p-ISSN 2355-5343
e-ISSN 2502-4795
http://ejournal.upi.edu/index.php/mimbar

Article Received: 28/11/2024; Accepted: 29/12/2024
Mimbar Sekolah Dasar, Vol.11(4), 722-739
DOI: 10.53400/mimbar-sd.v11i4.78770

Effective Sentence Writing in Story Problems on the Arithmetic Operations of Whole Numbers in Grade IV of State Elementary School Pelandakan 1

Widia Nur Jannah✉[1], Tatang Herman[2], Mubiar Agustin[3], Vismaia S. Damaianti[4] & Nordin Bin Mamat[5]

[1] Elementary Teacher Education Program, Universitas Muhammadiyah Cirebon, Cirebon, Indonesia
[1,2,3,4] Postgraduate Elementary Education, Universitas Pendidikan Indonesia, Bandung, Indonesia
[5] Department of Early Childhood Education, Sultan Idris Education University, Perak, Malaysia

✉ widianurjannah87@gmail.com

Abstract. This study aims to evaluate the advantages and disadvantages of using effective sentences in writing story problems related to integer arithmetic operations. The research methodology used is descriptive analysis with a qualitative approach, and case study design to explore in depth a phenomenon or problem. Data were collected through a documentary study of story problems used in resources for arithmetic procedures involving integers. Furthermore, interviews were conducted with teachers to find out their perspectives on the formulation of the problems. The data analysis technique was carried out by categorizing sentences in narrative story problems and assessing their effectiveness based on linguistic criteria and clarity of information. The results of the study showed that most of the narrative story problems analyzed did not fully meet the criteria for effective sentences. There were vague, long, and imprecise sentences so that they did not convey the information needed. Certain questions also contained terminology that was less familiar to students. This study identified the need for improvements in sentence structure and vocabulary selection to be more appropriate to students' level of understanding. This study shows the need for teacher training in composing effective sentences for story problems in order to improve the quality of questions presented to students.

Keywords: Literacy of Mathematical; Problem-Solving Skills; Story Problems; Sentence Writing; Arithmetic Operations.

1. Introduction

The development of educational technology, such as digital learning, brings new challenges and opportunities in mathematics education. Technology enables the use of visual and interactive tools that can help students understand and write math story problems better (Herawati et al., 2023). The growing educational technology can support students in writing more interesting and interactive math story problems. With the help of apps or learning platforms, students can learn to write effective story problems while understanding math operations through more engaging media (Karim et al., 2022).

Recent years have seen an increased emphasis on the quality of word problem composition in mathematical resources, especially within elementary schools. Mathematics education in elementary schools has considerable difficulties in formulating questions that both evaluate arithmetic proficiency and cultivate critical thinking abilities in students. Clear and comprehensible sentences in word problems are essential for conveying information effectively to students (Reusser & Stebler, 1997).

According to Law Number 14 of 2005, Article 1, teachers hold a crucial position in the educational process. In addition to teaching, a professional educator's duties also include educating, guiding, directing, training, assessing, and evaluating students. Teachers must develop questions, such as essay exam questions, to assess and evaluate students' abilities who have engaged in learning activities.

Current trends reveal that numerous instructors and education specialists are increasingly prioritizing the formulation of well-structured questions and the utilization of clear, exact

language. Research and practice indicate that poor or ambiguous words might result in misunderstandings and adversely affect students' learning outcomes. Consequently, there is a strong need to refine the formulation of questions to conform to the principles of effective sentence construction, to enhance students' comprehension and proficiency in resolving mathematical word problems (Ainsworth & Bakar, 2023).

In mathematics, essay test questions frequently manifest as word problems requiring students to apply mathematical concepts in real-life scenarios. Word problems in mathematics aim to train students to think critically and analytically, as well as to apply their mathematical knowledge to solve problems they may encounter in everyday life. Therefore, the story problems created by the teacher must be contextual, using problem-solving strategies to assess the critical thinking skills of upper-grade students, thereby sharpening the minds of each student (Salsabila et al., 2023). This is in line with efforts to develop problem-solving skills, which are one of the essential competencies in education. Thus, the preparation of good and appropriate questions is very important to provide an accurate picture of students' abilities to understand and apply the concepts they have learned.

Mathematics story problems need to use language or literacy that accommodates the language characteristics of the students as the medium for understanding. Like Wittgenstein, who played a major role in analytic philosophy and is considered one of the greatest philosophers of the 20th century, his thoughts are divided into two periods (Hartini et al., 2019). The first period is the early period mentioned in his work "Tractatus Logico-Philosophicus (TLP)," which discusses language or logic, and the picture theory, also known as the theory of meaning (Bertens, 2002). In this case, defining the limits of language is the main objective of the mathematical thinking present in the TLP. Kılıç, K. et al. (2020) found that questions with complex or ambiguous sentences make it difficult for students to understand the information needed to solve mathematics problems, thus negatively impacting their learning outcomes. Rojas-Drummond et al. (2021) showed that clear and well-structured questions can increase student engagement and understanding. Ainsworth & Bakar (2023) emphasized the importance of using simple language in mathematics problems to make it easier for students to understand the problem. Hoch & Silver (2020) found that unclear questions can cause anxiety in students and decrease their performance. Mata & Salgado (2022) concluded that questions with good sentence structure can improve students' problem-solving skills.

1.1. Problem Statement

If teachers are to study, they must create narrative questions while considering literacy that accommodates the language characteristics of the students as the medium. Language prioritizes grammatical aspects while also paying attention to meaningfulness (Suyadi, 2000). Therefore, it is necessary to create math story problems for elementary school students using communicative language, which aligns with the communicative competencies of the students as determined by the teacher (Sumarwati, 2013). This is in line with the study by Ramadani et al. (2018), which explains that the use of appropriate language significantly influences students' success in addition and subtraction of integers, as language can help students solve these problems. Therefore, teachers provide a solution in the form of using language to give a different meaning to the operations of addition and subtraction of integers, allowing students to grasp the meaning of these symbols (Ramadania et al., 2018).The studies' premises conclude that teachers should use suitable language while formulating numerical story problems to offer alternative meanings, as language facilitates students' problem-solving abilities.

The problem in the study stems from a preliminary study which found that fourth grade elementary school students tend to be less careful in reading story problems, are less motivated to read math story problems, and their reading comprehension is still low, for example, low understanding of reading information texts, only 40% of students have good reading comprehension skills (Preliminary, 2024).

