

# Investigating the Teaching Methods Used to Teach Mathematical Problem-Solving in the Junior Primary at Rural-Farm Schools: Kunene Region

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## Abstract

The study sought to determine the best teaching strategies for rural-farm schools in Kunene to improve students' mathematics problem-solving skills. The study used a qualitative phenomenological design to record teachers' and learners' lived experiences and views of mathematics problem-solving education in rural-farm schools. Five junior primary teachers and three HoDs were actively chosen for the study. Structured interviews, observation schedules, and document analysis provided data for the study. These questions led to our study: How are Kunene junior primary rural-farm schools in Namibia teaching mathematical problem-solving? How do rural-farm schools in Kunene fulfill the needs and concerns of rural learners? How do Kunene rural-farm schools' teaching approaches affect learners' mathematical problem-solving performance compared to other Namibian regions? A unique coding strategy was utilized to categorize data for theme analysis. The majority of teachers struggled to use proper teaching approaches while teaching young learners mathematical problem-solving skills, according to this study. Teachers most often taught mathematical problem-solving by identifying important terms in story problems and using manipulatives. Rural-farm teachers usually use group work and whole-class involvement to promote learning and engagement. The survey also found that rural agricultural school teachers utilize a one-size-fits-all approach to teaching mathematics problem-solving. Therefore, the study suggests that teachers provide reading exercises that help learners identify, understand, and use operation sign terminology to improve reading comprehension. The report also suggests that Education Regional Offices offer Grade 3 teachers professional development sessions. In addition, all

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regional schools should have the same effective teaching materials.

## Keywords

Teachers, Learners, Performance, Mathematics, Junior Primary Schools, Rural-Farm Schools, Learning Individualization

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## 1. Introduction/Background of the Study

Rural-farm schools' mathematics education, especially junior primary, has been criticized in recent years (Kleopas, 2020; Brown, 2020). The Kunene region in north-western Namibia is rural and agricultural, which makes it difficult to provide adequate education, especially in math. Remote rural communities in the region often lack excellent schooling. Given the importance of mathematics as a foundational subject and problem-solving as a critical skill, effective teaching approaches to improve mathematical learning outcomes in this environment are essential (Johnson et al., 2019). Mathematics is essential for developing problem-solving, logical thinking, and critical reasoning (Clements & Sarama, 2019).

Hiebert and Grouws (2007) found that mathematics teaching styles greatly affect learners' learning. Traditional teaching methods, such as rote memorization and drills, may not improve problem-solving and mathematical thinking (van de Walle et al., 2013). Thus, innovative teaching strategies that deepen mathematics understanding and interest learners are necessary.

Learner-centered techniques like project-based learning (PBL) and inquiry-based learning (IBL) have been found to improve mathematical problem-solving skills (Johnson et al., 2019). PBL gives learners real-world problems to solve through collaborative and inquiry-based methodologies (Vygotsky, 1978). IBL encourages learners to question, investigate, and discover mathematical concepts (Piaget, 1952). Both strategies teach problem-solving, critical thinking, and mathematical reasoning (Clements & Sarama, 2009).

Rural-farm schools in Kunene must be considered in their specific environment (Jones, 2019). Innovative teaching approaches can be hindered by a lack of materials, technology, and skilled teachers (Smith, 2017; Brown, 2020). Cultural and language obstacles may also affect arithmetic comprehension and participation (Kleopas, 2020; Brown, 2020). Thus, rural-farm schools in Kunene, Namibia, need excellent teaching methodologies.

The study examines mathematical problem-solving instruction in Kunene junior primary schools in rural-farm regions. The Kunene region in north-eastern Namibia is notable for its rural environment and agriculture (Muyenga, 2019). Rural-farm schools confront distinct obstacles due to low resources, distant sites, and socioeconomic conditions (Lukolo, 2020).

Mathematics learners learn to apply mathematical concepts and principles to real-world situations through problem-solving. It involves problem analysis, stra-

tegy development, and solution selection (OECD, 2019). Effective teaching is essential for problem-solving and arithmetic success (Hiebert et al., 2016).

Due to various factors, rural-farm schools in Kunene may use different teaching approaches than metropolitan or more resourced schools. Language difficulties, insufficient educational materials, and fewer competent teachers are examples (Mbazzi, 2018). Thus, to identify mathematical problem-solving strengths, weaknesses, and opportunities for growth, these schools' instructional approaches must be examined.

Teaching methods in Kunene rural-farm schools can enlighten educational officials, administrators, and teachers about present practices and their efficacy. This knowledge can help create targeted interventions, professional development, and curricular modifications for these schools' children (Kanyimba, 2020).

