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Profile of Students' Problem-Solving Skills Viewed from Polya's Four-Steps Approach and Elementary School Students

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Abstract: Problem-solving is considered one of the thinking skills that must be possessed in 21st-century education because problem-solving skills are required to solve all problems that arise. The problem-solving stages that can be used are Polya's four steps, namely, understanding the problem, devising a plan, carrying out the plan, and looking back. Problem-solving skills are essential for solving word problems. Word problems based on arithmetic operations are divided into three types: one-step, two-step, and multistep. This qualitative research aimed to see problem-solving skills viewed from the type of word questions and elementary school students' third, fourth, and fifth grades. A purposive sampling technique with 22 third-grade students, 28 fourth-grade students, and 21 fifth-grade students was used. The data were collected using documentation, testing, and interview methods. The findings of the study showed that fourth-grade students' problem-solving skills are better than those of third-grade students, and the problem-solving skills of fifth-grade students are better than those of fourth-grade students. The percentage of Polya's steps always decreases because not all students master problem-solving. Based on the types of questions, the percentage of the one-step word problem is better than that of the two-step while the percentage of the two-step word problems is higher than that of the multistep.

Keywords: *Polya's step, problem solving, word problem.*

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Introduction

Science and technology in the 21st century develop rapidly. Everyone can access any information freely, and its validity cannot be accounted for, which results in complex social problems. Therefore, certain higher-level thinking skills such as critical thinking, discussion, decision making, and scientific thinking are needed to help individuals solve the problems faced today (Yılmaz-Özcan & Tabak, 2019). This is reinforced by Holmes (Wardhani et al., 2010), claiming that one needs to learn to solve mathematical problems because, in this twenty-first century, people who can solve problems will be able to solve their everyday problems effectively.

The 2013 curriculum in Indonesia has already regulated the importance of basic competence of problem-solving skills in the Content Standards by the Indonesian Ministry of Education and Culture. It is stated that students are expected to be able to demonstrate attitudes that are logical, critical, analytical, careful, conscientious, responsible, responsive, and never give up on solving problems (Kemendikbud, 2014). Problem-solving skills certainly play a key role in the mathematics learning process because with these skills, students can solve problems that cannot be solved yet. Mathematical problem-solving skills were also expressed by the National Council of Teachers of Mathematics (NCTM, 2000). According to NCTM, the five standards of mathematical skills that students should have are problem-solving, communication, connection, reasoning, and representation skills.

Problem-solving skills are important skills that individuals must possess and can be used in daily life (Kaya et al., 2014). Problem-solving skill development is one of the focuses on 21st-century educational goals (Gunawan et al., 2020; Kivunja, 2015; Rahman, 2019). According to Nurhayanti et al. (2020), problem-solving skills are the highest stage of thinking because the skills have complex processes such as reading, processing, and solving mathematical problems. Problem-solving skills are the process of thinking, using information, and finding the solution to solve a problem and reach the goal (Demitra & Sarjoko, 2018). The problem-solving process requires analyzing the problem, organizing the

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possessed information, preparing an action plan, evaluating all the operations carried out, and making decisions (Özsoy et al., 2015).

Problem-solving is a complex cognitive process required to utilize linguistic information, identify the missing information, identify problems, benefit from problem-solving strategies, and identify computing problems (Vula et al., 2017). According to Kaya et al. (2014), problem-solving skills are a complex process to identify the problem and its salient features, imagine based on experience, deal with problem-solving, analyze for a solution, draw a conclusion and make a decision. According to Ardiyanti et al. (2014), problem-solving skill indicators include understanding the questions, making mathematical models, computing, and drawing conclusions. Sari et al. (2019) stated that problem-solving in mathematics includes identifying the adequacy of data to solve problems, identifying strategies to solve problems, completing the mathematical model, and checking the answers. Problem-solving helps students improve their analytical abilities and apply them to a variety of situations. Problem-solving skills help people develop their mathematical thinking as a tool for daily life because mathematics can be applied to a variety of unusual situations (Schoenfeld, 2014). Developing problem-solving skills is the primary goal of the curriculum at the schools.

In the world of education, the students' skills to solve problems are far from the educational expectations and goals. In 2016, this was explained in an education assessment center seminar conducted by the Ministry of Education and Culture, in which Indonesia previously participated in Trends in International Mathematics and Science Study (TIMSS) for the eighth grade. Then, it participated in the fourth-grade level in 2015. Indonesia is ranked 6th from the bottom or 43rd out of 49 participating countries. In addition, based on the academic quality among nations through the Program for International Student Assessment (PISA) in mathematics in 2015, Indonesia ranked 62nd out of 70 participating countries with a score of 403 from an average OECD (Organisation for Economic Cooperation and Development) score of 493. This shows that Indonesian students still have very low skills in solving problems in the form of study questions, reasoning, communicating, and solving and interpreting various problems. Mathematical problems in PISA's study measure are more related to reasoning, problem-solving, and argumentation skills than memory and calculation skills. Low problem-solving skills can be seen in solving non-routine word problems. This is in line with Noer's (2010) findings that the TIMSS study results revealed that Indonesian students are weak in some aspects of problem-solving include solving non-routine problems related to verification or proofing, problem-solving that requires mathematical reasoning, finding generalizations or conjectures, and finding relationships between data or facts given. Meanwhile, PISA's study revealed that Indonesian students are weak in solving problems focusing on mathematics literacy, which is shown by the students' skills to use mathematics where they learn to solve problems in daily life.

