and misconceptions that Grade 5 learners encounter when solving problems involving addition of decimal numbers.

Moreover, think-aloud protocols can provide insight into the problem-solving strategies used by Grade 5 learners including their strengths and weaknesses. The data collected through think-aloud protocols can be used to develop targeted interventions to support Grade 5 learners who struggle with addition of decimal numbers (Van Someren et al 2014). Additionally, think-aloud protocols can increase the validity and reliability of research findings by providing a more direct and unobtrusive measure of cognitive processes. In a nutshell, they can be adapted to suit the needs of different research studies and can be used in conjunction with other research methods providing a more nuanced understanding of learner perspectives and experiences which can inform teaching practices and curriculum design.

3.7.6 Tests/ Assessments:

According to Popham (2014), tests or assessments are evaluation tools used to measure a students knowledge, skills and understanding of a particular subject or concept. In the context of investigating challenges faced by Grade 5 learners when solving problems involving addition of decimal numbers, tests or assessments were used to evaluate students' understanding of decimal numbers and their ability to perform arithmetic operations. Administering standardised tests or assessments focused on addition of decimal numbers can help researchers evaluate the performance and proficiency of grade 5 learners in this specific skill area (Mills 2014). Tests or assessments can be standardised allowing for consistent evaluation of learners' knowledge and skills. Therefore, the researcher of this study used pre-test and post-test to assess the performance of Grade 5 learners when solving problems involving addition of decimal numbers.

Furthermore, tests or assessments provide an objective measurement of students' knowledge

and skills reducing the risk of bias. Crocker & Algina (2016) reiterate that tests or assessments can provide data-driven insights that can inform decision making at the classroom, school or district level. One can deduce that tests or assessments can provide comparable data across different schools, districts or countries allowing for a broader understanding of the challenges faced by Grade Five learners. Hence, tests or assessments can be designed to collect efficient data from a large number of learners, reducing the time and resources required for data collection.

In addition, tests or assessments can help researchers identify knowledge gaps and areas where students need additional support. In support to the idea, Nitko (2014) posits that tests or assessments can be used to monitor students' progress over time, allowing teachers to adjust their instruction to meet the needs of their students. Moreover, tests or assessments provide valuable information for informing instruction and developing targeted interventions to support student who are struggling. Popham (2014) posits that tests or assessments can evaluate students' problem-solving skills including their ability to apply mathematical concepts to real-world problems. Overally, tests and assessments can be designed to improve the validity of the results by using a variety of question types and formats.

3.7.7 Work Samples/ Artifacts:

Collecting and analysing Grade Five (5) learners' work samples, such as completed mathematics assignments or problem-solving worksheets provides concrete evidence of their understanding and performance in adding decimal numbers. Creswell (2014) argues that work samples or artifacts refer to the actual work produced by students, such as worksheets, quizzes, tests,

projects and other assignments. Work samples can provide valuable insights into the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers.

Patton (2015) posits that work samples or artifacts provide an authentic representation of students' work allowing researchers to gain more accurate understanding of their challenges. This implies that work samples or artifacts provide context of the challenges faced by Grade Five learners allowing researchers to understand the specific problems and difficulties they encounter. In addition, collecting work samples or artifacts is a non-intrusive method that provides a permanent record of learners' work, detailed information about students' thought processes, problem-solving strategies and errors allowing researchers to collect, review and analyse data without disrupting the natural learning environment.

Yin (2014) postulates that work samples or artifacts can provide valuable information for informing instruction and developing targeted interventions to support student who are struggling. Therefore, work samples or assessments are used to assess student learning and understanding of mathematical concepts including addition of decimal numbers. They can be used in conjunction with other research methods such as surveys and interviews to triangulate data and increase the validity of the findings.

3.8 Data presentation methods and analysis

Data was collected and presented through the use of tables, pie charts, bar graphs, and column graphs. Presenting data can be a straightforward way to organise and display numerical information related to the challenges faced by Grade Five (5) learners when adding decimal numbers. Data analysis is the process of evaluating given data using analytical and logical reasoning to examine components of the data provided.

3.9 Data collection procedures

In this research, the researcher visited Dorset primary school administrators to seek permission to engage junior class teachers in this research. The researcher seeks permission to engage Grade five learners who were to be selected through simple random sampling. After being granted permission by the school administrators, the researcher introduced himself to the Dorset primary junior class teachers, clearly stating the reason(s) why he visited them, while putting emphasis on rapport. Ethical considerations were clearly explained by the researcher to the both teachers and learners as a way of safe guarding privacy and confidentiality of the intended findings. Questionnaires were issued to the selected teachers for them to complete. This was done to find out if those teachers were also experiencing some challenges and misconceptions in learners when solving problems involving addition of decimal numbers.

Furthermore, the Grade Five (5) learners from the class to participate in the study were selected considering factors such as diversity, academic performance and demographics to ensure a representative sample. Also the researcher obtained informed consent from the

participants' parents or legal guardians as well as assent from the students themselves. Clear explanation on the purpose of the study, the procedures involved and the rights of the participants were also given. Moreover, the researcher selected appropriate data collection tools such as observation protocols, interviews, questionnaires, problem-solving tasks or tests/assessments to gather information on the challenges faced by Grade 5 learners when adding decimal numbers.

The researcher used multiple data collection methods to triangulate the findings and ensuring data validity and reliability. In addition, the researcher collected data on how to administer data collection tools consistently and accurately. A pilot study was conducted with a small group of Grade 5 learners to test the procedures and make necessary adjustments before full-scale data collection.

Furthermore, data collection sessions were conducted in a controlled environment such as a classroom or a quiet space to minimise distractions, ensure focus from the participants and following standardised procedures for administering data collection tools. In addition, the researcher recorded data accurately and systematically using either note-taking or digital tools ensuring that data are securely stored and protected to maintain confidentiality and privacy. Moreover, different sources of data were combined to provide a comprehensive understanding of the challenges faced by Grade Five (5) learners in adding decimal numbers.

Finally, analysis of the data collected was done using appropriate qualitative or quantitative analysis techniques looking for patterns, themes and variations in the challenges faced by Grade Five (5) learners when adding decimal numbers. The findings were interpreted within the

context of the research objectives and existing literature clearly reporting the results including challenges identified, insights gained and implications for teaching and learning of decimal numbers.

3.10 Ethical considerations

Ethical approval will be sought from relevant educational authorities; these are Dorset Primary School and the Ministry of Primary and Secondary Education at district level. Informed consent will be obtained from participating facilitators, learners and parents. Clear explanations on the purpose of the study, what participation involves and how the data will be used are given.

Confidentiality and data protection will be strictly maintained throughout the research process. Ensuring the privacy and protecting the identities of the students and ensure that any data collected is anonymised to prevent identification. All participants will be treated with respect and dignity ensuring that the research does not cause harm or distress to the students involved.

Participation in the study should be voluntary. Students should not be coerced or pressured to participate and should be able to withdraw from the study at any time without consequences. Steps are taken to minimize any potential harm that may arise from the research. This includes ensuring that the study does not cause emotional or psychological distress to the participants.