The study examines mathematical problem-solving training in Kunene junior primary schools to reveal teachers' practices. It tries to uncover successful mathematical problem-solving strategies that engage, understand, and master learners. The project also seeks to uncover any obstacles instructors face in implementing these strategies and offer suggestions for improving rural-farm school education (Mbewe et al., 2021). The requirements and challenges of rural-farm schools have become increasingly apparent in recent years. Research shows that rural and urban areas have different educational resources and possibilities, requiring focused interventions (Chikoko, 2017). This study adds to rural education discussions by examining Kunene rural-farm school teaching practices.

Rural-farm schools struggle with teaching materials. Poor infrastructure, technology, textbooks, and supplies plague these schools (Musarandenga, 2020). These issues may affect mathematical problem-solving instructional resources. Understanding this context's teaching approaches might help teachers overcome these constraints and develop new ways to promote students' learning.

Another major element affecting teaching approaches is the rural teacher shortage (Manyoni et al., 2019). Rural-farm teachers may experience additional challenges due to increased class sizes, multi-grade instruction, and insufficient professional development (Muzenda, 2020). These elements can influence teachers' mathematical problem-solving methods. By studying existing teaching approaches, the study can reveal teachers' innovative responses to these issues.

Language limitations can also hinder rural-farm school communication and instruction. In Namibia, where various languages are spoken, including indigenous ones, the language of teaching can affect pupils' mathematics problem-solving (Kapuire et al., 2017). Teachers in Kunene can demonstrate how they use language variety and effective communication to improve learners' mathematical problem-solving skills.

The study has important implications for enhancing mathematics teaching in rural-farm schools in Kunene and other situations. This can help create focused interventions and support mechanisms for these schools' difficulties. The study

can improve education and promote equity for rural-farm kids by identifying effective teaching techniques and areas for development.

The findings from this study can also inform regional and national educational strategies. They can help create curricular frameworks for rural-farm schools and recommend mathematical problem-solving methods. The findings can also help teachers improve their teaching and help rural-farm pupils solve arithmetic problems.

## 2. Statement of the Problem

Mathematics being a crucial subject in primary education, teachers find it challenging to employ effective teaching methods to enhance mathematical problem-solving understanding (Kleopas, 2020). Despite efforts to improve mathematics education in rural-farm schools within the Kunene region, there remains a significant challenge in effectively teaching mathematical problem-solving skills to learners at the junior primary level. This problem is highlighted in a study conducted by Johnson et al. (2022), which found that the current teaching methods employed in these schools often fail to adequately develop learners' problem-solving abilities, resulting in weak academic performance and limited mathematical proficiency among learners and as a result it makes learners repeat grades which causes overcrowding and subsequently makes it very difficult for a teacher to handle a large class (Brown, 2020).

Rural-farm schools in the Kunene region further face unique challenges in providing effective mathematics education, particularly in the context of teaching mathematical problem-solving in junior primary grades. Despite the significance of mathematical problem-solving skills for students' academic success and real-world application of mathematics, there is a lack of recent research specifically examining the teaching methods employed in these schools to promote mathematical problem-solving abilities.

Limited access to educational resources, such as textbooks and technology, is a prevalent challenge in rural-farm schools (Musarandenga, 2020). Additionally, the shortage of qualified teachers in rural areas can impact the quality of instruction and the implementation of effective teaching methods (Manyoni et al., 2019). Language barriers and cultural diversity may also affect communication and instruction in these schools (Kapuire et al., 2017). These factors contribute to the need for a thorough investigation of the teaching methods used for mathematical problem-solving in the Kunene region's rural-farm schools.

Despite the significance of mathematical problem-solving skills for learners' academic success and real-world application of mathematics, there is a lack of recent research specifically examining the teaching methods employed in these schools to promote mathematical problem-solving abilities. The existing literature provides limited recent insights into the specific teaching methods employed in these settings. While there have been studies on mathematics education in rural areas, the majority of them focus on broader issues such as access to

education and quality of learning outcomes, rather than investigating the teaching methods specifically related to mathematical problem-solving in rural-farm schools in the Kunene region.

Therefore, there is a need for research that addresses the gap in understanding the teaching methods used to teach mathematical problem-solving in junior primary schools in the rural-farm areas of the Kunene region. This study examines the teaching methods currently employed in junior primary mathematics education in rural-farm schools in the Kunene region, this study aims to identify strengths and weaknesses in the existing practices. Additionally, the study seeks to explore alternative teaching methods that can effectively enhance mathematical problem-solving skills among learners in this context. Rural-farm schools in the Kunene region face unique challenges in providing effective mathematics education, particularly in the context of teaching mathematical problem-solving in junior primary grades.

This study aims to address the following research questions: What teaching methods are currently employed by teachers in rural-farm schools in the Kunene region to facilitate mathematical problem-solving in junior primary grades?