In reading word problems, students need to be careful in understanding to ensure that they understand what they read. They also need more time to understand difficult word problems because they must pay attention and visualize information to help them remember and understand what they read. This is in line with the study findings of Harvey and Goudvis (2007). They claimed that awareness of reading comprehension is an ongoing process and continues to develop in accordance with what the reader thinks. Özsoy et al. (2015) argued that problem-solving requires the reading process, which is understanding the text and using mathematical knowledge and operations.

Based on arithmetic operations, there are three types of word problems; they are (1) one-step word problems that are mathematical problems containing mathematical sentences with one type of arithmetic operation (addition or subtraction or multiplication or division); (2) two-step word problems that are mathematical problems including mathematical sentences with two types of arithmetic operations; (3) multistep word problems that are mathematical problems containing mathematical sentences with more than two arithmetic operations (Kızıltoprak & Köse, 2017; Raharjo & Waluyawati, 2011). Based on the types of word problems, each type has a different level of difficulty. Multistep word problems certainly have a higher level of difficulty than one-step and two-step word problems. Two-step word problems can help students cognitively process variations in two different types of operations (Mautone & Mayer, 2001).

There are some steps that can be used as a reference to measure problem-solving skills. One of these steps is Polya's four steps for problem-solving. The first step is understanding the problem. At this stage, students are expected to understand the given problem to determine what is known and what they are asked to solve the problem presented. The second step is devising a plan. At this stage, students must be able to determine the separation of variables, make mathematical models, identify the strategies or methods to be used, and write down the steps that will be used in solving problems. Third, the students must carry out their problem-solving plan. At this stage, they carry out predetermined plans and mathematical calculations. The latter is looking back at the solution obtained. At this stage, students make a reflection that checks or tests the solutions obtained.

The elementary school students' problem-solving skills certainly vary according to their cognitive levels based on Jean Piaget's theory of cognitive development, advocating that elementary school children are at a concrete operational stage. During this period, their logical minds begin to develop. Children with concrete-operational think have also mastered meaningful learning, namely the characteristics captured by the senses, such as the size and shape of things that can be different without having to affect, for example, the quantity of the object in question (Karatas & Baki, 2013; Suyono & Hariyanto, 2015). At this stage, they can think logically about concrete events and classify objects into different forms (Baharuddin & Wahyuni, 2015; Kramarski, 2017). Children in the concrete operational stage are still marked by the existence of an operating system based on what looks real/concrete. They still apply logical thinking to concrete things, not yet abstract things, especially hypotheses. Children also still have difficulties in solving problems with many variables. However, their intelligence stages are advanced. Therefore, this research examines the third-, fourth-, and fifth-grade elementary school students' problem-solving skills.

The results of the preliminary research through the problem-solving skill test for the students showed that their mathematical problem-solving skills were still relatively low. To determine the students' problem-solving skills based on Polya's steps, mathematical problem-solving skill tests were conducted in the form of multistep word problems with the flat figure topic. This test examined whether students could model a mathematical problem, use the right strategy, solve problems, and recorrect the answers. Only five out of 22 third-grade students could complete Polya's four steps of completion. Of 28 fourth-grade students and 21 fifth-grade students, only seven and four students could complete all the steps. This revealed that their problem-solving skills were still low.

This study is expected to be an illustration for educators and educational activists in designing learning to create an effective learning environment in accordance with the learning framework of the 21st century and produce learning outcomes to overcome global challenges. Also, there are a large number of studies involving problem-solving skills, but they only focused on improvement (Ahmed et al., 2020; Bailey, 2017; Hobri et al., 2020; Hulaikah et al., 2020; Kojo et al., 2018; Peranginangin et al., 2019; Suarsana et al., 2019). Thus, further analysis is needed to profile students' skills to solve word problems (one-step, two-step, and multistep word problems) based on their grades. Hence, the teacher can determine the correct learning model/strategy.

Methodology

Research Goal

This study aimed to examine the profile of students' skills in solving word problems in terms of the type of word problems and students' grades. This study used a mixed-method of quantitative and qualitative methods. The quantitative method was used to analyze the quantitative data obtained from the word problem tests. While the qualitative research method was used to explain in more depth the results of the word problem test research that had been obtained quantitatively.

Sample and Data Collection

This study was conducted in elementary schools in Surakarta, Indonesia. The research subjects were selected purposively consisting of 21 third-grade students, 28 fourth-grade students, and 22 fifth-grade students in Surakarta, Indonesia. Data collection methods used in this study were observation, interviews, and tests. First, the researcher conducted an observation of learning and interviews with teachers using instruments that had been declared valid through the Pearson Product Moment technique and reliable through Cronbach's alpha technique. Second, the researcher used tests and conducted interviews with students to collect the data. Third, the researcher analyzed by reducing and presenting the data. Fourth, the conclusion was drawn.