Researchers found the main problem that fourth grade students tend to be less careful in reading story problems, less motivated to read math problems, and have low reading comprehension. For example, only 40% of students have good reading comprehension skills.

This problem indicates that students cannot fully understand the information in math story problems, which has the potential to hinder their ability to solve math problems, especially story problems related to integer operations.

These problems are caused by the accuracy and clarity of the information in the questions, the relevance of the narrative context to the topic, the suitability of the level of difficulty related to students' cognitive abilities, and the overall effectiveness of the format and sentence structure. Overcoming these obstacles is important to ensure that story problems can effectively assess and improve students' understanding of concepts related to integer operations. Therefore, the research question investigates the strengths and limitations of using effective sentences in formulating story problems related to integer calculations (Preliminary, 2024).

1.2. Related Research

The results of Bergeson's study concluded that students in solving story problems are faced with word problems, experience cognitive difficulties if operations are required and solution procedures are contrary to operations in the underlying structure of the problem (Bergeson, T: 2000). Meanwhile, Newman's (2008) study produced a large amount of evidence that students have difficulty with semantic structures, vocabulary, and mathematical symbols compared to standard algorithms (Karnasih, 2015). Some common mistakes are lack of understanding of symbols, place values, calculations, incorrect use of processes, and illegible writing (Akbar et al., 2018). According to research conducted by Nainggolan, et al. (2024), the factors that cause students to answer questions incorrectly are the inability to understand the structure of sentences or words, signs or mathematical units used in the story problems given (Nainggolan, 2024). Based on the results of the studies, it can be concluded that students in solving story problems often have difficulty understanding sentence structure, semantic structure, vocabulary, and mathematical symbols. Meanwhile, the results of Sumarwati and Purwadi's (2007) study found that in story problems in mathematics textbooks and Student Worksheets used in SDN 15 Surakarta, there was a context that was less appropriate to students' daily lives. This phenomenon shows that, in addition to not being oriented towards students' linguistic competence, the questions also do not use literacy that is appropriate to the authentic communication situations faced by students in everyday life. Thus, students' difficulties in solving mathematical story problems are not sufficiently approached from a mathematical perspective, but are possible with a new perspective, namely story problems as a discourse related to linguistics or literacy (Sumarwati, 2013).

The findings of Erlina and Wulandari's research (2023) proved that reading literacy skills have a strong positive relationship with the ability to solve mathematical story problems of grade IV students of SDN Buluh 1. According to the results of their research, when students have strong literacy skills, their understanding of reading is also strong so that they can solve literacy problems well (Arianti & Wulandari, 2023). In addition, research conducted by Aulia, et al. (2024) proved that there was a significant positive relationship between reading literacy and the ability to solve mathematical story problems in grade IV of SDN Mangga Besar 1 with a significance value of 0.047 (Aulia & Maksum, 2024).

This study offers novelty by integrating linguistic or literacy perspectives in understanding students' difficulties in solving mathematical story problems. The main novel contribution of this study is the integration of reading literacy and mathematical problem solving. In other words, this study proposes that mathematical problem solving cannot be separated from reading and text comprehension skills, which brings this study into a broader field, namely literacy-based teaching in the context of mathematics.

1.3. Research Objectives

This study aims to significantly enhance this objective includes: (1) the analysis of learning process, (2) Students' understanding of effective sentence questions, and (3) analysis of the strengths and weaknesses of the questions in mathematical word problems for fourth-grade learners. This study conducts a thorough examination of the clarity, relevance, and effectiveness of sentences within the problems, while also offering practical suggestions for enhancement.

2. Theoretical Framework

The theoretical framework in this study discusses writing effective sentences in mathematical story problems.

2.1. Effective Sentence

An effective sentence is a sentence that is short, concise, clear, complete, and can convey information accurately (Marzuqi, 2016). One of the requirements for an effective sentence is that the sentence is not ambiguous or has multiple meanings. One of the requirements for an effective sentence is that the sentence is not ambiguous or has multiple meanings. Meanwhile, an effective sentence is a sentence that expresses the author's thoughts, is structured according to established rules and includes sentence construction, writing, and correct word pointers. So that all sentences that follow these rules are clear and can be understood by the listener (Nababan, 2021). One of the requirements for an effective sentence is that the sentence is not ambiguous or has multiple meanings. In an effective sentence, always look at the use of diction. Diction is the ability to find a form that is appropriate (suitable) for the situation and the sense of value possessed by the listener's community group and the ability to distinguish precisely and accurately the meaning of the idea to be conveyed, and (Keraf, 2010; Marzuqi, 2016). Zhang & Yang (2020) discuss how sentence clarity and word choice affect reader comprehension, as well as how to avoid ambiguity in text. Cheng & Wang (2021) examine the relationship between precise word choice and clear sentences to convey ideas effectively, as well as reduce ambiguity. Ali & Rahman (2019) examine the effect of clear and concise sentence structure on students' comprehension, especially in written test questions. Liu (2022) focuses on how to construct effective sentences in academic writing to avoid ambiguity. Martinez & Herrera (2023) examine how sentence length and structure affect text comprehension, emphasizing the importance of concise and clear sentences.

2.2. Math Story Problems

Story questions are a form of questions that present problems related to everyday life in the form of stories (Muntaha, et al: 2020; Nurjannati: 2017). Story questions are a form of questions that present problems in everyday life in the form of narratives (Febrilia et al, 2019:). According to Ida Farida Laily, story questions are in the form of everyday verbal sentences whose meanings of concepts and expressions can be expressed in mathematical symbols and relations (Laily, 2014). Meanwhile, according to Nurjannati (2017), story questions are a form of questions that present problems related to everyday life in the form of story questions (Muntaha, et al: 2020). Based on several explanations, it can be concluded that story questions are problems that are stated in the form of sentences that have meaning and are easy to understand. In solving them, story questions are questions that are associated with problem solving. Story questions are questions that present everyday life problems in the form of sentences that apply principles, concepts and applications in mathematics.

2.3. Literacy in Reading Math Word Problems

Reading literacy abilities are not limited to the story or a text that is offered; they may also be used to solve problems (Arianti & Wulandari, 2023). Literacy refers to the ability to comprehend information in writing or reading and apply it in decision-making (Kemendikbud, 2017). Literacy can also be defined as literacy, reading, and writing abilities (Arianti & Wulandari, 2023). Literacy is the ability to effectively collaborate knowledge and understanding to meet the demands of daily life (Ermiana et al., 2021). Learning counting is one of the primary school learning materials that involves reading literacy, understanding of number concepts, critical thinking, and settling skill because reading comprehension is also crucial in other disciplines, particularly mathematics (Anis Fitria et al., 2022).