Furthermore, the research is conducted in a fair and equitable manner.Avoiding any bias or discrimination in the selection of participants or in the interpretation of the results. The results of the study are reported accurately and honestly. Feedback is provided to the participants and the school community in a way that is understandable and respectful.

In a nutshell, ethical issues to be considered include informed consent, anonymity of informants, avoidance of harm, respect of participants' privacy and confidentiality. The researcher will make use of consent forms where participants sign to show the agreement. When conducting research involving children, it's especially important to follow ethical guidelines to protect their rights and well-being. By adhering to these ethical considerations, researchers can conduct studies that are respectful, fair and beneficial to the participants

3.11 Summary

The researcher presents the research approach used for data collection. Both qualitative and quantitative approach was done by the researcher. Random sampling technique was used to make sure the objectives of the study were achieved successfully. Population and sample of the study were also discussed. Data analysis and presentation were also discussed to ensure reliable and valuable of data from respondents. Confidentiality of respondents was also considered and respondents were respected and protected. The next chapter is going to look at data presentation and analysis.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the findings of investigation into the challenges faced by Grade 5 learners when solving problems involving the addition of decimal numbers. The data collected through interviews, questionnaires, pre-test, post-test was analysed in order to reveal common patterns and themes related to learners' conceptual understanding, procedural skills and emotional responses during problem-solving tasks. Presentation and analysis of data was followed by the interpretation. The graphs, tables, pie charts and narrative descriptions were used to represent the collected data. To effectively gather and analyse data for this study, a combination of qualitative and quantitative research instruments was employed.

4.2 Data presentation and analysis

4.2.1 Questionnaires from teachers

Teacher	Sex	Age	Qualifications	Teaching experience
A	Male	44	Diploma in education	24years
B	Female	40	Diploma in education	16 years
C	Male	37	Diploma in education	9 years

Table 4.1 : Teacher sex, age, qualifications and teaching experience

Structured questionnaires were distributed to both teachers. The teachers' questionnaires focused on instructional strategies and observed student behaviors when engaged with decimal problems. Both sexes were represented since there was one female and two males. The age of facilitators were within the range of 37-44 years, hence mature and old enough to be having much experience.

4.2.2 Questionnaires for learners

The student questionnaires aimed to assess learners' self-reported confidence and perceived difficulties with decimal addition. 25 learners all managed to return the distributed questionnaires filled with the information that was being researched by the researcher. The first

question needed the learners to indicate their sex. From the 25 learners, 12 were boys and 13 were girls. The second question required learners to indicate their age category and results were as follows:

Age	Number of learners
10 years and below	8
11 years	9
12 years	7
Above 13years	1

Table 4.2: Frequencies of learners' age group

From the table 4.2, the modal group was 11 years with 9 learners. Those with 10years and below were 8, also 7 were aged 12years and 1 learner was above 13 years. So the influence of the age on performance of learners was significant since all learners suit the level of the study. The ages of learners can be displayed on a column graph as below:

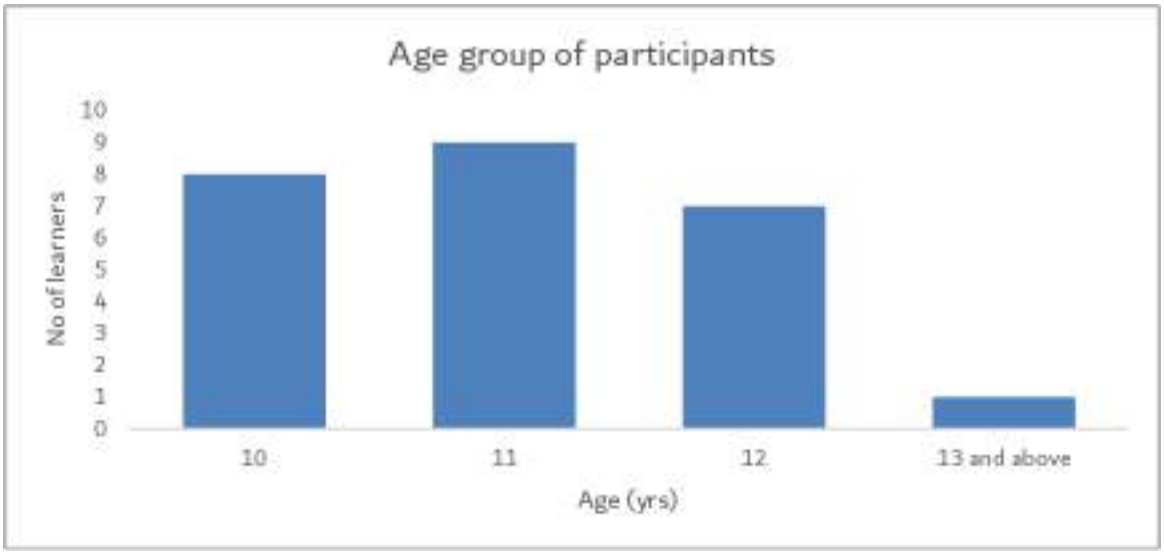

Fig 4.1: The age group of participants

4.3 Interviews

Semi-structured interviews with a sample of Grade Five (5) facilitators provided deeper insights into specific challenges faced. These interviews allowed facilitators to share their experiences, thoughts and suggestions for improving decimal addition instruction.

The interviewed facilitators indicated that the best approach of teaching decimal numbers requires a thoughtful and multi-faceted approach where concrete media such as blocks or base ten blocks are used to introduce decimal numbers. Furthermore, it was suggested that the use of visual aids such as diagrams and charts to represent decimal numbers is of paramount importance before the gradual introduction of abstract representations of decimal numbers such as digits and symbols.

However, some mentioned the use of games and activities such as decimal bingo and decimal scavenger hunt as best approach of teaching decimal numbers since they are child-centered. Differentiated instruction and collaborative learning were noted that they create a comprehensive and engaging approach to teaching decimal numbers at primary level.

Furthermore, some facilitators indicated that the type of media suitable for teaching addition of decimal numbers include interactive whiteboard software, online mathematics games, interactive simulations, digital worksheets and mathematics apps such as decimal games. Additionally, some possible solutions for teachers to improve the teaching and learning of decimal numbers noted include professional development, proper lesson planning and formative assessments to monitor student progress and adjust instructions accordingly. In addition students should be provided with hands-on activities.

Moreover, the teaching of decimal numbers is highly relevant to the teaching and learning of mathematics because they have numerous real-world applications such as finance, science and technology. In addition the interviewed facilitators postulate that learning of decimal numbers prepares students for high level mathematics courses such as algebra, geometry and calculus.

In a nutshell, it was noted that understanding decimal numbers is crucial for STEM education which is essential for preparing students for careers in life. Decimal numbers develop problem solving skills, enhance mathematical literacy, develop conceptual understanding and improve mathematics fluency.

4.4 Observations

Classroom observations were conducted during mathematics lessons. The researcher noted learners' engagement, problem-solving approaches and interactions with peers and teachers while working on addition of decimal numbers tasks. This helped to contextualise the challenges identified in surveys and interviews.

Additionally, it was noted that some learners still have misconceptions on decimal place value notation and finding perimeter of shapes when given dimensions of decimal numbers. Some struggled in decimal number alignment while others have problems in the interpretation of word problems. Moreover, it was observed that carrying over values when adding decimal numbers posed challenges to some learners.