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### 3. Significance of the Study

This study holds several implications for the field of education, specifically in the context of rural-farm schools in the Kunene region. Firstly, it will provide an overview of the current teaching methods employed in these schools, shedding light on the strategies and techniques used by teachers to promote mathematical problem-solving. This understanding can inform educational policymakers, curriculum developers, and teacher training programs in designing contextually appropriate interventions to enhance mathematical problem-solving instruction in similar settings. Secondly, by assessing the effectiveness of the teaching methods, the study will contribute to evidence-based practices in mathematics education. It will identify the strengths and weaknesses of the current approaches and provide recommendations for improving instructional strategies in rural-farm schools in the Kunene region. Lastly, this research will add to the limited literature on teaching methods for mathematical problem-solving in junior primary education specifically within rural-farm schools in the Kunene region. It will fill the existing gap in knowledge and serve as a foundation for future research in this area, potentially leading to more comprehensive and tailored educational interventions.

### 4. Theoretical Framework

The theoretical framework for examining teaching methods used to teach mathe-

mathematical problem-solving in junior primary at rural-farm schools in the Kunene region draws on several key concepts and mainly on socio-cultural theory.

The socio-cultural theory posits that learning is influenced by social interactions and cultural contexts (Vygotsky, 1978). This theory suggests that effective teaching methods should consider the cultural background and experiences of learners. In the rural-farm schools of the Kunene region, where learners may have unique cultural perspectives and experiences, incorporating socio-cultural elements into teaching methods can enhance learners' engagement and motivation in mathematical problem-solving (Barton, 2003).

Scaffolding refers to providing temporary support and guidance to learners as they engage in problem-solving tasks. Teachers can structure activities, offer prompts, and provide step-by-step guidance to help learners develop problem-solving strategies (Wood, Bruner, & Ross, 1976). Gradually, the scaffolding can be reduced as learners gain proficiency, allowing them to solve problems independently.

By applying the constructivist and socio-cultural theories, incorporating problem-based learning, and integrating technology, teachers in the Kunene region's rural-farm schools can create a supportive learning environment that fosters learners' mathematical problem-solving skills and enhances their overall mathematical proficiency.

The theoretical framework presented above offers a foundation for teaching mathematical problem-solving in junior primary at rural farm schools in the Kunene region. Socio-cultural theories create an enriched learning environment that fosters learners' mathematical problem-solving skills. Implementing these methods will require support from teacher training programs, resource allocation, and collaboration among stakeholders to address the unique challenges faced by rural farm schools in the Kunene region.

## 5. Literature Review

### 5.1. The Mathematical Problem Solving Teaching Methods

It is acknowledged that the concept of problem solving is important for the learning and understanding of Mathematics (Van de Walle et al., 2013). Ronden (2012) explained that problem solving promotes reasoning, logical thinking and critical thinking. Thus, Billstein, Libeskind and Lott, (2013), and Van de Walle et al. (2013) are of the opinion that the teaching and learning of Mathematics in the early primary schools should be based on the five standard processes, namely: problem solving, reasoning and proof, communication, connections and representation. The current status of teaching methods employed in the Junior Primary classrooms in Namibia is that teachers demonstrate mathematical problem solving activities using local examples such as concrete materials found in the environment, e.g. stones, sticks, bottle tops, etc.

Learners work in well-organized small groups, pairs, individuals or whole class so that they learn from one another (Ministry of Education, Arts & Culture,

2015). Other teaching methods include demonstration, brainstorming, peer teaching and problem solving.

### 5.1.1. Group Work, Pairs, Individual or Whole Class

Tanveer's (2008) research on group work vs. whole-class activity in Pakistan examined how teaching methods can be utilised effectively in the classroom and highlighted areas of concern. The purpose of the reviewed study is to provide an overview of teaching strategies in order to determine which method of learner organisation is most effective when completing various classroom tasks. The bonding of the entire class is a significant aspect of whole-class discussion, which is significant. Additionally, the greater the size of the group, the greater the diversity of ideas, opinions, and experiences expressed, all of which contribute to the learning process. In addition, whole-class activities are frequently used to summarise what has been taught or accomplished during a particular lesson. In addition, Tanveer (2008) emphasised that group activities increase learner participation in classroom activities. When learners are in groups, 1) they speak and communicate more easily with one another; 2) group activities encourage learners to learn through discussion; and 3) group activities encourage learners to work collaboratively with one another, according to Tanveer (2008). As a primary school educator, I've observed that group activities guarantee maximum participation from all group members. In contrast, Tanveer (2008) stated that grouping the entire class or group into a single cluster is a valuable teaching strategy, but it has limitations and drawbacks. For example, its efficiency and effectiveness are contingent on the attentiveness of the learners. If the lecture lacks sufficient interest, it fails to engage the learners. A further disadvantage of this activity is that, when organised as a class or a group, only a small number of learners can participate. The timid or passive individuals prefer to remain silent while the others participate actively.