The demand for linguistic literacy in the mathematics curriculum is critical and must be developed. Good language literacy helps students understand math word problems better. The reason why language literacy is important in mathematics learning is because story problems require good text comprehension. If students do not understand the language used in the question, they will struggle to identify important information and apply relevant

mathematical concepts. Thus, mathematics teachers should be aware of the critical language and numeracy concerns raised by math word problems. As a result, teachers must comprehend, live, and carry out literacy that follows primary school students' developmental stages to formulate numeracy story problems.

Literacy that accommodates learners' linguistic characters as a medium is a teacher's attempt to reduce learners' difficulty in comprehending and mistranslation of math word problems, hence improving their maths skills (Sumarwati, 2013). Language is a language that is concerned with aspects of grammaticality, as well as paying attention to aspects of meaning (Suyadi, 2000). In other words, it is a communicative language. To apply literacy at the communicative level, the user must be able to not only construct grammatical sentences but also use these sentences in the context of communication.

3. Method

3.1. Research Design

This study uses qualitative methods to understand individual perspectives through in-depth descriptions and analysis of their experiences, views, or thoughts (Creswell, 2015). This method focuses more on understanding phenomena in a natural context without involving numerical measurements. According to Ibrahim (2018), qualitative methods aim to explore data in depth regarding social or cultural phenomena. The design used is descriptive-analytical. Descriptive design aims to describe phenomena that exist in real conditions without variable manipulation. The data collected is then analyzed to find patterns, themes, or relationships that can provide further understanding of the phenomena being studied.

The present study employs a qualitative research methodology. Qualitative research involves comprehending an individual's viewpoint, which they can articulate through their ideas but cannot be quantified using numerical values (John W. Creswell, 2015). According to Ibrahim (2018: 52), qualitative methods refer to a research methodology that prioritizes the thorough investigation of data to get the desired level of research quality. Based on multiple viewpoints, it can be inferred that qualitative research methods are a form of study that specifically examines the natural conditions in a certain location or event and adheres to the required stages or procedures for gathering data. The research methodology employed in this work is a descriptive-analytical approach.

3.2. Participant

This research was conducted at SDN Pelandakan 1, an elementary school that has been certified as a "*Sekolah Penggerak*/Driving School." The participants in this study consisted of a fourth-grade teacher and 23 students (See Table 1). Most of the fourth-grade students at SDN Pelandakan 1 come from lower-middle-class families, with parents primarily working as self-employed individuals earning an average daily income of IDR 100,000 to IDR 150,000.

Table 1. Characteristics of Participants

Characteristics	Description
Number of participants	1 teacher (Female) and 23 students (12 male, 11 female)
Age of Participants	Students aged between 9 and 10 years (average age 9.5 years)
Teacher Education	Teachers have a bachelor's degree (Bachelor of Education), with more than 5 years of teaching experience
Student Parents' Jobs	The majority of parents work as entrepreneurs, with a daily income of around IDR 100,000 - IDR 150,000
Socio-Economic Background	Most students come from lower middle-class families
Competencies	Students have varying reading and writing skills, with most requiring extra support in understanding math story problems.

3.3. Data Collection

The research techniques employed in this study include content analysis, classroom observation, interviews, questionnaires, and analysis of test results. Data was collected using a variety of instruments tailored to each specific method (Cohen, Manion, & Morrison, 2018). Content analysis was performed using coding forms that were designed to categorize and interpret the content of the story problems. Classroom observation was carried out using structured observation sheets to record student and teacher interactions during lessons. Interviews with both students and teachers were guided by interview protocols, focusing on their perceptions and understanding of the sentences in the story problems (Fraenkel, Wallen, & Hyun, 2019). Questionnaires were distributed to gather responses from students and teachers regarding their experience with the story problems and the clarity of the sentences. Test results were evaluated using evaluation forms designed to assess students' comprehension of the problems (Krippendorff, 2018).

The data collected includes qualitative data from the interviews and classroom observations, as well as quantitative data from the questionnaires and test results (See Table 2). To ensure a comprehensive understanding of the study, a data collection matrix was used to organize and align the instruments with the research objectives, detailing what data was gathered, from whom, and at which stage of the research (Cohen, Manion, & Morrison, 2018).

Table 2. Data Collection Matrix

Methodology	Instrument	Data Collected	Participants	Purpose
Content Analysis	Coding forms	Categorization of sentence structures	N/A	To analyze the efficacy of sentences in story problems
Classroom Observation	Observation sheets	Teacher and student interactions	Fourth-grade students, teachers	To observe comprehension and engagement with sentences
Interviews	Interview guides	Perceptions on sentence clarity	Students, teachers	To explore understanding and challenges of the sentences
Questionnaires	Response forms	Responses on story problem clarity	Students, teachers	To gather opinions on sentence effectiveness
Test Results	Evaluation forms	Comprehension test outcomes	Fourth-grade students	To assess the impact of sentence structure on comprehension

The research techniques employed in this study include content analysis, classroom observation, interviews, questionnaires, and analysis of test results. Each methodology is equipped with specific instruments specifically developed to efficiently gather and analyze data. The instruments comprise coding forms for content analysis, observation sheets, interview guides, responses for students and teachers, and evaluation forms for test outcomes. This study intends to provide a thorough understanding of the efficacy of sentences in five story problems and their influence on the comprehension of fourth-grade students at State Elementary School Pelandakan 1.

3.4. Data Analysis

This study aims to significantly enhance the analysis of learning process, students' understanding of effective sentence questions, and analysis of the strengths and weaknesses of the questions. It conducts a thorough examination of the clarity, relevance, and effectiveness of sentences within the problems, while also offering practical suggestions for enhancement. The data analysis methods employed in this study include content analysis, test result analysis, questionnaire analysis, and observational analytics. Each technique consists of specific

operational procedures and tools specifically developed to efficiently gather and analyse data. The objective of employing these methods is to offer a thorough study of the quality and effectiveness of sentences in word problems and their influence on the understanding of fourth-grade students at State Elementary School Pelandakan 1.