4.5 Performance Tasks

A set of performance tasks involving addition of decimal numbers was administered to gauge the students' abilities and the types of errors they commonly made. Analysing their work provided concrete examples of the difficulties learners faced, allowing for a clearer

understanding of their mathematical reasoning and computation skills.

Table 4.3 : Pre-test results

Marks	0-2	3-4	5-6	7-8	9-10
Number of learners	8	5	4	3	5

The information in the above frequency distribution table shows that 12 out of 25 learners passed the pre-test with the mean of 12marks. The marks obtained by learners in the pre-test can be represented using a column graph as below:

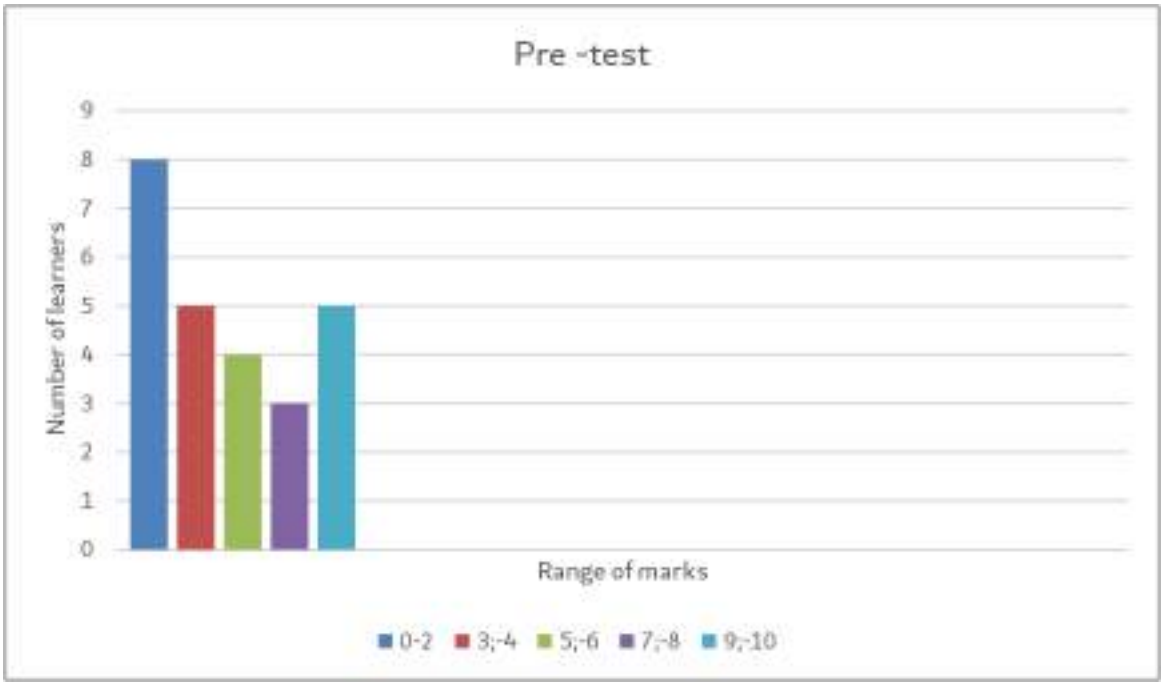

Fig 4.2 : Column graph showing pre-test

From the column graph in Fig 4.2, it is evident that most learners scored marks in the range of 0-2 since it has the tallest bar. Learners were tested on their previous knowledge of the concepts on decimal numbers. Generally, learners in the sample proved that they have some knowledge on decimal numbers. Difficulties encountered by the learners in the pre-test were noted. The percentage of learners who passed and who failed can be represented on a pie chart as below :

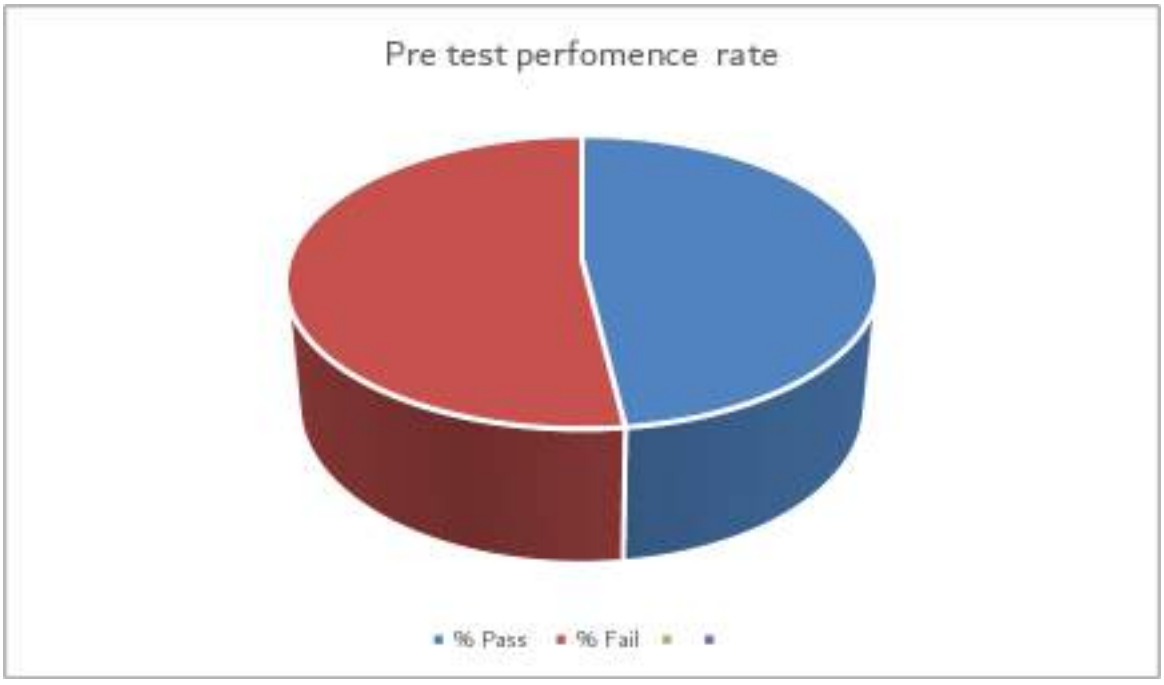

Fig 4.3 : Pie chart showing pre-test performance

From Fig 4.3 Learners performance in the pre-test indicated that the percentage pass rate is 48% and percentage of those who failed is 52% . This implies that most learners have challenges in dealing with decimal numbers.