Three types of problem-solving word problems were used as the study instruments; they were (1) one-step word problems (mathematical sentences with addition or subtraction or multiplication or division), (2) two-step word problems (mathematical sentences with two types of arithmetic operations), and (3) three-step word problems (mathematical sentences with more than two types of arithmetic operations). The problems were first tested for their validity and reliability before they were used. After being declared valid and reliable, the problems were used. This test was a 35-minute word-problem essay test. The problems were given twice to determine whether there was an increase in their skills. The topic used was the flat figure.

Analyzing of Data

The data were analyzed using a mixed technique of descriptive quantitative and qualitative analyses. The data credibility test was time triangulation by comparing the suitability of the results of test 1 and test 2 so that valid data were obtained (Moleong, 2010). The assessment criteria used referred to Saputri et al. (2017) using an instrument scale criteria of 0-4, as shown in the following table.

Table 1. Scoring Criteria

Score	Criteria
4	Perfect answer: the completion is complete and correct.
3	Correct answer: there is only one mistake.
2	Partially correct answer. there are multiple mistakes in the completion.
1	Incorrect answer: the answer is not resolved.
0	Incorrect answer: there is no answer at all.

The total score obtained was converted into a percentage to see the category of students' achievements in meeting Polya's steps. The references used are as follows (Budiyono, 2015).

Table 2. The Conversion of the Students' Achievement of Indicators

Percentage Interval (%)	Category
80 ≤ x ≤ 100	Very good
60 ≤ x < 80	Good
40 ≤ x < 60	Enough
20 ≤ x < 40	Poor
0 ≤ x < 20	Very poor

Meanwhile, the qualitative data were analyzed using interactive analysis. According to Budiyono (2017), there are 4 (four) main components in the interactive analysis model, namely data collection, data reduction, data presentation, and verification (drawing conclusions) which are reciprocal between one to another. The reliability test on the qualitative analysis has been carried out by auditing the entire research process (Moleong, 2010). In addition, the details of field notes were recorded using a recording device, and the digital files were transcribed.

Findings / Results

Third-Grade Students' Problem-Solving Skills in Word Problems

After the word problem tests were carried out for the third grade, the results were obtained. Table 3 describes the third-grade students' skills in completing Polya's word problems at Tests 1 and 2.

Table 3. Third-Grade Students' Word Problem Solving Based on Polya's Steps

Polya's Steps	Test 1	Test 2	Mean	Criteria
Understanding problem (P1)	80%	89%	84.5%	Good
Devising a plan (P2)	64%	73%	68.5%	Enough
Carrying out the problem (P3)	47%	55%	51%	Enough
Looking back (P4)	36%	42%	39%	Less

According to Table 3, the average of step P1 was in the good category of 84.5%. That means 16 third-grade students could write information correctly. The percentage was higher than those of steps P2 and P3, which were in enough categories of 68.5% and 51%, respectively. The poor category was only 39%, that is, only nine students could review the answers. The percentage of test results showed a decrease from P1 to P4, but it increased from test 1 to test 2. Furthermore, the percentage of test results based on one-step, two-step, and multistep word problem types is shown in Figure 1.

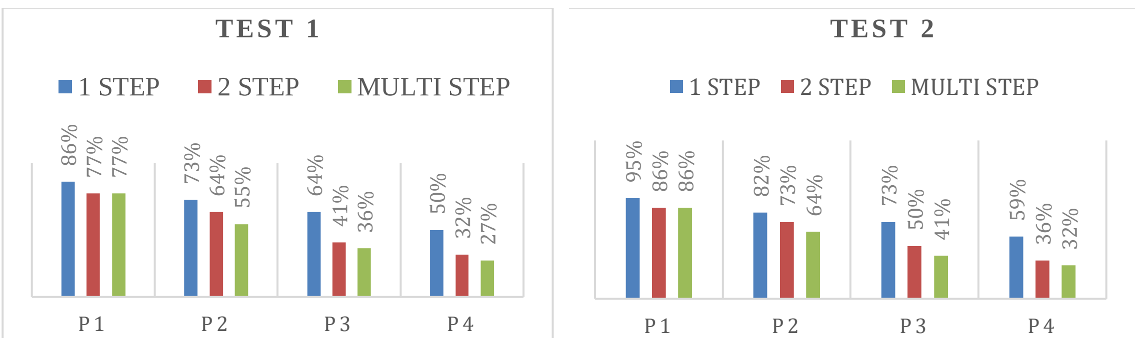


Figure 1. Comparison of Third-Grade Students' Tests 1 and 2 Results

In line with previous results, giving problem-solving problems for P3 and P4 obtains poor categories, especially for the two-step and multistep problem types. This can be seen in step P4 of the first test. The findings revealed that 11 students (50%) could complete one-step problems. Then, 32% of the students or seven students could complete two-step problems. As for the multistep word problem category, six students (27%) could solve the problems. The students' percentage has increased on the second test. The table shows that the percentages of all Polya's steps of P1-P4 have increased. However, two-step and multistep word problems were still in the poor category. Figure 2 describes the comparison of the achievements of the problem-solving skills based on the types of problems.