Similarly, Chiriac and Frykedal (2011) conducted a qualitative study on the administration of group and pair work in the classroom in Sweden. This qualitative study's primary objective was to examine group and pair work as classroom activities from the teachers' point of view and, more specifically, to determine why teachers are reluctant to use group and pair work as modalities of work in education. Teachers are still reluctant to use group work as a pedagogical aid in the classroom, according to the findings.

These reviewed studies investigated the efficacy of using whole-class, group, and partner work as instructional strategies for effective teaching and learning. According to these authors, using whole-class, group, and pair work methodologies maximises learning and allows learners to interact with one another. They are learning from one another because they are exchanging ideas and understanding how others think. However, the authors agreed that these teaching methods necessitate exceptional administration skills and effort from teachers. The scope of these studies did not include mathematical problem-solving contexts or the application of these methods in rural agricultural schools for third



grade. Consequently, the purpose of this study is to investigate the instructional strategies utilised by a sample of Grade 3 Junior Primary instructors in rural farm schools to teach mathematical problem-solving skills.

### 5.1.2. Demonstration

Another teaching method used to ensure effective and efficient teaching and learning is demonstration. Noah (2017) defined demonstration as a method of instruction that involves manipulating and displaying objects, events, rules, and activity sequences, either directly or through the use of instructional media pertinent to the subject or materials.

The demonstration method has numerous benefits and drawbacks. The results indicate that the demonstration method has a greater impact on learner achievement than the traditional lecture method. This outcome suggests that instructors should exert more effort to improve their learners' mathematical comprehension. Integration of the demonstration method is challenging, particularly for teachers who lack solid pedagogical knowledge. As a consequence of experiencing the complexity of the shared content, this method facilitates comprehension of more abstract concepts.

Motshoane's (2006) study investigated teachers' knowledge and understanding of demonstrations and sought to identify any benefits and limitations teachers associate with the use of demonstrations. The results indicate that teachers face significant difficulties with the concept of demonstration, with the consequence that many do not use it as a teaching technique. Moreover, due to the poor economic conditions of government institutions, there is a lack of audio-visual aids and equipment, and teachers lack the creativity to create hand-crafted models for demonstration. In addition, there is a general lack of diligence among teachers, who desire to complete the syllabus or syllabi as quickly as possible, without making genuine efforts to improve the learners' comprehension of the material.

It is concluded that teachers are unfamiliar with the benefits and alternatives for implementing demonstrations is reasonable. Both researchers emphasised the value of demonstration when properly incorporated into a lesson. None of the reviewed studies have focused on teaching methods of mathematical story problems in a Namibian context of early grades rural farm-schools. This study therefore tries to investigate the teaching methods used to teach mathematical story problems in rural farm schools of Namibia.

### 5.1.3. Brainstorming

US-based Agha (2009) described brainstorming as a teaching style in which all learners respond or offer their views on one issue. This method fosters novel thoughts in learners. This teaching technique starts with a question, problem, or topic. Then, the learners suggest responses, words, and concepts. These methods helped learners collaborate and learn. The teacher summarises the notion on a white board and discusses it in an open class.



Agha's (2009) study examined how brainstorming affects eleventh-graders' mathematical thinking skills on both sides of the brain. The study sample included an experimental group of 30 eleventh-graders and a control group of 30. The sample was chosen to ensure parity in age and math achievement. A brain control test and the researcher's mathematical thinking abilities test (induction, enquiry, conclusion, rationalism, problem solving, and symbolization) were used. The researcher found these results using statistics. The brainstorming method positively affected the experimental group. Brainstorming in maths class developed mathematical thinking and mental abilities.

The teacher should brainstorm mathematical problem-solving notions and methods. The teacher should explain the notion. Brainstorming should also include how learners should solve problems. Learners study operational sign synonyms (addition, subtraction, multiplication, and division).

#### 5.1.4. Guided Method

Newton (2013) claims the guided technique lets teachers meet learners at their instructional level to help them succeed. He emphasises that guided mathematics allows teachers to teach pupils in their zone of proximal growth in small instructional groups. The zone of proximal development (ZPD) is the difference between what a learner can perform alone and with aid from a peer or teacher (Vygotsky, 1978). Jones (2015) added that a youngster can do what she can do now with help tomorrow. Mathematical problem solving is a complex concept, so Vygotsky (1978) believed that teachers should simplify learning to provide scaffolds, such as manipulatives or peer help.

Newton (2013) claims that guided mathematics aims to help learners develop conceptual comprehension, procedural fluency, strategic competence, adaptive reasoning, and mathematical confidence. Guided Mathematics helps children understand numbers, operations, and mathematical ideas so they may work freely in new contexts. Murray and Jorgensen (2007) define the guided method in mathematics as an environment where some learners work independently to build skills, concepts, and strategies using teacher-directed tasks and/or Mathematics Learning Centres. The teacher pre-selects a group to observe and conference with to assess learner growth and identify areas for support. Guided mathematics, even once a week for 15 minutes, helps learners develop self-reliance, independence, and critical thinking (Newton, 2013).