Table 4.4: Showing pre-test performance per question

Item	Number of correct answers	Percentage of correct answers	Number of wrong answers	Percentage of wrong answers
Value of 7 in 3,745	9	36%	16	64%
2,54 +1,7=	12	48%	13	52%
Add $7,25 and $5,87	16	64%	9	36%
4 plus 6,375	12	48%	13	52%
3,742+8,928=	14	56%	11	44%
2,3litres + 1,8litres	15	60%	10	40%
19,5cm+ 1,9cm	8	32%	17	68%

Total of 4,2km;2,5km and 7,36km	10	40%	15	60%
Increase 6,5kg by 3,7kg	14	56%	11	44%
Perimeter of a triangle with sides 6,3m; 7,4m and 9,3	10	40%	15	60%

From the above table learners most fail rate was on item 7 with fail rate of 68% . This implies that most learners lack decimal alignment skills which is assumed to be caused by the challenges on place value. The pass rate on item 1 which is 36% showed that there is need for Improvement. The highest pass rate is 68% on item number 3 which indicate that learners are able to apply the decimal concept in real-life situation. The information in the table can be represented on a column graph as below

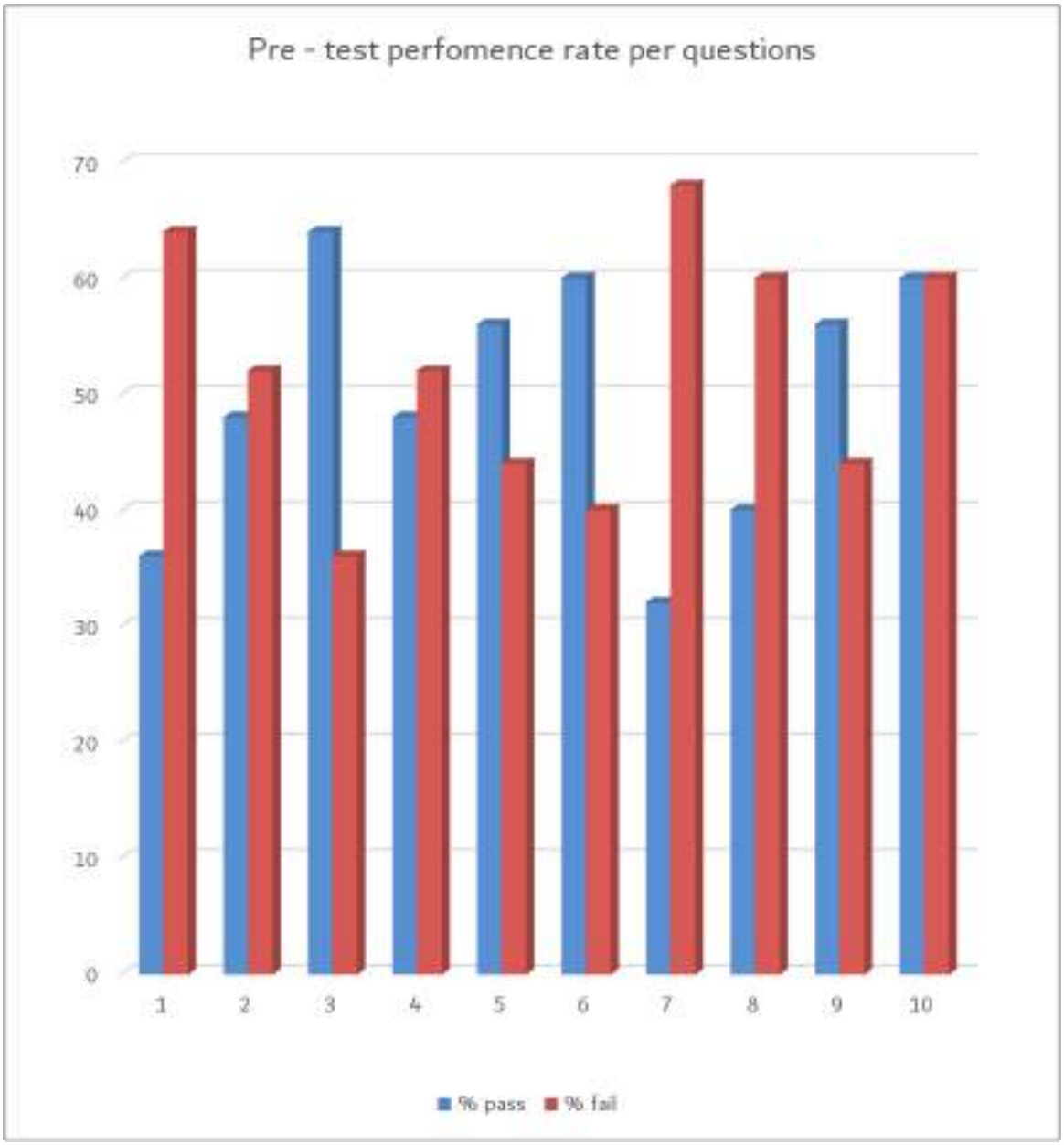
Pre - test perfomence rate per questions
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
% pass
% fail

Fig 4.4 : Column graph showing Pre-test performance rate

4.6 Course of action

The researcher conducted 3 lessons with learners, each was 30 minutes long. The concepts of decimal numbers were covered in the lessons. Application of decimal numbers in real-life was done. Groupwork, demonstrations question and answer methods of teaching and learning were used during the lesson delivery. Charts, number line strips, money, liquids, work cards and shapes were used. The lessons were done in a normal classroom setup. All activities in the lessons were closely monitored by the researcher to an extent of assisting even individuals who facing challenges. Learners were split into 5 groups of 5 learners each when doing groupwork. Learners were contributing by raising their hands in the class discussions when wanted to give responses. The researcher also decided to conduct other three remedial lessons with 8 learners of the sample group who scored 0-2 marks in the pre-test. Each lesson carried 5 minutes.

4.7 Focus Groups

Focus group discussions with students allowed for collaborative exploration of learners' thoughts on why they struggle with decimal addition. These discussions emphasised group dynamics and peer explanations, offering valuable qualitative data.

4.8 Observations

The researcher observed that some learners lack interest in the activities involved, however some showed some understanding as they were participating in the lesson process. Place value notation seemed to be a challenge to some of the learners when dealing with decimal numbers, for example learners were identifying the value of 7 in 3.745 as Hundreds meaning to say the

were not aware of the decimal comma on the numbers. In addition to that, the majority of learners were really making some errors of omitting the decimal comma, for example 2,3+1,8 =41 instead of 4,1. Moreover, some were misaligning decimals when adding, for example when adding 6. 375 and 4, learners aligned 4 under thousandths and end up getting 6.379 as the answer instead of 10.379. In addition, some introduced a decimal comma when adding 100 and 10.79 and end up with 10.79+10.0=20.79 instead of 100+10.79=110.79 and also 3.84+1.4=5.24 instead of 14+3.84=17.84

Furthermore, some failed to add four decimal numbers when finding perimeter of a rectangle given dimensions in decimals, for example they added only two sides 3.94km+2.68km=6.62km instead of 3.94km+2.68km+3.94km+2.68km=13.24km. In addition, some failed to align decimals when adding decimal numbers rounded to three and two decimal places, for example when adding 13.674cm³and 2.89cm³. In a nutshell, some were failing to align their work properly. However, the researcher took corrective measures.

Furthermore, some learners were failing to grasp the concept as the researcher was teaching in English. The facilitator then used code-switching between the mother tongue and English and most of the learners started to understand well. A post-test was then administered to the sample group to check if there was difference in learners' performance. Questions set were different from those of the pre-test. Learners were being monitored to make sure that they were not assisting each other in any way.