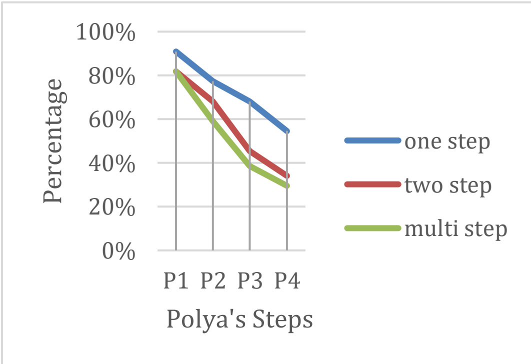


Figure 2. Comparison of Third-Grade Students' Test Results of the Word Problem Types

According to Figure 2, one-step word problems are better than two-step and multistep ones. The two-step word problems are better than multistep word problems. Similarly, the percentage of P1 is better than those of P2, P3, and P4, while the percentage of P2 is better than those of P3, P4, and so on.

The findings showed that 22 students were able to solve problems based on Polya's steps, but some students failed to fulfill Polya's several steps, especially in the multistep word problems. This type of problem uses more than two completion operations with square and rectangular area application materials. Figure 3 shows a sample from the results of students' works.

There is a rectangular city park. It has 30m length and 10m width. Along the park will be located trash cans with a distance of 20 m. How many trash cans are needed?	(see student work below)

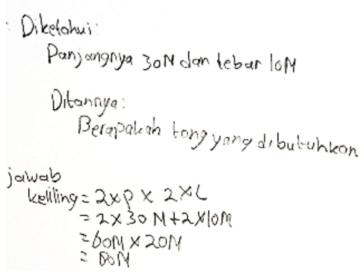


Figure 3. A Sample of a Third-Grade Student Work

In step P1, the researchers saw the students' skills to explain the available information. The results of the students' works showed that they could not explain the information in detail. The subject only wrote a length of 30 m and a width of 1 m. He did not explain the complete context of the problem that there would be a trash can every 20 m throughout a park with a certain size.

The next step, P2, involved devising a plan. It showed that the subject could not write a plan for completion. He only wrote the formula around the rectangle, counted it, and the result was 80 m. These steps also fulfilled step P3. However, this result was less precise because the subject had not divided the circumference of the rectangle by 20 m per trash can. Furthermore, step P4 was also not explained. Thus, the subject did not know whether the given answer was correct.

Fourth-Grade Students' Problem-Solving Skills in Word Problems

After the word problem Test 1 and Test 2 were carried out for the fourth grade, the results were obtained. Table 4 describes fourth-grade students' achievement in solving problems based on Polya's steps.

Table 4. The Fourth-Grade Students' Word Problem Solving Based on Polya's Steps

Polya's Steps	Test 1	Test 2	Mean	Criteria
Understanding problem (P1)	70%	83%	76.5%	Good
Devising a plan (P2)	65%	70%	67.5%	Good
Carrying out the problem (P3)	48%	57%	52.5%	Enough
Looking back (P4)	39%	48%	43.5%	Enough

Overall, the results obtained in P1 and P2 were in the good category of 76.5%, that is, 22 students can write what is known and asked correctly. This skill also affected the planning of completion (P2), which was 67.5%. That means 19 students were able to complete it. The completion plan could be completed precisely by 15 students (52.5%). Furthermore, only 12 students (43.5%) could review whether the given answers were correct. The findings showed that P1 achieved the highest percentage while P4 achieved the lowest. Furthermore, the result of test 2 also showed improvement from the result of test 1. Figure 4 describes the percentage of the fourth-grade students' works in solving word problems based on the types of problems and Polya's steps.

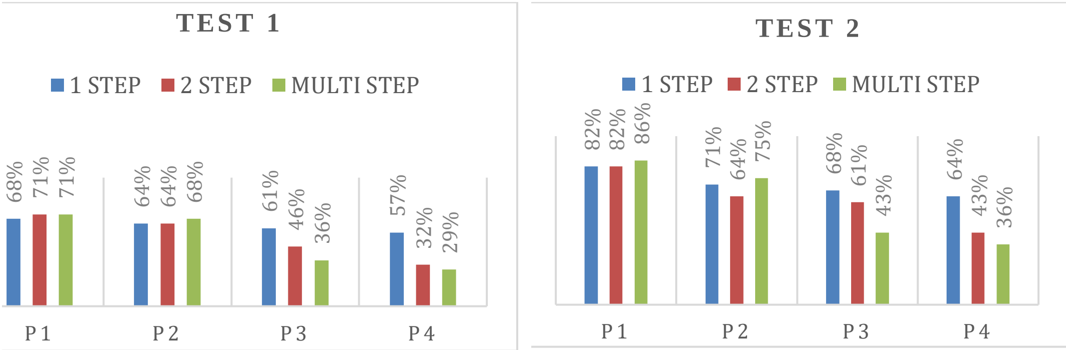


Figure 4. Comparison of Fourth-Grade Students' Tests 1 and 2 Results

The findings revealed that the students' works based on steps P1 and P2 for all types of word problems were in a good category. However, steps P3 and P4 were in enough and poor categories, especially for two-step and multistep types of problems. The result showed that, in step P3 of two-step problems, 13 students (46%) could solve the problems appropriately. Only 10 students (36%) could review their work for the multistep types of problems. Similar results can also be seen in step P4. For two-step and multistep word problems, only 32% and 29% of the students could complete the steps. The results at the second test showed an increase in the skills in all steps and types of problems compared to the result of the first test. This increase did not make the percentage criteria in the good category. This can be seen in step P3 of the second test; there was a significant increase in the two-step type of problem from 46-61%. The multistep type of problem also experienced an increase from 36% to 46%. The improvement also applied to step P4; although it was not too significant. The accumulated percentage of achievements based on the types of problems is as follows.