The South African Department of Education (2007) states that teachers' advice helps learners acquire mathematical problem-solving. The same policy document advises teachers to provide maximum learning support to help learners understand the story problem, identify key words, choose appropriate key words, and compute using strategies (Department of Education, 2014).

#### 5.1.5. Integration

Jacobs (2011) examined the consequences of US middle school integration. An integrated curriculum emphasises significant topics and their connections rather

than memorization and recital. In the 21st century, flexible knowledge use requires insights from connected, integrated learning rather than a shallow grasp of many separate occurrences. Perkins (2016) favours teaching for transfer and intentional learning: A concern with connecting things up, with integrating concepts, inside and across subject topics, and with parts of out-of-school life, inherently involves a concern with understanding in a larger and deeper sense. Thus, integrative education and teaching for understanding are natural allies (p. 7).

Vars (2010) examined Kent's middle school integration history. He believed curricular integration enriches schooling. Any educational adjustment that improves learner success is under scrutiny due to low national accomplishment and high dropout rates. Curriculum integration may make teaching manageable and meaningful, and research on how children learn supports it. Cromwell (2017) examines brain processing and organisation. The brain organises new knowledge using previous experiences and their meaning. Holistic memories are easily recalled because the brain processes numerous factors at once. "The human brain actively seeks patterns and searches for meaning through these patterns," argues (Shoemaker, 2011: p. 13).

Integration fits learner thinking, according to the Ministry of Education, Arts & Culture (2015). Brain research suggests younger learners process and organise multiple things at once. Teaching ideas holistically rather than piecemeal better matches how young learners receive information. All integration issues in Junior Primary are from the Environmental Studies syllabus, and the other 6 courses are integrated and related to this where possible. These integration topics are from the three Environmental Studies themes: Social Environment, Health, Safety, and Nutrition, and Natural Environment. Junior Primary learners should also learn maths and numeracy. But integration isn't always possible. Sometimes data management or measurement can relate to an issue. Möller (2018) suggested starting lessons with a story issue to familiarise learners.

In conclusion, Jacobs (2011) and Vars (2010) highlighted curricular integration as a technique to connect academics to the "real world" and make learning relevant. This was accomplished through the use of interdisciplinary approaches. Cromwell (2017) and the Ministry of Education, Arts and Culture (2015) advocate processing educational ideas in a holistic and pattern-based manner for the benefit of younger learners' abilities to remember information.

## 6. Methodology

This study used a phenomenological qualitative research design. Qualitative research methodology provides a rich understanding of complex phenomena through in-depth exploration of participants' experiences and perspectives (Creswell, 2013). In the context of teaching methods used to teach mathematical problem-solving in junior primary at rural-farm schools in the Kunene region, qualitative research can offer valuable insights into the unique challenges and

effective strategies employed. A phenomenological approach was adopted to capture the lived experiences and perceptions of teachers and learners regarding mathematical problem-solving instruction in rural-farm schools. Phenomenology enables the exploration of participants' subjective experiences, allowing for an in-depth understanding of the phenomena under investigation (Creswell, 2013).

The targeted population for this study was 3000 Grade 3 teachers and 105 000 Grade 3 learners in the Kunene region. The five public primary schools were purposively sampled as based on a school's diverse population of learners; radius of 50 km in and around Outjo and Kamanjab districts; professional qualified teachers for Grade 3, with at least a teaching diploma; the existence of more than 5 years; and the use of English as a medium of instruction in the Junior Primary schools because that is the only language the researcher is conversant with compared to other languages of medium of instruction in the Kunene region such as Afrikaans, Khoekhoegowab and Otjiherero. The sample included teachers and learners from diverse backgrounds and experiences to ensure the representation of different perspectives (Marshall & Rossman, 2016). The three instruments used during data collection in this study were interview schedules, classroom observation schedules and document analysis. The interviews were audio-recorded and transcribed verbatim to ensure accurate data representation (Creswell, 2013). Additionally, classroom observations were conducted to gain insights into the actual teaching practices and their effectiveness.

The data were subjected to a method known as thematic analysis in order to establish recurrent patterns, themes, and meanings (Braun & Clarke, 2019). In order to establish a full picture of the instructional strategies utilised for mathematical problem-solving, the transcripts and observational notes were both coded and categorised before being subjected to an analysis. Further, to guarantee both rigour and validity, the process of analysis included iterative coding as well as debate among the researchers.

By employing a qualitative research methodology, this study aims to provide valuable insights into the teaching methods used to enhance mathematical problem-solving in junior primary at rural-farm schools in the Kunene region.

## 7. Findings and Discussions

Due to the qualitative methodology used in this study, data were analyzed conceptually and presented in a theme and sub-themes. The main theme and the sub-themes were identified through sequential phases which are data familiarization, data coding, searching for themes and theme development, reviewing themes, defining and naming themes and finally writing up the themes. The data was then presented in one main theme with sub-themes with transcribed quotations of the respondents being included to support the findings. The main theme is teaching methods for mathematical problem solving skills and six subthemes such as pair and group discussion, whole class participation, demonstration, in-

tegration, guide and brainstorm methods.