Table 4.5: Showing post-test results

Marks	0-2	3-4	5-6	7-8	9-10
Number of learners	4	3	8	7	3

The information in the above frequency distribution table shows that 18 out of 25 learners passed the post-test with an average mark of 13,9. This shows an improvement of learners' performance as compared to pre-test. The marks obtained by learners in the post-test can be represented using a bar graph as below:

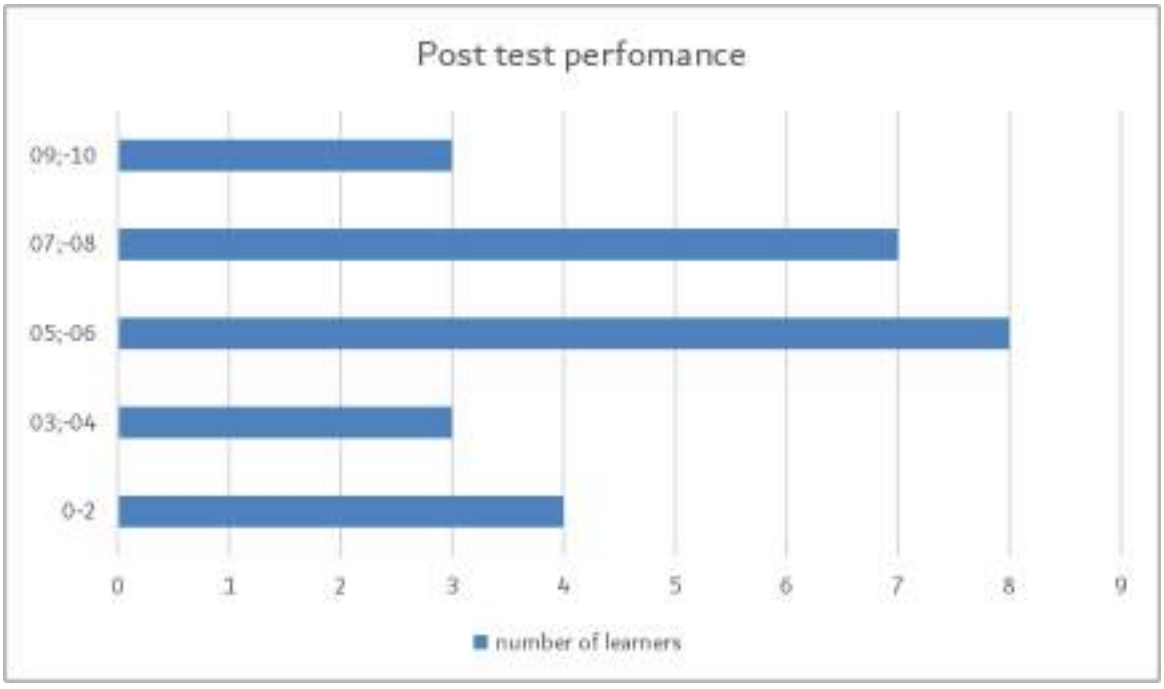

Fig 4.5: Showing marks obtained in post-test

From the bar graph in Fig 4.5, it is evident that most learners scored marks in the range of 5-6 since it has the longest bar. Learners were tested on their knowledge of the concepts on decimal numbers so far. Generally, learners in the sample proved that they have improved on their performance and knowledge on addition of decimal numbers. This proves that the teaching and learning methods and strategies used by the facilitator were effective and appropriate. Difficulties encountered by the learners in the post-test were noted. The percentage of learners who passed and who failed can be represented on a pie chart as below :

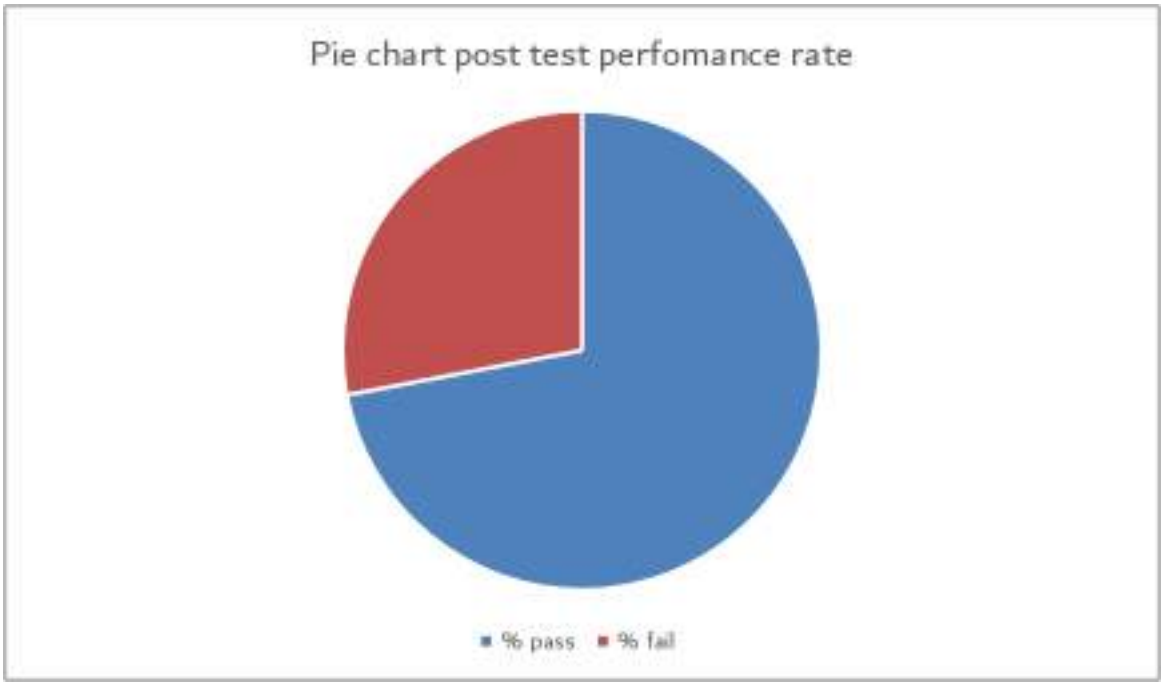

Fig 4.6: Pie chart showing post-test percentage pass rate

From Fig 4.6, it is evident that learners post-test percentage pass rate increased to 72% and percentage of those who failed decreased to 28% as compared to pre-test. This implies that the teaching and learning methods used were effective, hence most learners showed an understanding on the concept.