The data analysis methods employed in this study include content analysis, test result analysis, questionnaire analysis, and observational analytics. These methods are implemented using specific operational procedures and tools that have been developed to efficiently process and analyze the collected data (Cohen, Manion, & Morrison, 2018). Content analysis will be used to evaluate the structure and clarity of sentences in the word problems. Test result analysis will focus on students' performance, helping to assess the impact of sentence clarity on comprehension. Questionnaire analysis will provide insight into student and teacher perceptions regarding the effectiveness of sentence construction (Fraenkel, Wallen, & Hyun, 2019). Observational analytics will involve reviewing classroom interactions to further understand how students engage with and interpret the problems. The combination of these methods will offer a comprehensive understanding of the quality and effectiveness of sentences in word problems and their influence on the comprehension of fourth-grade students at State Elementary School Pelandakan 1.

4. Findings

Based on the problem formulation and methodological stages above, this study presents data on the learning process of writing effective sentences in story problems related to arithmetic operations with whole numbers in Grade IV of State Elementary School Pelandakan 1. The data based on this objective includes: (1) the analysis of learning process, (2) Students' understanding of effective sentence questions, (3) analysis of the strengths and weaknesses of the questions. The detailed data is divided into three components as follows.

4.1. Analysis of Learning Process

Here is the description of the data regarding the stages of learning associated with the subject "Analysis of Effective Sentence Writing in Word Problems on the Operations of Whole Numbers in Fourth Grade Elementary School." Figure 1 below is an outline for structuring the research findings on the stages of learning in a classroom.

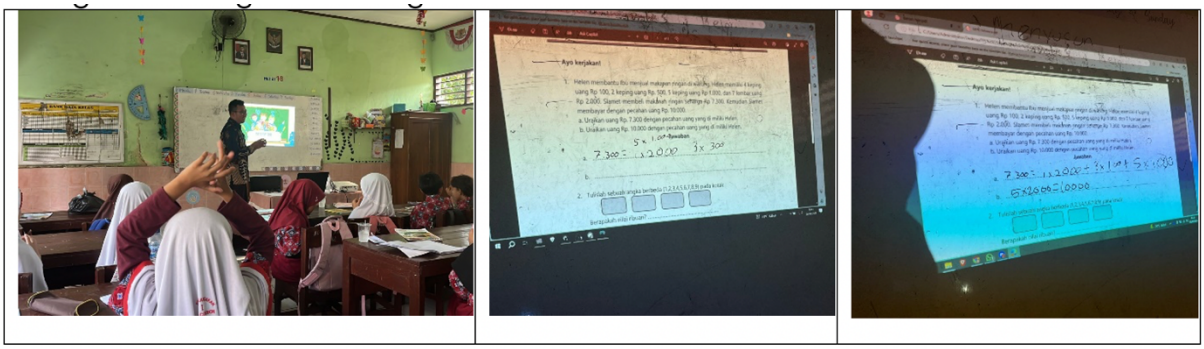

Figure 1. The Implementation of Writing Effective Sentences in Story Problems Related to the Operations of Whole Numbers

a. Introduction to the Concept. At this stage, the objective is to familiarize students with the basic concepts of arithmetic operations using whole numbers and the significance of constructing effective sentences in word problems. The activities began with a classroom discussion on the mathematical operations of addition, subtraction, multiplication, and division. An explanation of the concept of an effective sentence and its significance in word problems was given. The teacher presented a story problem that included both effective and ineffective sentences. The students condition indicated their comprehension of fundamental principles of mathematical operations applied to whole numbers and their ability to construct effective sentences.

b. Introduction to Effective Sentence Structure. The objective at this stage is to educate students on the components of successful sentences, including clarity, conciseness, and simplicity. The activity involves explaining the components of an effective sentence and practicing differentiating between effective and ineffective sentences using illustrative narratives. The teacher conducts a group activity to convert ineffective statements into more effective ones. Through this stage, students developed the ability to recognize and constructed effective sentences within the context of story problems.
c. The practice of Writing Story Problems. This stage focusses on the application of the concept of effective sentences in the context of writing story problems. The task requires students to generate basic word problems by using arithmetic operations with whole numbers and construction of effective sentences. Other tasks are collaborative analysis of the outcomes of students' composition of story problems, and evaluation of the usage of effective sentences in story problems by teachers and peers. The activity facilitated the development of students' ability to compose clear and effective story problems as well as their comprehension of how to improve ineffective compounds.
d. Assessment and evaluation. The objective of this stage is to assess student's understanding of effective sentences and their implementation in word problems. This stage is distinguished by tasks such as evaluating students' work through written examinations or individual tasks. Classroom discussions about common errors and strategies for enhancement were done. The teacher performed regular evaluations to verify that students had achieved proficiency in constructing effective sentences. This assignment yields an evaluation that reflects the level of comprehension and application of effective sentences in composing story problems by students.
e. Reflection and reinforcement. The objective of this stage is to enhance student understanding and address inadequacies in their understanding. Characteristics of activities include classroom feedback on the acquisition and practical use of successful sentence learning. Supplementary activities or assignments to enhance proficiency in constructing effective sentences were given. The instructor conducted a question-and-answer session to acknowledge and clarify any uncertainties among the students. This phase leads to students developing a greater sense of confidence in employing effective sentences when solving story problems, therefore enhancing their proficiency in previously areas of weakness.

4.2. Students' Understanding of Effective Sentence Questions

The primary objective of the interview with the homeroom teacher of the fourth grade at SDN Pelandakan 1 was to assess the students' comprehension of word problems related to operations involving whole numbers. The teacher highlighted several factors that impact students' understanding and skill in solving word problems within the context of this subject matter (See Figure 2).

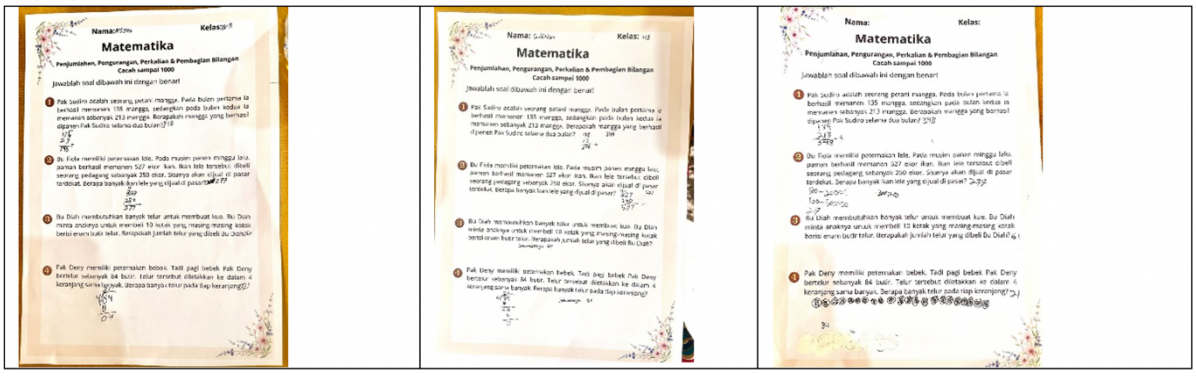

Figure 2. Students' Understanding of Effective Sentences

The teacher explained that the comprehension of word problems among students exhibits significant variation. Key findings from the interviews indicate that certain students struggle with reading and comprehending the instructions embedded in the story problems. They frequently

encounter confusion when it comes to determining the right steps to resolve issues. The identification and organization of relevant information from the problem text provide challenges for many students. Their ability to distinguish the essential material from the extra, irrelevant information is often lacking.