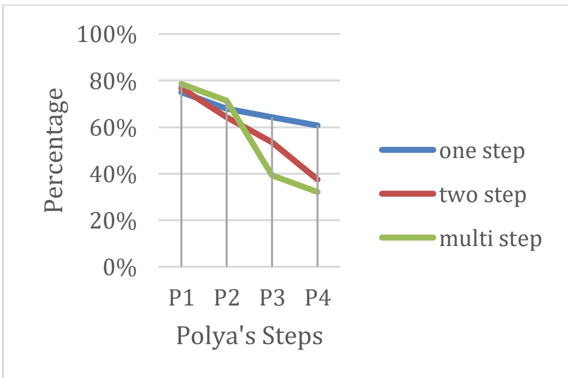


Figure 5. Comparison of Fourth-Grade Students' Test Results of The Word Problem Types

Figure 5 shows that, in Polya's steps P1 and P2, there is no significant difference in the three types of word problems. However, in steps P3 and P4, the two-step and multistep types of problems have significantly decreased. Overall, the percentage of students completing one-step problems tends to be stable at around 60%-80%. Overall, the fourth-grade students were good for steps P1 and P2 and poor for steps P3 and P4. Figure 6 describes a sample on the description of the fourth-grade students' problem-solving skills.

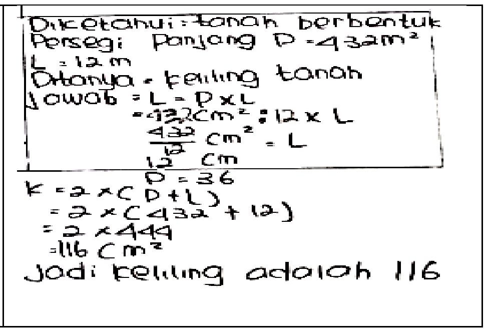
Mr. Doni has a rectangular land plot with an area of 432 m2. If the land is 12 m wide, what is the circumference of the land?	

Figure 6. A Sample of Fourth-Grade Student's Works

The above problem is a multistep problem given to the fourth-grade students. The subject could complete step P1 appropriately. He wrote down the information about the rectangular plot of land with an area of 432 m^2 and a width of 12 m. The question was about the circumference of a plot of land. For step P2, the subject first wrote the rectangular area formula to find the length. Although the steps taken were correct, the obtained result was still incorrect. He wrote p = 432/12 = 12. The length of the rectangle should be 36 m. After that, he determined its circumference. The written formula was incorrect; hence, the obtained answer was incorrect either. The subject did not review whether his answer was correct. Thus, he could not complete steps P2, P3, and P4.

Fifth-Grade Students' Problem-Solving Skills in Word Problems

After the word problem Test 1 and Test 2 were carried out for the fourth grade, the results were obtained. Table 5 presents the achievements of fifth-grade students in solving problems based on Polya's steps.

Table 5. Fifth-Grade Students' Word Problem Solving Based on Polya's Steps

Polya's Steps	Test 1	Test 2	Mean	Criteria
Understanding problem (P1)	79%	100%	90%	Very Good
Devising a plan (P2)	73%	97%	85%	Very Good
Carrying out the problem (P3)	64%	87%	76%	Good
Looking back (P4)	52%	81%	67%	Good

The rate of the ability to understand a problem (P1) was 90%, that is, 19 students were in the very good category. This demonstrates the students' abilities to understand the presented information. It also showed the students' skills to write any information they know and asked correctly. The next step was to plan problem-solving (P2) based on the information collected. Understanding the problem also affected the decisions made. It was not much different from P1, in which 85% or 18 students were very good at planning problem-solving. However, the students' works showed that many of them could not write down the completion plan with their completion steps. Most of them immediately solved the problems and implicitly wrote their plans. The percentage showed that 16 students (76%) have been able to solve problems correctly. Of the 16 students, only 14 students (67%) could check the answers given.

The results also showed an increase in the skills' percentage at all Polya levels for the second test. This increase did not necessarily apply to all word problem types. Figure 7 shows fifth-grade students' Tests 1 and 2 details.