Table 4.6: Post-test learners' performance per question

Item	Number of correct answers	Percentage of correct answers	Number of wrong answers	Percentage of wrong answers
14+3,84=	9	36%	16	64%
100+10,79=	4	16%	21	84%
3,7m+2,46m+4,54m=	16	68%	9	36%
13,674cm³+2,89cm³=	12	48%	13	52%
9,7litres+8,6litres=	20	80%	5	20%
0,08+0,2=	22	88%	3	12%
23,84+6,57=	17	68%	8	32%
$9,65+$7,85=	19	76%	6	24%
2(3,94+2,68)=	2	8%	23	92%
6,4hours+3,6hours+0,75hours=	18	72%	7	28%

From the above table it is observed that learners have improved in dealing with decimal numbers with the highest performance rate at 88% on item number 6. There was an improvement of learners' performance per question as compared to pre-test which had a maximum of 68% pass rate. This implies that some learners knew what methods they were supposed to apply to solve the question. However, the percentage pass rate per question fell from 32% to 8% on item number 9. It indicates that some learners still have challenges that need to be dealt with in some of problems involving decimal numbers. The information on the table can be represented on a column graph as below;

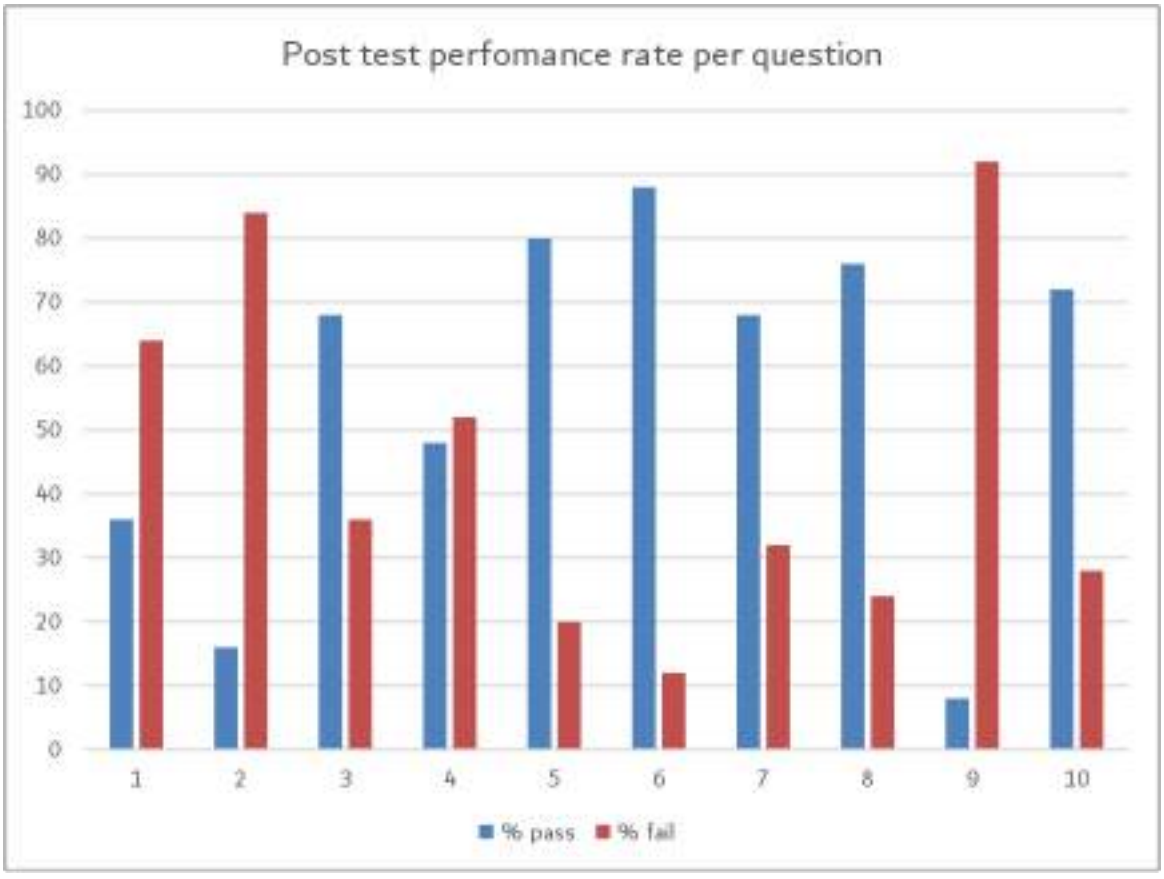

Fig 4.7 Performance pass rate per question

Graph shows that most of the learners performed well in the post-test and few learners failed the post-test challenges faced by learners at the pre-test were rectified although some continued to fail.

Table 4.7: Testing the association between teaching and learning methods used in investigating challenges faced addition of decimal numbers and the performance of learners using Spearman ranking.

Student	Pre-test mark(x)	Rank (x)	Post-test mark(y)	Rank (y)	Rx- Ry= d	d^2
1	10	2	9	1	1	1
2	9	4,5	9	1	3,5	12,25
3	8	6,5	9	1	5,5	30,25
4	4	15	7	8,5	6,5	42,25
5	7	8	7	8,5	-0,5	0,25
6	8	6,5	7	8,5	-2	4
7	4	15	7	8,5	6,5	42,25

8	9	4, 5	8	5	-0,5	0,25
9	3	17	8	5	12	144
10	10	2	8	5	-3	9
11	2	19	6	13,5	5,5	30,25
12	4	15	6	13,5	1,5	2,25
13	5	12	6	13,5	-1,5	2,25
14	5	12	6	13,5	-1,5	2,25
15	2	19	5	17,5	1,5	2,25
16	6	9	5	17,5	-8,5	72,25
17	5	12	6	13,5	-1,5	2,25
18	10	2	6	13,5	-11,5	132,25
19	4	15	4	19,5	-4,5	20,25

20	1	22	4	19,5	2,5	6,25
21	2	19	3	21	-2	4

22	0	24.5	0	24,5	0	0
23	0	24.5	1	23	1,5	2,25
24	1	22	0	24,5	-2,5	6,25
25	1	22	2	22	0	0
Total of d^2						570,25

Spearman

= 1- 6(sum of d^2)/n(n²-1)

= 1-6(570,25)/25(25²-1)

=1-(3421,5/15600)

=12178,5/15600

=78,1%

Conclusion: There is a strong positive correlation relationship between teaching methods and learners performance.

4.9 Summary

Each of these instruments played a critical role in triangulating data and ensuring a comprehensive understanding of the challenges faced by learners. The results from these methods will be presented in the subsequent sections, highlighting key themes and recommendations for educators to enhance teaching and learning experiences related to decimal arithmetic.

Chapter 5: Summary, conclusion and recommendations

5.1 Introduction

This chapter gives the summary of the study, conclusion drawn from the findings got from tests, questionnaires, interviews with both learners and facilitators. Recommendations will also be made hoping that they shall be helpful to all interested parties in the study of mathematics and for future studies.

5.2 Summary

The purpose of this study was to investigate the challenges faced by Grade Five learners when solving problems involving addition of decimal numbers at Dorset primary school in Shurugwi District in Midlands Province where the researcher was teaching. 25 learners from Grade 5 of mixed abilities and 3 facilitators all from Dorset Primary School were taken as subject in the study. Random sampling was used to select learners to make sure that there was no bias. Qualitative and quantitative methods were used to collect data through questionnaires, observations, interviews and tests. Various constraints met during the research period could have had a negative effect to the study. However, the researcher worked hard to mitigate these constraints in order to make the research successful. Challenges in teaching and learning of decimal numbers were noted and some attempts were made in trying to come up with some solutions.

5.3 Findings of the study

5.3.1 Challenges faced by learners when dealing with decimal numbers

In the questionnaires, learners indicated that they did not understand the meaning of decimal numbers. The results of tests which involved some real-life situations posed challenges in decimal numbers. Furthermore, from the interviews, facilitators stated that the majority of learners have difficulties in solving problems involving addition of decimal numbers.