Students who can understand word problems typically encounter difficulties in implementing the accurate mathematical processes. For instance, a learner may possess strong reading skills yet encounter difficulties in consistently executing addition or subtraction operations with precision based on the information provided.

The teacher identified various elements that impact students' comprehension, one of which was insufficient reading abilities which might result in challenges in understanding written questions. Limited reading proficiency among students typically hindered their ability to comprehend the fundamental meaning of word problems. Prior educational experiences also influenced students' comprehension. Students who engaged in more extensive word problem practice generally demonstrated superior performance in comprehending and resolving more complex questions. The teaching methods employed by teachers had a crucial impact on facilitating students' comprehension of the questions. To enhance students' comprehension of word problem-solving, teachers utilized a range of strategies, including modelling and supplementary practice.

The teacher presented some strategies that had been used to improve student comprehension: the teacher regularly engaged students in practice with diverse story problems to familiarize them with varied forms and degrees of complexity. Furthermore, the teacher employed visual aids, such as photographs or diagrams, to facilitate students' comprehension of the material presented in the story problems. The teacher conducted a class discussion session to facilitate students in sharing their problem-solving strategies and discussing the procedures they followed. In addition, the teacher consistently administered evaluations and offered constructive feedback to assist students in recognizing areas that required enhancement and reinforcing their comprehension.

The findings from the interview with the teacher suggest that students' comprehension of word problems related to the operations of whole numbers is impacted by several factors, such as reading proficiency, previous experiences, and teaching methods. By adopting the mentioned strategies, it is expected that students' comprehension will improve significantly.

4.3. Analysis of the Strengths and Weaknesses of the Questions

Data on the analysis of the strengths and weaknesses of the questions should include case studies involving Yudi as an entrepreneur, Mr. Sudiro as a farmer, Mrs. Fiola who owns a farm, Mrs. Diah who requires a large quantity of eggs for cake making, and questions about Mr. Deny who runs a duck farm. The specific details of these case studies are as follows:

> *Yudi adalah seorang pengusaha muda. Yudi memiliki usaha dalam bidang makanan khas daerah Cirebon. Dalam satu hari, Yudi mempunyai rata-rata keuntungan bersih Rp 120.000,00. Jika Yudi berjualan selama satu minggu, keuntungan bersih Yudi adalah…?*
> (Yudi is a young entrepreneur. Yudi has a business in the field of traditional Cirebon cuisine. In one day, Yudi has an average net profit of Rp 120,000.00. If Yudi sells for a week, what is Yudi's net profit...?)

When considering the accuracy of concept selection or word meaning, this question is good since it lacks any phrases or sentences that may be interpreted in many ways or with ambiguity. Regarding the selection of word forms, particularly for words with affixes, all cases are correct, including the terms *pengusaha, makanan, mempunyai, keuntungan,* and *berjualan* (entrepreneur, cuisine, to have, profit, and to sell). This question, when seen through the lens of language variations of denotation and connotation, exclusively utilises denotative language, both in the selection of words and in the formation of sentences. Upon examining the accuracy of function word usage, it is evident that this question lacks proper use of function words, exemplified by the first sentence's use of the word "*adalah* (is)". The word "*adalah*" in that sentence is either operational or redundant, as its absence does not alter the sense of the sentence. The term "*adalah*" is often employed to specifically explain certain aspects of a

statement in definitions. The inclusion of the conjunction "*jika* (if)" in the final sentence is accurate as it serves to link the subsequent clause. From an efficacy standpoint, there are still sentences that require enhancement. For instance, in the initial sentences, the word "*adalah*" should be eliminated as it is unnecessary; even if the word is excluded, the intended meaning of the sentence remains unchanged. The third sentence contains an illogical word order; the placements of "*rata-rata dan keuntungan* (average and profit)" should be interchanged as because in Indonesian Language the phrase should tell that Yudi's possession is not an average but a profit. Hence, the statement will be modified to " *Yudi mempunyai keuntungan bersih rata-rata Rp 120.00,00* (Yudi's net profit amounts to Rp 120,000.00.)". The final statement lacks effectiveness because of the presence of an unnecessary word, namely "*adalah* (is)." To enhance its effectiveness, the final statement should be transformed into a question "*Jika Yudi berjualan selama satu minggu berapa keuntungan yang diperolehnya?* (If Yudi sells for a week, how much profit does he make?)"

> *Pak Sudiro adalah seorang petani mangga. Pada bulan pertama ia berhasil memanen 135 mangga, sedangkan pada bulan kedua ia memanen sebanyak 213 mangga. Berapakah mangga yang berhasil dipanen pak Sudiro selama dua bulan?*
> (Mr. Sudiro is a mango farmer. In the first month, he successfully harvested 135 mangoes, while in the second month he harvested 213 mangoes. How many mangoes did Mr. Sudiro manage to harvest in two months?)

The second question regarding the selection of concepts or meanings of words or sentences is basically sound; however, the second statement is somewhat compromised by the inappropriate use of the conjunction " *sedangkan* (whereas)". The term "whereas" typically serves to contrast; however, in this instance, it links two parallel sentences into a compound sentence as written in this sentence: *Pada bulan pertama ia berhasil memanen 135 mangga, sedangkan pada bulan kedua ia memanen sebanyak 213 mangga.* (In the first month, he successfully harvested 135 mangoes, while in the second month he harvested 213 mangoes). The statement would be more impactful if divided into two sentences: "*Pada bulan pertama ia berhasil memanen 135 mangga. Pada bulan kedua ia memanen sebanyak 213 mangga*" ("In the first month, he managed to harvest 135 mangoes. In the second month, he harvested 213 mangoes."). The initial statement contains redundant function words, notably the term "*adalah* (is)". This term should be excluded, as it will not alter the meaning. From the standpoint of word development, particularly for affixed words, all is accurate. The words used in the phrases of the questions are precise, such as *petani, memanen, dan berhasil* (farmer, harvesting, and successful). From the perspective of denotative and connotative meanings, all expressions utilize denotative diversity or their literal meaning. The statements in question number two are unambiguous and entirely logical. The inaccuracy in that question stemmed from the use of function terms, as previously discussed.