### Teaching Methods for Mathematical Problem Solving Skills

Teachers who participated in this study indicated that they use different teaching methods to teach mathematical problem solving skills. All the participants interviewed identified pair and group discussions; whole class participation; demonstration; integration; guided method and brainstorming as the best teaching methods. Teachers' views on each of these teaching methods are presented below.

#### Subtheme 1: Pair and group discussions

Three participants out of 8, indicated that they used pair and group discussion to carry out the tasks. For example, Teacher Red, specifically mentioned that, *"I give learners to do work in pairs and small groups..."*

Similarly, HoD Purple cemented that, *"...my teachers make use of small groups during mathematical problem solving activities so that each learner gets attention of the teacher."* In addition, Teacher Blue said that, *"... I usually discuss with the learners in small groups and as time goes on you will see the improvement with these learners [cos] discussion make them interested in word sums activities."*

HoD Purple suggested during his interview that, *"teachers should do more group activities because learners learn from the peers, so they should not arrange desks in rows but in groups to allow interaction during activities."*

During observations, it was detected that Teacher Blue used pair work while Teacher Orange allowed learners to work in groups of 3 prior to the individual task.

#### Subtheme 2: Whole class participation

The analysis of data shows that all 8 participants indicated that they used whole class teaching methods when teaching mathematical problem solving skills. For example, Teacher Green explained *"I employ more of whole class activities but as time goes on I give them individual tasks..."* This was supported by Teacher Blue who said that *"... mostly I ask the whole class to read together the word sums either in the worksheets, chalkboard or posters as a choral."*

From the observation, all five teachers employed whole class participation mostly by letting learners to read the word sums as a choral. Learners also read terminologies on posters as a whole class. The teacher read first and then learners repeated after the teacher.

#### Subtheme 3: Demonstrations

In order to enhance the teaching of mathematical problem solving skills manipulation of objects should be employed to attract learners' attention and facilitate their comprehension. Three (3) participants explained that learners were instructed to do some activities on the chalkboard by demonstrating with sketches how to solve a certain word sum. For example, Teacher Yellow mentioned that *"I instruct the learners to do activities and demonstrate in front of the class..."* Teacher Green added that, *"...I let learners to act out the problem. They dem-*

onstrate by drawing and they are encouraged to draw first before they solve the word sums...” Teacher Blue emphasised that “since he has learners who are facing challenges in problem solving in the class, he puts more emphasis by demonstrating word sums with physical objects to help learners to compute correctly...”

What we observed in the various classes was that only two teachers out of five showed learners the procedures of doing mathematical problem solving skills through demonstration. In Teacher Blue’s and Teacher Red’s classes, we observed learners demonstrating how to solve word sums to the learners while fellow learners looked on.

#### **Subtheme 4: Integration**

Participants recommended the integration approach in Mathematics to be taught across all Mathematics topics so that learners can get used to it. Two (2) of the participants said that they integrate problem solving in everyday mathematical activities to ensure that learners have mastered the skills. They further mentioned that this practice works better for them and learners also performed better as a result. Specifically, Teacher Green explained that, “I don’t teach it differently, I do the way it is working for me ..... Every day I integrate problem solving in each component of Mathematics rather than just teaching it separately. So, I think is better if you integrate it in every topic of Mathematics to make learners get used to it.

Teacher Orange reported that, “in the first term, one can teach skills in isolation but it should not remain that throughout the year...”

In all the five lessons we observed, only 2 teachers knew how to integrate in Mathematics. These teachers could at least integrate topics from Environmental Studies across to Mathematics in order to add to the meaning of what was taught and learnt. However, we checked the lesson plans of 3 teachers and noted that they did not integrate components of Mathematics in their lesson preparations. Their activities on word sums did not talk about the topic of integration which should be taken from the Environmental Studies syllabus.

#### **Subtheme 5: Guided method**

The majority of teachers used various strategies to guide learners when doing problem solving activities. This was supported by Teacher Red, who revealed that there are five steps which she used when teaching learners how to solve word sums. These are: 1) reading the story problem and decide on the operation; 2) finding the number in the word sum; 3) writing the number sentence using an operation place holder; 4) doing the calculation; and(5) writing the correct answer and unit”. Both Teacher Green and Teacher Orange stressed that “it is important to use whole class method by following five steps which learners have to master when solving word sums.”

In addition, the HoD Brown confirmed that “there are steps that you can use with the children who have difficulties in mastering problem solving. However, you can teach the steps even to fast learners who don’t have challenges of learning.”