Moreover, from the questionnaires for facilitators, they reiterate that learners face challenges like aligning decimal points and carrying over values. In addition, facilitators stated that learners do a lot of errors and some face challenges in solving problems involving addition of decimal numbers because of the negative attitudes towards the teaching and learning of mathematics. Learners also fail to grasp the concepts of decimal numbers when taught in English throughout. On another note, learners do not perform well because some parents do not play their roles in supporting education of their children.

5.3.2 Possible causes of the challenges

The researcher noted that most of the facilitators from their questionnaires stated that lack use of concrete media such as scales, poor attention by learners, inadequate parential support and use of outdated textbooks with insufficient examples are some of the possible causes of challenges. The majority of interviewed facilitators cited Grade 3 second term as the appropriate time to introduce addition of decimal numbers, though it is a bit late considering the importance of decimal numbers in the mathematics syllabus and real-life situations.

Teaching and learning methods used also cause problems if they are not appropriate.

5.3.3 Solutions to challenges faced by learners

The researcher also observed that teaching and learning methods used such as groupwork, guided hands-on activities, discussions and demonstrations with the aid of concrete media are some of the solutions to problems if properly applied as mentioned by facilitators in interviews. From both questionnaires and interviews for facilitators, the use of code-switching between mother language and foreign language, use of scales, use of current textbooks with many examples, use of online platforms can be solutions to causes of challenges faced by learners when dealing with decimal numbers at Grade 5 level.

5.4 Conclusion

The challenges encountered by learners when solving problems involving addition of decimal numbers varied and some of them are direct while others are others are indirect. However, the researcher used research tools mentioned earlier to arrive to a number of conclusions which contribute to challenges faced by learners in the teaching and learning of decimal numbers. The challenges include inappropriate teaching methods, lack of practice, lack of teaching and learning resources, negative attitude of both learners and facilitators towards decimals, poor attention on part of learners, failure to interpret and the language used especially if it is English. It is evidenced in the study by Spearman ranking that learning outcomes improves when appropriate teaching and learning methods are effectively implemented.

5.5 Recommendations

In light of the conclusion mentioned, the researcher found it worth to make the following recommendations:

- Decimal numbers should be introduced at Grade 3 level in order to allow enough time for learners to interact with decimals especially story sums.
- Explanations by facilitators should be clear enough to avoid misapplications
- Teaching and learning methods should be appropriate and motivational.
- Facilitators should use code-switching of both indigenous language and English when teaching decimals for learners understand better.
- The use of concrete media is of paramount importance in the teaching and learning of all mathematics lessons.
- All stakeholders should take part in the improvement of teaching and learning of mathematics.

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APPENDIX A

Questionnaire for teachers

I am Mabuto Happison a student from Bindura University carrying out a research on the challenges faced by Grade 5 learners at Dorset Primary School in solving problems involving addition of decimal numbers.

Section A

1. Gender..... .[MALE] [FEMALE]

2. Subject(s) taught : .....

3. Teaching experience :.....(in years)

3. Level taught :.....

4. Have you taught Grade 5 before? [Yes] [No] (tick the appropriate answer)

SECTION B

5. Ways of introducing decimal numbers_concept. e.g question and answer exercise, using quizzes, use of decimal charts

.....

6a). State methods or strategies of teaching addition of decimal numbers.

- Direct instructions [Yes] [No]
- Hands-on activities [Yes] [No]
- Visual aids (charts, diagrams etc) [Yes] [No]
- Groupwork [Yes] [No]
- Technology (online resources) [Yes] [No]
- Other (please specify).....

6b). If using online resources state two online resources you use

.....

.....

7. How frequently do you incorporate decimal addition in your lesson? (Select one)

Daily [ ] Weekly [ ] Monthly [ ] Rarely [ ] Never [ ]

8a). What are the most common challenges faced by Grade Five learners when solving problems involving addition of decimal numbers?

Understanding place value [ ]

Aligning decimal points [ ]

Carrying over values [ ]

Confidence in Mathematics skills [ ]

Applying concepts in word problems [ ]

Other (please specify).....

8b). Give possible ways of overcoming challenges stated yes above

.....

9. What resources or materials do you feel would support in improving their skills in adding decimal numbers? (open-ended)

.....

10. Are there any professional development opportunities you have participated in that have helped you teach decimal addition more effectively? If yes, please describe. (open-ended)

.....

11. What suggestions do you have for improving instructions related to the addition of decimal numbers at Grade 5 level? (open-ended)

.....

12. What recommendations do you have for addressing the challenges faced by learners at Grade 5 level at Dorset primary school?

.....

Thank you for taking time to complete this questionnaire. Your insights are invaluable in understanding and addressing the challenges learners face when solving problems involving addition of decimal numbers. Your responses will contribute significantly to enhancing the educational experience for Grade 5 learners at Dorset Primary School and the world at large.

APPENDIX B

Questionnaire for participants

I am Mabuto Happison, a mathematics student at Bindura University carrying out a research on challenges faced by Grade Five learners when solving problems involving addition of decimal numbers. Below is a set of questions which I humbly request you to answer. Information will be treated with strict confidence.

Instructions for Participants:

- Please answer all questions to the best of your ability.

- Your responses will remain confidential and will be used solely for research purposes.

Section A: Demographic Information

1. Age

  - [ ] Below 10

  - [ ] 10

  - [ ] 11

  - [ ] 12

  - [ ] 13 and above

2. Grade Level:

  - [ ] 4th Grade

  - [ ] 5th Grade

  - [ ] 6th Grade

- [ ] 7th Grade

3. Gender:

- [ ] Male

- [ ] Female

- [ ] Non-binary

- [ ] Prefer not to say

4. Have you received any special education support for Maths?

- [ ] Yes

- [ ] No

Section B: Understanding of Decimal Numbers

5. How confident do you feel when working with decimal numbers? (1 = Not confident, 5 = Very confident)

- [ ] 1 - [ ] 2 - [ ] 3 - [ ] 4 - [ ] 5

6. How often do you encounter problems involving decimal numbers in your Maths classes?

- [ ] Rarely

- [ ] Sometimes

- [ ] Often

- [ ] Always

Section C: Challenges Faced

7. Did you understand the concept of decimal numbers? [YES] [NO]

8. Did you enjoy the way you were introduced to decimal numbers? [YES] [NO]

9. Did you enjoy Maths after learning decimals? [YES] [NO]

10. Did your teacher explain well the concept of decimal numbers with confidence? [YES] [NO]

11. What specific challenges do you face when solving problems involving decimal numbers? (Select all that apply)

- [ ] Understanding the concept of decimals

- [ ] Performing operations (addition, subtraction, multiplication, division)

- [ ] Comparing and ordering decimal numbers

- [ ] Rounding decimal numbers

- [ ] Word problems involving decimals

[ ] Other (please specify): _____

Section D: Support and Resources

12. What resources do you find helpful when learning about decimal numbers? (Select all that apply)

- [ ] Textbooks

- [ ] Online tutorials/ videos

- [ ] Homework help from teachers

- [ ] Study groups with peers

- [ ] Educational apps or games

-[ ] Other (please specify): _____

13. How would you rate the support you receive from your teachers regarding decimal numbers? (1 = Poor, 5 = Excellent)

- [ ] 1 - [ ] 2 - [ ] 3 - [ ] 4 - [ ] 5

Section E: Additional Comments

14. Do you have any additional comments or suggestions on how to improve learning about decimal numbers? (Open-ended response)

.....