> *Bu Fiola memiliki peternakan lele. Pada musim panen minggu lalu, paman berhasil memanen 527 ekor ikan. Ikan lele tersebut dibeli seorang pedagang sebanyak 250 ekor. Sisanya akan dijual di pasar terdekat. Berapa banyak ikan lele yang dijual di pasar?*
> (Ms. Fiola has a catfish farm. In the harvest season last week, my uncle managed to catch 527 fish. The catfish were bought by a trader in the amount of 250 fish. The rest will be sold at the nearest market. How many many catfish are sold in the market?)

Question number 3 lacks precision in terms of conceptual accuracy or meaning. The lack of connection is seen in the relationship between the meanings of the first and second sentences, among others. The initial sentence indicates that Mrs. Fiola is the owner of the catfish pond; nevertheless, it is her uncle who conducts the harvesting. Sentences one and two lack a relationship. From the standpoint of lexical utilization, particularly the construction of affixed terms or words with affixes, all the attached terms are accurate, including *memanen, pedagang, dan dijual* ("harvesting," "trader," and "sold"). Examining the diversity of language, particularly the denotative and connotative forms, reveals that all instances employ denotative language. The function word employed in the statement is suitable, exemplified by the term *pada* (in) in the following sentence: "*Pada musim panen minggu lalu, paman berhasil memanen 527 ekor ikan*. (In the harvest season last week, my uncle managed to catch 527 fish.)". The sentences formulated in the questions are complete, comprising both a subject and

a predicate, and are not open to numerous interpretations. The phrase " *berapa* (how many)" in the final sentence signifies a quantity, while "*banyak* (many)" similarly denotes a quantity. Consequently, to be concise, the term "*banyak* (many)" might be excluded. Consequently, the final phrase will be, " *Berapa ekor ikan lele yang dijual di pasar (*How many catfish are sold in the market)?".

> *Bu Diah membutuhkan banyak telur untuk membuat kue. Bu Diah minta anaknya untuk membeli 10 kotak yang masing-masing kotak berisi enam butir telur. Berapakah jumlah telur yang dibeli Bu Diah?*
> (Mrs. Diah needs a lot of eggs to make a cake. She asks her child to buy 10 boxes, each containing six eggs. How many eggs did Mrs. Diah buy?)

The term "kue" in the initial sentence is incorrect; it ought to be "kueh." Nonetheless, this line is accurate from a conceptual perspective. Every term in that sentence employs a denotative language style or its literal meaning; the selection of word forms is already precise, and the usage of the function word "*untuk* (to)" is accurate. The second sentence is complicated. From the conceptual standpoint, this sentence remains insufficiently clear due to the improper usage of the function word "*untuk* (to)"; its removal would be advisable. The expression "*10 kotak* (10 boxes)" It would be preferable to designate them as 'eggs'. This second statement should be rearranged into two simple sentences for clarity and effectiveness which becomes" *Bu Dia meminta anaknya membeli 10 kotak telur*". *dan Masing-masing kotak berisi enam butir telur*" (Mrs. Diah instructed her child to buy ten boxes of eggs, with each box containing six eggs). The statement contains an incorrect word choice, namely the term "*minta*" which in the Indonesian language is a root word. The term "*minta*" should ideally be preceded with a prefix "*me*" to form "*meminta*," therefore clearly conveying Mrs. Diah's action. Consequently, the sentence that was divided into two has been amended from "*minta*" to "*meminta*." The final sentence is already effective. This statement is unambiguous and prevents different interpretations. The utilization of vocabulary is already accurate, encompassing root words, derived words, and function terms.

> *Pak Deny memiliki peternakan bebek. Tadi pagi bebek Pak Deny bertelur sebanyak 84 butir. Telur tersebut diletakkan ke dalam 4 keranjang sama banyak. Berapa banyak telur pada tiap keranjang?*
> (Mr. Deny has a duck farm. This morning, Mr. Deny's duck laid 84 eggs. The eggs were placed into 4 baskets equally. How many eggs are in each basket?)

In the last question, the author showed caution in employing concepts or meanings. The utilization of word forms, particularly affixed terms, is entirely accurate, such as: *memiliki, peternakan, dan diletakkan* (having, livestock farming, and placed). The language utilized is entirely suitable, employing denotative and conventional forms of expression. The employment of the function word "*tiap*" is appropriate as it is succeeded by a noun. The term "*tiap*" in the final phrase signifies one, and this is accurate. The employment of the preposition "*ke*" in the third sentence is incorrect as "*ke*" is commonly utilized to denote a destination. Consequently, the preposition "*ke*" should be substituted with the preposition "di," as it solely denotes a location rather than a goal. The third statement in the fifth question is, "The eggs were placed in four identical baskets." Question number five exhibits integrity and lacks ambiguity. The language employed is entirely uncomplicated and anticipated to be readily comprehensible by elementary school students. The selection of vocabulary is concise. The sentences exhibit parallel structure, without any complexity. The sentences in question number 5 are already effective, as described above.

5. Discussion

5.1. The Analysis of Learning Process

The learning process at SDN Pelandakan 1 employs story problems to enhance comprehension of counting operations within a contextual mathematical framework. This research demonstrates that the strategy emphasizes not just the mastery of fundamental mathematical operations but also the enhancement of students' critical thinking and problem-solving abilities.

Previous research by Halim (2020) indicates that employing story problems can enhance students' comprehension of mathematics by connecting abstract concepts to real-life contexts; thus, the teachers at SDN Pelandakan 1 implement a comparable approach. The procedure commences with the presentation of fundamental principles regarding arithmetic operations on whole numbers with class discussions. Upon mastering the fundamental theory, the teacher presents word problems constructed with precise words to exemplify topics related to the students' everyday experiences. This corresponds with Sudarwan's (2019) viewpoint, which highlights the necessity of formulating word problems in simple language that corresponds to the students' comprehension level. Throughout the educational process, the teacher breaks the students into small groups to work together to address story problems. This approach enables students to engage in discourse and evaluate their solutions, reinforcing Vygotsky's (1978) theory of social learning, which argues that peer interaction can enhance conceptual comprehension. Group conversations facilitate students in recognizing and rectifying their misconceptions, confirming Nasution's (2021) findings that collaboration can enhance students' problem-solving abilities (Harahap et al., 2022).