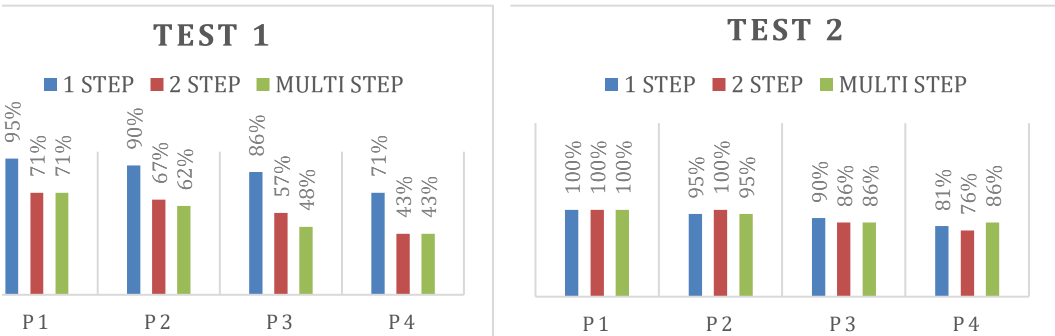


Figure. 7 Comparison of Fifth-Grade Students' Tests 1 and 2 Results

The given treatment to P1 in all three types of problems had a fairly high percentage. Twenty students (95%) could understand the problems well and write down all information in the problems. This result was in line with the two-step and multistep word problems. Fifteen of twenty-one students (71%) completed Polya's steps. Furthermore, P2 had a similar result. Slightly different from the previous two Polya's steps, P3 and P4 on the two-step and multistep word problems had a low percentage. In step P3, 57% of students achieved enough-category results while 48% of them were in the poor category. Step P4 also showed that 43% of students were in the poor category for the two-step and multistep word problems. All Polya's steps were in the very good and good categories in the second test. Figure 8 describes the accumulated percentage of achievements based on the types of word problems.

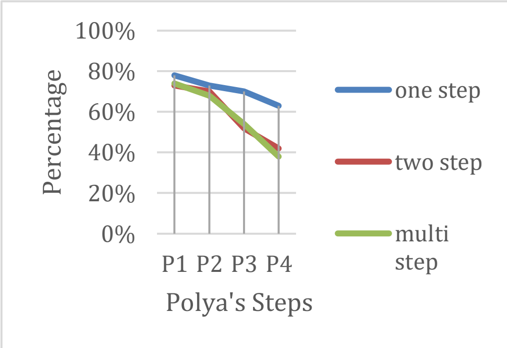


Figure. 8 Comparison of Fifth-Grade Students' Test Results of the Word Problem Types

The Figure shows that in Polya's steps P1 and P2, there is no significant difference between the three types of word problems. However, in steps P3 and P4, the two-step and multistep types of problems decreased significantly.

The fifth-grade students' works revealed that they were in enough category for P2 and P3 and poor category for P4. Figure 9 describes a fifth-grade student's work.

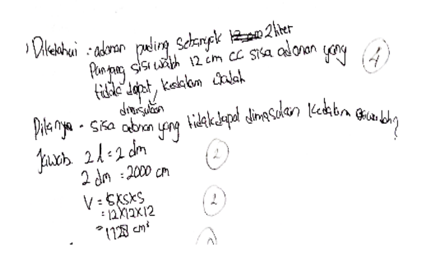
Mrs. Dona has a 2-liter pudding mixture. The mixture will be put into a cubical container. The side length of the container is 12 cm. How much cc is the remaining mixture that cannot be put in the container?	

Figure 9. A Sample of a Fifth-Grade Student's Work

Like the third- and fourth-grade students, the sample problem was also a multistep type with a level of difficulty adjusted to the fifth-grade students. The student's work showed that he could provide information known and asked. He wrote that the 2-liter pudding mixture was put into a cubical container with a 12-cm side length. The question was about the remaining mixture that could not be put into the container. Furthermore, for step P2, the subject wrote that 2 liters = 2 dm and 2 dm = 2000 cm. This was indeed incorrect because 2 liters = 2 dm^3 and 2 dm^3 = 2000 cm^3. After changing the units, he entered step P3 by calculating the container's volume. The result was 1728 cm^3. This result was correct, but it seemed that he did not have good planning. He did not deduct the container's volume with the quantity of the mixture of 2000 dm^3 - 1728 dm^3 = 272 dm^3 because 1 cc = 0.001 dm^3, 272 dm^3 = 0.272 cc. This indicated that he could only complete step P1 well.

Profile of Elementary School Students' Skills in Solving Word Problems Based on the Types of Word Problems

There are different achievements in each type of problem. Figure 10 compares the achievements in each type of problem.

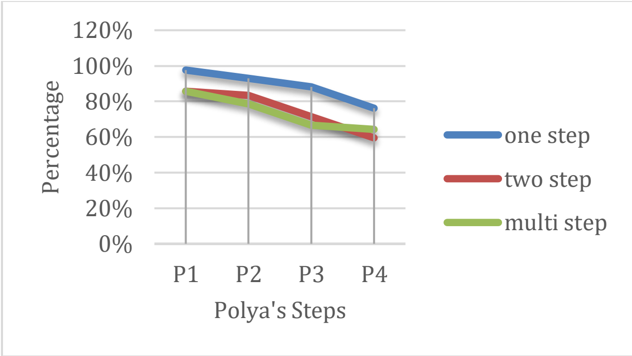


Figure 10 Comparison of Students' Achievements in Each Word Problem Type

The figure shows the accumulation of the students' achievements in each Polya's step based on the type of problem. According to figure 10, there is a significant difference between the one-step word problem type and the other two other types in each Polya's steps. However, there was no significant difference in each Polya's step between the two-step and multistep types of problems.