When it came to observation, only 2 out of 5 teachers were observed teaching learners the five steps of doing word sums. I had seen a poster with the steps to be followed when doing mathematical problem solving activities displayed in Teacher Blue's classroom. Teachers drilled these 5 steps to ensure that learners mastered them. The other 3 teachers observed did not use the 5 steps and apparently were not aware of them.

#### **Subtheme 6: Brainstorming**

Three participants out of 8 used brainstorming as a teaching method when solving word sums. For example, Teacher Blue indicated that *"I ask my learners to identify key words from the word sums and think of the appropriate operation sign. Further, I instruct learners to write down an equation"*. Similarly, Teacher Orange explained that *"I prepare word sums on a poster for example: Petrus has 2 fewer caps than Tomas. Tomas has 6 caps. How many caps does Petrus have? I gather learners together to get their ideas about the activity, by identifying key words, identifying the correct operation signs and drawing the problem."*

HoD Brown suggested that *"... the teacher needs to strengthen learners' ideas after brainstorming and assist them to think critically."* Similarly, I observed Teacher Green using word sums and asking learners to brainstorm ideas before they solved the word sums for example, requiring learners to look for the key words from the word sums, identify the operations sign, formulate the equation, etc. Before the presentation of the lesson, Teacher Yellow wrote the operation signs on the chalkboard and asked learners to mention all terms which related to the operation signs.

## **8. Discussion of Findings**

### **Teaching Methods for Mathematical Problem Solving Skills**

In order to fulfil the tenets of social constructivism, learners should be taught in a social context (i.e. the classroom) how to move from the known to the unknown, thereby gaining understanding of the story problems. This is achieved in various ways, one of which is help from a more knowledgeable other such as a peer or a teacher. This occurs until the learner has achieved the ability to gain full understanding on his/her own.

The findings of this study revealed several teaching methods that teachers used when teaching mathematical story problems in an attempt to allow learners to progress and achieve in this field. These teaching methods included group work and whole class participation; demonstration; the guided method as well as integration.

The majority of the teachers emphasized group work and whole-class engagement for learning and interaction. This supports Tanveer (2008)'s claim that group work maximizes learners' participation and helps learners understand each other's perspectives. Vygotsky (1978) believed that extensive classroom interaction helps learners reflect and internalize concepts that would be difficult

without peer and instructor involvement. He added that social information is only communicated when told and remembered. Teachers should then use Vygotsky's social interaction to improve problem-solving. Few teachers used group work and whole-class involvement, even though most favoured it. According to Chiriac and Frykedal (2011), teachers are reluctant to use group work while teaching mathematical problem-solving.

Additionally, this study found that teachers can manage small groups of 3 learners. Tanveer (2008) said group size relies on how the teacher manages and engages learners. This study indicated that grouping or pairing in class was unsupervised. Teachers cannot assess learners' understanding and teamwork unless they roam around the class to monitor and facilitate idea-sharing.

This study found that all Grade 3 teachers should use demonstration to teach mathematics problem-solving. Learners in Junior Primary grades learn better by watching teachers or classmates. Thus, teachers should demonstrate how to solve story problems using visual signals like sketching drawings, tangible items, and non-traditional methods. Rural agricultural schools lack advanced teaching resources, so teachers make their own, which are usually poor. The lack of proper instructional resources made it hard for teachers and learners to use and learn from them.

The study confirmed Motshoane (2006)'s results that teachers struggle to employ demonstration, especially with poor materials. This causes some of the teachers to ignore the method due to its intricacy. The findings of this study agreed with Noah (2017) that teachers should use quality physical models to engage all students in concept demonstrations. The rural demonstration method failed due to a shortage of teaching materials. Noah (2017) advised teachers to learn demonstration methods using concrete items. This would strengthen learners' skills in the classroom, where they must participate actively in group discussions and solve problems. It also promotes friendships and teacher-student dialogue to deepen their insights and thinking.

Participants in this study endorsed using tangible objects to teach computation. There was consensus that learners would improve their mathematical concept mastery so they can solve problems effectively and develop responses based on concepts they understand and master, not just by memorizing without enriching and expanding their critical thinking. This supports Vygotsky's theories and Noah (2017)'s proposal that teachers use demonstration more to improve student comprehension.

In addition, lesson activities helped learners comprehend and understand mathematical problem-solving ideas. This supports past research that found the demonstrative method boosts learners' interest and keeps them engaged throughout the lesson (Crouch, Fagen, & Callan, 2004).

Despite the fact that demonstration is an important way for teaching little children problem-solving skills, the teachers employed the lecture method, which causes limited attention span and poor learning. The study confirmed Motsho-



ane (2006)'s claim that majority Junior Primary teachers struggle to apply effective teaching approaches.

