Analogy-Based Selective Problem-Solving Learning on the Skill to Solve Word Problems

Isna Fauziyah Nurroini[1]; Mohammad Faizal Amir[2]; Mahardika Darmawan Kusuma Wardana[3]

[1,2,3]*Faculty of Educational Psychology, Universitas Muhammadiyah Sidoarjo, Indonesia*
[2]*Corresponding Email: faizal.amir@umsida.ac.id, Phone Number: 0857 xxxx xxxx*

Article History:
Received: Apr 26, 2023
Revised: Jun 14, 2023
Accepted: Jun 25, 2023
Online First: July 03, 2023

Keywords:
Analogy,
Problem-Solving Skill,
Selective Problem-Solving.

Kata Kunci:
Analogi,
Kemampuan Pemecahan Masalah,
Selective Problem Solving.

How to cite:
Nurroini, I. F., Amir, M. F., & Wardana, M. D. K. (2023). Analogy-Based Selective Problem-Solving Learning on the Skill to Solve Word Problems. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(3), 1357-1371.

Abstract: Researchers generally use SPS learning to develop creative thinking and problem-solving through analogical thinking. While the problem-solving word problems of elementary school students still need a lot of attention. This study aims to determine the application of analogy-based particular problem-solving (SPS) learning to improve students' problem-solving in word problems. The research method used is a quantitative experimental approach regarding the ability to solve students' math problems before and after being given treatment in the form of SPS learning. The test is given to students through a mathematical word problems solving instrument. Students' problem-solving abilities are measured based on the steps of solving problems, according to Polya. The subjects of this study were fifth-grade students at SDN 188 Gresik. Data collection techniques using tests. Meanwhile, data analysis using the t-test. The results of the SPS on problem-solving skills obtained t-table > t-count, namely 4.102 > 2.0930. The results showed that analogy-based SPS learning impacted elementary school student's ability to solve math problems in word problems. The results of this study imply that elementary school teachers can use analogy-based SPS in cultivating concept-oriented understanding and leading to students' problem-solving abilities.

Abstrak: Para peneliti umumnya menggunakan pembelajaran SPS untuk mengembangkan berpikir kreatif dan kemampuan pemecahan masalah melalui penggunaan berpikir analogi. Sementara kemampuan pemecahan *word problems* siswa sekolah dasar masih banyak membutuhkan perhatian. Penelitian ini bertujuan untuk menentukan penerapan pembelajaran *selective problem solving* (SPS) berbasis analogi untuk meningkatkan kemampuan pemecahan *word problems* siswa. Metode penelitian yang digunakan adalah pendekatan kuantitatif eksperimen. Mengenai kemampuan dalam menyelesaikan masalah matematika siswa sebelum dan sesudah diberikan perlakuan berupa pembelajaran SPS. Tes tersebut diberikan kepada siswa melalui instrumen pemecahan masalah matematika dalam bentuk *word problems*. Kemampuan pemecahan masalah siswa diiukur berdasarkan langkah-langkah memecahkan masalah menurut Polya. Subjek penelitian ini adalah siswa kelas V SDN 188 Gresik. Teknik pengumpulan data menggunakan tes. Sementara, analisis data menggunakan uji-t. Hasil SPS terhadap kemampuan pemecah masalah siswa diperoleh t-tabel > t-hitung yaitu 4.102 > 2,0930. Hasil penelitian menunjukkan bahwa pembelajaran SPS berbasis analogi memiliki dampak pada kemampuan siswa sekolah dasar dalam memecahkan masalah matematika dalam bentuk *word problems*. Implikasi hasil penelitian ini adalah SPS berbasis analogi dapat digunakan oleh guru sekolah dasar dalam menumbuhkan pemahaman konsep yang berorientasi dan menuju pada kemampuan pemecahan masalah siswa.