Discussion

Profile of Elementary School Students' Skills in Solving Word Problems Based on Polya's Steps

The results of the quantitative data at hand indicate that the problem-solving skills based on Polya's steps, and the types of fourth-grade students' word problems are better than those of the third grade. Also, the fifth-grade students' problem-solving skills are better than those of the fourth-grade students. This is related to the characteristics of lower-grade elementary school students according to Piaget in which third-grade students are in the concrete operational stage (Karatas & Baki, 2013; Suyono & Hariyanto, 2015). This is marked by their learning ability on concrete matters only. The language skills used are also at the stage of developing vocabulary. At this stage, the students have understood the concepts of length, width, weight, area, and volume. Furthermore, their learning is still done hierarchically. Given these characteristics, it is not surprising that the third-grade students' skills in solving word problems are lower than those of the fourth- and fifth-grade students. This finding is in line with the research findings of Mädamürk et al. (2016). They claimed that the calculation skills of the third-grade students in solving problems are enough, but their word problem-solving skills are low. The research results of Wahyuningtyas (2013) also mentioned that the third-grade elementary school students experienced difficulties stemming from language, material, and basic mathematical concepts. The percentage of the research results showed that only 45.83% of the 24 students could solve word problems. In the second test, it increased to 54.17% for 24 students. Thus, the third-grade students still have low skills in solving word problems due to limited language skills.

The fourth-grade students' skills are not much different from those of the third-grade students. They are only slightly trained, and their cognitive skills are developed. This finding is in line with Dharma's study findings (Dharma et al., 2016) showing that the fourth-grade students are in good categories for steps P1 and P2, enough for step P3, and poor for step P4. The word problems presented can be transformed into a more concrete form to facilitate the analysis as the characteristics of the fourth-grade students who can recognize concrete events and classify objects into different forms (Baharuddin & Wahyuni, 2015). Mädamürk et al. (2016) found the same results and claimed that the fourth-grade students' calculation and problem-solving skills are quite good. Then, the study findings of Dharma et al. (2016) revealed that the fourth-grade students are in enough category averagely in solving word problems. Steps P1 and P2 are in a proper category while steps P3 and P4 are in enough and very poor categories, respectively. Based on the findings supported by the results of the previous studies, it can be concluded that the fourth-grade elementary school students have been able to solve word problems, especially steps P1 and P2.

Furthermore, the fifth-grade students have better results than the third- and fourth-grade students' results. This is because the fifth-grade students are already at the formal operational stage. The results of the students' works and interviews show that they have worked on problems effectively and systematically, and they are also able to analyze one fact with another together. This result is parallel with the results of revealing that the fifth-grade students can already think logically, abstractly, and proportionally. Thus, when given word problems, it is not too difficult for them to solve. A study by Mädamürk et al. (2016) revealed the same results. They found that the fourth-grade students have good skills in calculation and solving word problems. Similarly, Dewi et al. (2014) also mentioned that the fifth-grade students' problem-solving skills are in the medium category of 70%.

However, there are some notes about the students' skills to work on word problems based on both written test and interview results. The skill to fulfill P1 is closely related to mathematical concepts and students' language understanding, including the concepts of area and volume of solid figures. The concepts affect the completion of mathematical problems. If the students have low concepts, they will have difficulties in solving the given word problems. This result is in line with Espinal and Gelvez's (2020) study, arguing that students with difficulty reading and understanding mathematical problems will have difficulty determining the arithmetic operations needed to find solutions. When students are unsure about how to translate problems according to mathematical models, excessive cognitive burdens arise for various reasons, at least related to general weaknesses in working memory in low-achieving students (De Jong, 2010). This is supported by the theory developed by Vula et al. (2017) claiming that many students have difficulties when they encounter problems with additional information because their math vocabulary is low; they cannot translate mathematical sentences and cannot directly plan a solution without representing the problem first. The study of Vilenius-Tuohimaa et al. (2008) stressed the effect of language development, claiming that students' reading skills affect their skills in solving word problems. Nortvedt (2011) added that the ability to understand problems is positively related to mathematical concepts, especially to multistep word problems. Therefore, reading comprehension skills should be given a (more) prominent role during word problem-solving instruction (Boonen et al., 2016).

The next is the ability to arrange a completion plan. At this stage, there are still many students who cannot write the completion steps correctly. Most students solve problems immediately without writing down the steps. Based on Karatas and Baki's (2013) results, even high school students still have difficulties choosing and determining the mathematical strategies used to solve problems. Based on the results of the interview, one of the reasons is the lack of practice in writing the completion steps. The completion steps are needed to see which strategy is used. This finding is in line with the study of Anderson (2011), arguing that strategy is an important part of problem-solving. By writing down strategies, various alternative solutions and completion schemes designed for students will be identified, from which we can know to what extent students understand the problem. Germain-Williams (2017) listed out the problem-solving plans that might be used to solve new problems such as acting out, analyzing the units, converting to algebra, creating a physical representation, using deductive logic, drawing a diagram, looking for a pattern, working backward, and so on.