Overall, the use of word problems at SDN Pelandakan 1 demonstrates that this approach can substantially improve students' mathematics abilities, focusing on the application of concepts in practical circumstances. The integration of story problems with effective sentences, coupled with interactive teaching methods and varied assessments, facilitates the attainment of learning goals and enhances students' critical thinking abilities.

5.1.1. Weaknesses, Further Research, and Significant Findings

Despite the positive outcomes observed in this study, several weaknesses can be identified. First, the research was limited to a single school, SDN Pelandakan 1, which may limit the generalizability of the findings. Future research could expand the sample size to include multiple schools or a broader geographical region, to provide a more comprehensive understanding of the effectiveness of story problems in diverse educational settings. Second, the study primarily focused on the clarity of sentence construction in word problems, but did not deeply explore the cognitive processes that students undergo when solving these problems. A more detailed investigation into how students process and apply information from the problems could offer valuable insights into the mechanisms behind their problem-solving abilities. Lastly, while the study utilized various data collection methods, it did not account for external factors that could affect student performance, such as socioeconomic background, learning disabilities, or individual teacher effectiveness, which could be explored in future studies.

This study opens up several avenues for future research. A longitudinal study could explore the long-term effects of using well-constructed story problems on students' mathematical comprehension and problem-solving skills. Additionally, comparative studies could investigate the effectiveness of different types of word problems (e.g., contextual vs. abstract) across various grade levels or cultural contexts. Research could also investigate the role of digital tools in enhancing the presentation and engagement of story problems in classrooms, which may offer further insights into how technology can complement traditional teaching methods.

This study reaffirms that the use of well-constructed story problems significantly enhances students' understanding of mathematical concepts. The findings suggest that using clear and contextually relevant language in word problems not only aids comprehension but also promotes critical thinking and collaborative problem-solving.

5.2. Students' Understanding of Questions that Use Effective Sentences

The comprehension of story problems using effective language by students at SDN Pelandakan 1 demonstrates substantial improvement in their proficiency in arithmetic operations involving whole numbers. This research demonstrates that well-constructed sentences significantly help students in comprehending and resolving story problems more efficiently. Data derived from observations and interviews with the fourth-grade homeroom teacher suggest that students presented with questions articulated in effective sentences demonstrate superior comprehension relative to those confronted with questions phrased in less clear expressions.

This aligns with Halim's (2020) findings, which indicate that effective phrases in word problems improve students' capacity to convert textual information into appropriate mathematical operations. At SDN Pelandakan 1, students have demonstrated improved accuracy and speed in solving story problems when the questions are articulated in clear and straightforward words. Despite the evident advantages of employing effective sentences, certain obstacles persist. A primary problem is maintaining the effectiveness of sentences while ensuring they align with the students' comprehension level, avoiding oversimplification that could undermine the complexity of the concepts being conveyed. The Ministry of Education and Culture of the Republic of Indonesia (2022) advises that word problems should be constructed with balanced sentences—sufficiently straightforward for comprehension yet sufficiently demanding to assess the understanding of mathematical concepts. At SDN Pelandakan 1, the teacher modifies the difficulty of sentences and offers supplementary exercises to assist students in addressing more intricate questions. Students' comprehension of story problems with effective words at SDN Pelandakan 1 indicates that simple and direct language enhance knowledge and facilitate the application of mathematical ideas. The implementation of effective sentence concepts in constructing story problems enhances learning outcomes and aids students in developing their problem-solving skills more effectively.

5.2.1. Weaknesses, Further Research, and Significant Findings

While the study highlights the positive impact of using well-constructed sentences in story problems, there are a few limitations to consider. First, the research was conducted in a single school (SDN Pelandakan 1), which limits the generalizability of the findings. The outcomes might vary in different educational settings, with different student populations or teaching approaches. Future research could involve a larger sample size across multiple schools to gain a broader perspective on the effectiveness of using effective language in story problems. Additionally, this study primarily focused on the clarity of language in word problems but did not delve deeply into the individual differences among students, such as learning styles, prior knowledge, or cognitive abilities. A more nuanced examination of how these factors influence the comprehension of story problems could offer valuable insights. Lastly, the study relied on qualitative data from interviews and observations, which may carry some researcher bias. Future studies could employ a mixed-methods approach, combining qualitative and quantitative data, to provide a more comprehensive evaluation of the impact of sentence construction on student learning outcomes.

This study opens up several opportunities for future research. First, a longitudinal study could explore the long-term effects of using effective sentences in story problems on students' overall mathematical performance. Additionally, future research could investigate how students from different socio-economic backgrounds or those with varying language proficiencies respond to story problems constructed with clear and simple language. It would also be valuable to examine the role of technology in the construction and presentation of story problems. Digital tools might offer innovative ways to present problems more interactively, which could further enhance comprehension. Further studies could also explore the relationship between student-teacher interaction during problem-solving activities and the development of critical thinking skills, to provide a more comprehensive understanding of how collaborative learning influences the effectiveness of word problems.

The findings of this study reaffirm that the use of clear, well-constructed sentences in story problems plays a significant role in enhancing students' comprehension of mathematical concepts. The study confirms that students who are presented with story problems in straightforward language demonstrate improved accuracy, speed, and overall performance in solving these problems. This suggests that carefully constructing word problems in alignment with students' comprehension levels is crucial for fostering better mathematical understanding. The implications of these findings are important for teaching practices, as they highlight the need for educators to pay careful attention to the language, they use in presenting mathematical problems. Moreover, the study suggests that teaching methods that promote active engagement, such as peer collaboration and interactive exercises, can further enhance the effectiveness of word problems in promoting problem-solving skills.