The guided method guides Grade 3 learners through story problem-solving. Learners should follow a procedure to solve story difficulties. The majority of the participants guided learners during problem-solving exercises, according to this study. The findings support Polya (1957)'s claim that teaching learners the procedures can improve their mathematical story problem-solving. The five steps from the findings—reading the story problem and deciding on the operation; finding the number in the word sum; writing the number sentence using an operation place holder; calculating; and writing the correct answer and unit—help learners solve story problems without teachers. This supports Newton (2013) and Murray and Jorgensen (2007), who described the guided method as a chance for learners to examine story problems independently to develop critical thinking and self-reliance. Participants thought it was crucial to practice story problem steps with the whole class until they got it. This study suggests that teachers should identify learners with common learning problems and arrange them in small groups to provide learning help instead of whole-class teaching. Thus, the teacher is present to help learners solve story problems and monitor their progress. Newton (2013) agrees with Vygotsky (1978), who argued that teachers should simplify learning and provide additional scaffolds, such as manipulatives or peer interaction.

Integration is a widespread teaching strategy in Junior Primary, although teachers find it challenging to employ in lesson preparations. In Junior Primary, story problems should be included into every component of math to help learners master their abilities. Due to time or ignorance, many teachers teach story problems separate from other math components. The outcomes of this study conflict with Möller (2018), who suggested that teachers start math lessons with a good story problem to familiarize learners. Contrarily, Perkins (2016) concluded that young learners should be taught math skills independently to minimize misunderstanding.

The syllabus suggests using an Environmental Studies theme in all story problems to apply learning to real-life circumstances. This study supports Cromwell (2017)'s claim that integration helps learners apply classroom learning to real life, making it more meaningful. However, most teachers did not include Environmental Studies subjects in story problems because they felt it was too time-consuming. Some participants also didn't understand Junior Primary integration. This supported Perkins (2016), who found that teachers lack the capacity to integrate ideas across subjects.

Integration across subjects is important to help learners remember what they learn, especially when it comes to their environment. Young children have short memory, thus they need organized brain processing. According to Cromwell (2017) and the Ministry of Education, Arts & Culture (2015), integration helps learners recall holistic experiences quickly and easily by organizing ideas into patterns and searching for meaning.

## 9. Conclusion

This study therefore concludes that teaching problem solving skills to young children is complex and challenging since it demands expertise in both language and mathematical elements. Effective teaching methods for mathematical problem-solving in junior primary schools often involve a combination of hands-on activities, interactive discussions, real-world applications, and the use of visual aids or manipulatives. These methods aim to engage students actively in the learning process, promote critical thinking, and help them develop problem-solving skills.

Learners should have good reading skills as well as knowledge of computing numbers in order for them to solve story problems effectively. Problem solving is regarded as one of the high ranking skills in the junior primary mathematics syllabus which significantly contributes to the development and enhancement of higher order thinking and logical reasoning skills among learners. Therefore, the study concludes that as reading is a barrier to good performance, and in turn hampers learners' ability to succeed in story problems teachers should place more emphasis on reading skills. Results that arose from the study include the lack of professional workshops and lack of appropriate teaching aids provided for use when teaching mathematical problem solving skills at rural farm schools. The unsympathetic conduct of Senior Education Officers during school visits was also raised.

## 10. Recommendations

In light of the study findings and conclusions, the study has the following recommendations:

- In order to promote active learning, encourage learners to actively participate in the learning process through group work, discussions, and problem-solving tasks. This can enhance their critical thinking, collaboration, and problem-solving skills.
- Recognize and address the diverse needs and abilities of learners by providing individualized or group-based instruction that targets specific skill levels and learning styles.
- The Education Regional Offices in Namibia should consider providing Grade 3 teachers in the regions with professional development training workshops at least twice every year in teaching mathematical problem-solving skills. This would serve as an advantage to both the teachers and their learners.
- The Senior Education Officers should visit rural farm schools' Grade 3 teachers more often and provide professional support in any shortfall which teachers might experience.
- The Education Regional Office should supply the same teaching materials to both rural and urban schools for use by both teachers and learners in mathematical problem solving lessons.
- The Ministry of Education, Arts & Culture should revise its policy of re-

cruiting teachers and discontinue staffing un- and underqualified teachers in the Junior Primary phase since this is a very sensitive phase where literacy and numeracy skills need to be developed by qualified Junior Primary teachers.

## 11. Areas of Further Research and Conflict of Interests from then Authors

- To explore the impact of language barriers on mathematical problem-solving in areas where learners might not have English as their first language. Research how to effectively bridge this gap and ensure learners understand the problem statements.
- To examine the potential benefits and challenges of integrating technology, such as tablets, computers, laptops, internet or educational apps, into rural-farm classrooms for teaching mathematical problem-solving
- Authors or researchers might have financial ties to educational publishers, companies, or products that promote specific teaching methods. This could potentially bias their research findings in favor of those methods.
- Authors' personal beliefs or preferences might influence their research outcomes. For instance, if an author strongly believes in a particular teaching method, they might unconsciously downplay or overlook alternative effective approaches.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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