Some students already have P3 skills, but their understanding of the area/volume concept is still low. The results of the interviews show that some students forget how to calculate area and volume. Besides, the lack of training provided by the teacher makes them find a little difficulty solving word problems. They forget because the teacher may not give contextual questions. Knowledge is essential to solving word problems because it not only builds students' knowledge about social situations but also shapes the context of the problem. The mathematical knowledge possessed will be relevant for modeling this given social situation. This finding is supported by the study of Verschaffel et al. (2007). They argue that solving word problems involves the application and operation of numbers to solve the problem identified. Problem-solving includes knowledge and facilities with numbers and operations to computational settings, involving sub-skills, such as understanding the relationship between the context of the problem and the necessary calculations.

The previous ability for students is to conclude or rewrite answers obtained. However, this skill can be fulfilled by only a few students. The ability to reexamine the efforts made is in the poor criteria compared to the other skills in solving word problems. This is caused by the lack of guidance from the teacher to write the conclusions when working on the word problems. The teacher is concerned only with the result of the word problem given, causing the low skill of P4. In line with Thevenot and Barrouillet's opinion (2014) on reviewing the answer, especially a word problem, an individual must understand the contextual situation described in the problem, track the information, examine numerical values in the relational structure of the storyline, and finally repeat the calculation. These stages certainly require complex thinking.

Profile of Elementary School Students' Skills in Solving Word Problems Based on the Types of Word Problems

In accordance with the previously presented data, the percentage of the students' achievements continues to decline from the types of one-step, two-step, and multistep problems. However, one-step problems are better than two-step and multistep problems. Meanwhile, the two-step problem is better than the multistep problem. Many factors cause students to make mistakes in solving story problems, such as the use of inappropriate and incomplete strategies, incorrect consideration of numbers, omitting important information, misinterpretation of story problems, and wrong analyses of information (Ulu, 2017). Kaya et al. (2014) claimed that identifying problems and information that support problem solving is the initial stage of problem-solving. Meanwhile, in several studies, students' problem-solving skills develop well when teachers associate learning with their real-life and by providing training for understanding strategies (Irwanto et al., 2018; Özreçberoğlu & Çağanağa, 2018; Ulu, 2017).

One-step problems are easier to solve because they only contain one mathematical operation. Two-step problems require students to integrate some information to solve problems. That is in line with the findings of Harter and Ku (2008). They claim that each step in the two-step problem-solving process offers a chance for errors that lead to wrong answers. Multistep problems are complex problem-solving questions with multistep completions. As emphasized by Schumacher and Fuchs (2013), a multistep word problem is a complex multistep procedure that requires students to read the problem, understand the meaning of the text, identify relevant information embedded in the text, build an abstract mental representation of the problem, make decisions about the solution steps, and take these steps to solve the problem. That is in line with the study results of Nortvedt (2011), claiming that one-step word problems generally have a small numerical error compared to multistep word problems. The multistep word problem presents more complicated word problems, given that more relationships between text elements need to be deciphered and more steps are included in the situation model. Nortvedt (2011) also stated that 5% of students were better at solving one-step word problems compared to two-step word problems. Based on the results and discussion, the multistep problems are the highest level of word problems so that all classes get low percentages.

Conclusion

In general, elementary school students can solve word problems. Based on the results and discussion above, it is concluded that the fifth-grade students have the best results compared to the third- and the fourth-grade students' results. The fourth-grade students have better presentations than do the third-grade students. The fifth-grade students are better than the fourth-grade students. The profile of students' problem-solving skills is also viewed from Polya's four steps. P1 is better than P2, P3, and P4. P2 is better than P3 and P4. Finally, P3 is better than P4. Based on the results obtained, the percentage has decreased from P1 to P4. Especially for P3 and P4. When viewed from the type of word problems (one-step, two-step, and multistep), the percentage of the one-step problems is better than those of two-step and multistep problems.

Meanwhile, two-step is better than multistep. That is caused by a hierarchy that the higher level of the word problems needs the more complex completion steps. The students find difficulty solving a problem because, first, the development of students' language is low so that they do not understand the purpose of the problem. As a result, the students have difficulty transforming word problems into mathematical sentences. Second, Students have a lack mastery of various strategies in solving problems. Third, they have a lack of mastery of the concept of area and volume of solid figures that they cannot solve the problem. Fourth, they have a lack of accuracy and attention in calculations. Fifth, they have a lack of practice in reviewing calculation results.

Recommendations

Based on the conclusions, this study can serve as an input for educators and educational activists to find the right models or learning strategies to improve the quality of problem-solving skills based on Polya's steps and word problem types. The teachers should use language in accordance with students' development, strengthen students' understanding of concepts in learning, and often provide students with problem-solving exercises. Furthermore, due to limitations, future researchers should expand this research's subject to a wider area, that is to the provincial or even the national level.

Limitations

This study was only conducted in Surakarta, Indonesia, and the sample size was too small. Thus, the results of this study do not describe the overall profile of elementary school students in Indonesia.

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Author Contribution Statement

Riyadi: Conceptualization, design, analysis, writing. Syarifah: editing/reviewing, supervision. Nikmaturrohmah: editing/reviewing, supervision.

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