5.3. Analysis of the Strengths and Weaknesses of Using Effective Sentences

The analysis of story problems employing effective sentences in the arithmetic operations curriculum for whole numbers at SDN Pelandakan 1 uncovers some notable strengths and flaws. Following the analysis of the gathered data and literature study, a commentary on the advantages and disadvantages is presented. The primary benefit of employing effective phrases in problem-solving questions is their capacity to improve students' comprehension of the subject matter. Arifin (2017) asserts that effective phrases diminish ambiguity and enhance the clarity of instructions, hence facilitating students' comprehension and problem-solving abilities (Aulia & Maksum, 2024). Observations at SDN Pelandakan 1 indicate that story problems using excellent sentences increase kids' ability to identify crucial information and the necessary processes for problem-solving. This aligns with Halim's (2020) findings, which indicate that clear and well-structured sentences can accelerate the problem-solving process and improve the correctness of students' responses. Nonetheless, the utilization of effective words also exposes certain deficiencies. A primary concern is the potential for oversimplification, which may reduce the depth and complexity of a question. Sudarwan's (2019) research highlights that the oversimplification of sentences may diminish the complexity necessary for assessing students' profound comprehension. At SDN Pelandakan 1, numerous story problems characterized by excessively simplistic phrases fail to adequately assess students' problem-solving capabilities, as indicated by evaluation results revealing a deficiency in the diversity of question difficulty levels. To rectify this deficiency, modifications in the question formulation are essential. The Ministry of Education and Culture of the Republic of Indonesia (2022) advises that story problems should be developed with effective sentences while preserving challenges suitable for the cognitive development stage of students. At SDN Pelandakan 1, the teacher has employed strategies such the integration of diverse question difficulty levels and the utilization of effective yet complex sentences to guarantee that students encounter challenges appropriate with their capabilities.

5.3.1. Weaknesses, Further Research, and Significant Findings

Although the findings indicate the effectiveness of using clear sentences in story problems, there are several limitations to consider. First, the study was conducted in a single school, which limits the generalizability of the results. Different schools may have varied student demographics and teaching practices that could influence how well students respond to story problems. Therefore, it would be beneficial to conduct similar studies across multiple schools or regions to validate the findings in diverse contexts. Additionally, this research focused on the clarity and effectiveness of sentence construction but did not examine how students' individual differences (e.g., cognitive abilities, learning styles, or language proficiency) might impact their ability to solve story problems. Future research could explore how these factors influence students' comprehension and problem-solving abilities in response to various types of word problems. Another limitation of this study is the reliance on qualitative methods, such as observations and interviews, which are susceptible to researcher bias. Incorporating quantitative methods, such as testing students' problem-solving performance before and after exposure to story problems, could provide more objective data and a clearer picture of the impact of sentence clarity on learning outcomes.

This study opens several avenues for further research. Future studies could investigate the long-term effects of using well-constructed story problems on students' mathematical understanding. For instance, a longitudinal study could explore whether students retain and apply problem-solving skills learned from story problems with effective sentences over time. Additionally, comparative research could examine the impact of different types of sentence structures or problem complexity on students' problem-solving abilities. Further exploration of how students with varying levels of prior knowledge or those from diverse socio-economic backgrounds respond to story problems could provide deeper insights into how context affects comprehension. Additionally, as educational technology continues to evolve, it would be interesting to explore the role of digital tools in constructing and presenting story problems. Digital platforms might allow for interactive and personalized story problems, which could potentially enhance students' engagement and comprehension even further.

This study reaffirms that well-constructed sentences in story problems can significantly improve students' comprehension and problem-solving skills in mathematics. The findings demonstrate that clear, straightforward language helps students identify critical information and apply the appropriate mathematical processes more effectively. This suggests that educators should prioritize clarity when designing word problems to ensure that students can focus on solving the problems rather than struggling with understanding the language. However, it is equally important to balance clarity with appropriate complexity. Oversimplification can undermine the depth of learning, so it is crucial to create problems that challenge students while being accessible. The study also highlights the importance of varied question difficulty levels to maintain student engagement and development.

6. Conclusion

The researcher concludes that based on data regarding the stages of learning, student understanding, and the analysis of the strengths and weaknesses of the questions of this research demonstrate that (1) the use of effective sentences in word problems related to whole number arithmetic operations significantly enhances the learning process for fourth-grade students at SDN Pelandakan 1. (2) Effective sentences, constructed to reduce ambiguity and improve the clarity of instructions, boost student comprehension of mathematical concepts. The analysis results indicate that effective sentences enhance students' ability to answer word problems with greater accuracy and efficiency, as they facilitate the identification of crucial information and the necessary steps for resolution. (3) The use of effective sentences in word problems enhances students' problem-solving abilities, hence increasing their confidence in addressing hard mathematical challenges. This finding high lights that while effective sentences improve clarity, there are concerns that excessive simplification may diminish the complexity of questions required to assess students' deep understanding. Consequently, the balance between clarity and difficulty in question formulation must be evaluated to guarantee optimal learning effectiveness. The three implications of this research are: (1) It highlights the need for educators to carefully consider the language used in problem construction and the value of interactive, peer-based learning environments. Furthermore, the research underscores the potential of story problems to bridge the gap between abstract mathematical concepts and real-world applications, thereby fostering a deeper understanding of mathematics among students. (2) This research reinforces the idea that effective sentence construction in story problems can significantly contribute to students' mathematical success, and it provides a valuable framework for educators to improve the quality of teaching and learning in mathematics. (3) the third finding have significant implications for teaching practices, indicating that teachers should carefully consider both the simplicity and complexity of language in their word problems. Furthermore, integrating active learning strategies, such as group work and peer discussions, alongside well-constructed story problems can foster collaborative problem-solving and deepen students' understanding of mathematical concepts.

Limitation

The limitations of this study are that it only presents data in the form of descriptive analysis, not explained quantitatively, such as calculating the effectiveness of using effective sentences in story problems on the problem-solving abilities of fourth-grade students. In addition, this study was only conducted in 1 school and on fourth-grade elementary school students.

Recommendation

Given the limitations of this study, several recommendations for future research are proposed. First, to provide a more comprehensive analysis, future studies could incorporate quantitative methods, such as statistical analysis, to measure the effectiveness of using well-constructed sentences in story problems and its impact on students' problem-solving abilities. This would allow for a more objective assessment of the influence of sentence clarity on student performance. Additionally, expanding the research to include multiple schools and grade levels would enhance the generalizability of the findings, offering a broader perspective on

how effective sentence construction in story problems impacts students across different contexts and demographics. Future studies could also consider exploring other factors, such as individual student characteristics, that may affect their ability to solve story problems, further enriching the understanding of how various elements contribute to students' success in mathematics.

Acknowledgments

The researcher would like to express his deepest gratitude to the promoter and co-promoter who have helped provide ideas for the research and writing of this article so that the research and writing of this article can be completed properly.

Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

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