Thank you for taking the time to participate in this questionnaire. Your insights are valuable in understanding the challenges learners face with decimal numbers and how to better support their learning.

APPENDIX C

Interview guide for facilitators

1. Sex
2. Teaching experience
3. Classes taught
4. With the experience you have in teaching and learning of mathematics, what do you think is the best approach of teaching decimal numbers?
5. What are the common challenges encountered by learners when dealing with decimals?
6. Do you use concrete media when teaching decimal number?
7. What type of media is suitable for teaching decimals at primary level?
8. How often do you incorporate the teaching and learning of decimals?
9. Give the possible solutions of improving the teaching and learning of decimal numbers.
10. At what learning level do you suggest decimals should be introduced to learners?
11. Is the teaching of decimal numbers relevant to teaching and learning of mathematics?

APPENDIX D

Pre-test

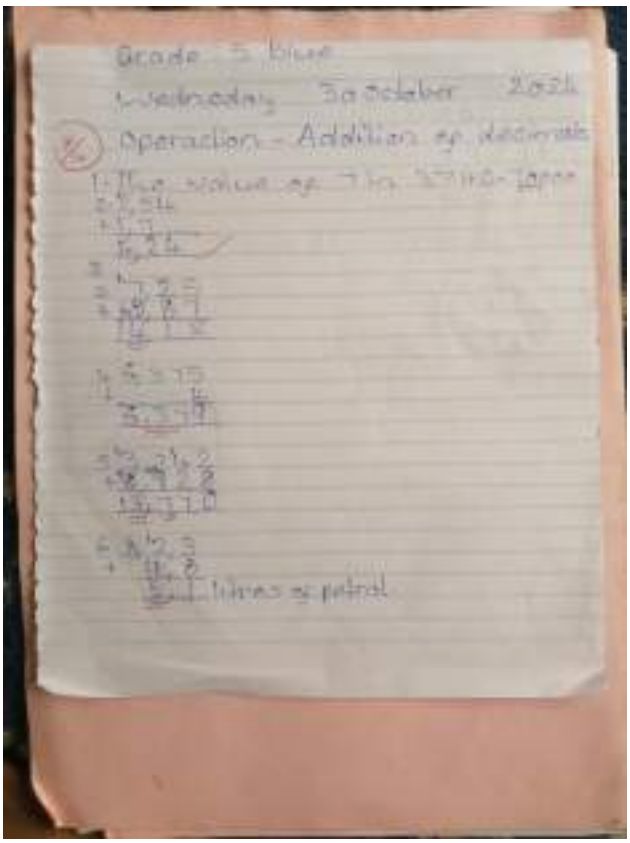
1. What is the value of 7 in 3,745?
2. 2,54 + 1,7 =
3. Add $7, 25 and $5,87
4. 4 plus 6,375=
5. 3,742 + 8,928=
6. Chipo had 2.3 litres of petrol. Her mother gave her 1.8 litres more. How many liters of petrol does she have now?
7. 19,5cm + 1,9cm =
8. What is the total of 4.2km; 2,5km and 7.36km?
9. Increase 6,5kg by 3,7kg
10. Find the perimeter of a triangle with sides 6,3m; 7,4m and 9,2m.

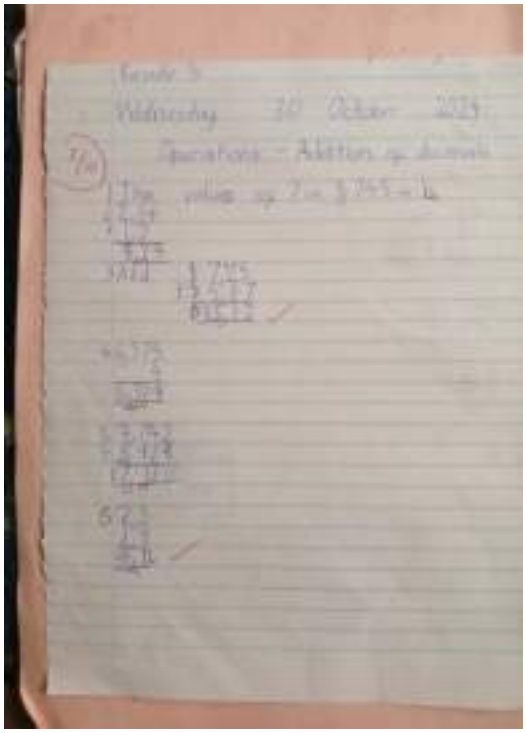
APPENDIX E

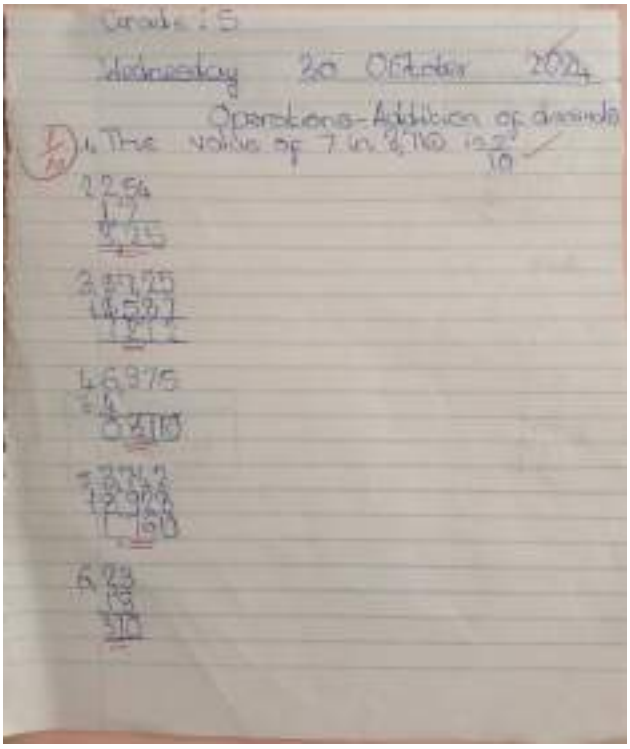
Post-test

1. 14 + 3,84=
2. What is the sum of 10,79 and 100?
3. 3,7m + 2,46m + 4,54m=
4. 13,674cm^3+2,89cm^3=
5. A farmer produced 8,6litres of milk on Monday and 9,7litres on Tuesday. How many liters of milk was produced by the farmer altogether?
6. 0,08+0,2=
7. 6,57kg plus 23,89kg=
8. Mother bought an axe at $7,85 and a shovel at $9,65. How much did she pay altogether?
9. Find the perimeter of a rectangle with length that measures 3,94km and width 2,68km
10. Add 6,4hours; 3,6hours and 0,75hours

PRE-TESTS


Grade 5 blue
Wednesday 30 October 2024
Operation - Addition of decimals
litres of petrol


Wednesday 30 October 2024


Grade : 5
Wednesday 30 October 2024
Operations-Addition of decimals
1. The value of 7 in 3.710 is 7/10

POST TESTS