https://doi.org/10.51276/edu.v4i3.521

A. Introduction

Word problems are the most critical part of learning math in elementary school (Jitendra et al., 2015). Word problems play an important role because they provide problems in everyday situations. Thus, it can help students to analyze mathematical problem-solving related to everyday life (Kashefi et al., 2015). In addition, word problems can improve problem-solving skills in elementary school students (Kribbs & Rogowsky, 2016; Jupri & Drijvers, 2016). However, word problem competency is influenced by students' reading comprehension. Attention to relevant word problems helps students improve their word problem skills. As word problems become more semantically complex, students will progress in their education (Boonen et al., 2016). So word problems in learning mathematics become important because this story problem can be related to everyday life (Awofala, 2016).

Word problems can take mathematical thinking beyond computational thinking, boost students' confidence when they understand the basics, and inspire elementary school students to acquire and develop methods to develop information. An important aspect of word problems is that they are standardized steps for students to solve many problems. One way to solve the problem is by using the word problems method because students are trained to think by using the word problems method. Word problems are often considered the most challenging problems students must solve in mathematics education (Felmer et al., 2016).

Similarly, with the help of analogy learning, students can develop teaching and learning activities directly or indirectly to create a compelling and creative learning process (Prayudi et al., 2023). The analogy learning process is an effort between teachers and students to develop and process information. The analogy is one of the ways to think about building and solving the problem. The analogy is an essential feature of human intelligence in developing knowledge about information from various sciences (Sari & Hermawati, 2020). The use of analogy has been proposed to strengthen teaching analogy thinking skills in constructivist lessons. The analogy can help students understand that it is difficult to understand all new information and experience if it is not related to existing knowledge and experience, so tools are needed to facilitate the transfer of understanding (Farida et al., 2022).

Analogy thinking is the cognitive basis for understanding and perceiving similarities in context. The analogy can challenge students who often must convey what is emphasized in class (Gentner & Maravilla, 2017). The analogy is a type or similarity where the same system of relationships applies to different elements. Analogy can be divided into two, namely, inductive analogy and declarative analogy. An inductive analogy is an analogy taken from similarity through case analogy. Students are trained to see how far they understand the concept of analogy and the case. Therefore, students can monitor their understanding of something being learned (Maarif, 2016). The analogy can process the understanding of similarities between two events and use it to infer the similarities. This shows that analogy is suitable for learning because students can more easily understand concepts based on previous lessons (Ellianawati et al., 2021). A good understanding of

https://doi.org/10.51276/edu.v4i3.521

concepts is expected to strengthen students' reasoning skills. The analogy learning process can help ease understanding. To understand new concepts in everyday life and relate them to the concept of (Boteanu & Chernova, 2015). The analogy is a powerful cognitive mechanism that allows this to happen and conveys information about one situation or context from another. Analogy thinking facilitates understanding and inference and makes conceptual shifts (Keri & Elbatarny, 2021).

Mathematics brings and develops particular problem-solving (SPS) as a significant component of school education that strongly influences students' formation (Căprioară, 2015). SPS learning is the most effective concept for knowledge transfer in meaningful mathematics learning. The SPS is the use of a learning activity model by training students to face various problems, either individual or group problems, to be solved alone or together (Griffin & Care, 2015). Ability to learn SPS students will gain experience, knowledge, and decision-making skills. Individual success will be determined by the ability to do SPS. This shows that it is essential to develop the ability to learn SPS (Manah & Isnarto, 2017).

The teacher's role revealed some student characteristics in demonstrating the SPS's success in showing their exceptional speed or sincerity in completing the SPS and their exceptional precision in their approach to the SPS (Tjoe, 2015). The SPS aims to develop students' ability to use and apply SPS mathematical knowledge in real-life situations. The SPS in math learning is realistic because it is a source or starting point for learning and developing SPS math concepts (Sumirattana et al., 2017).

In understanding SPS problems, it can be done by selecting necessary and unnecessary information and is needed by students in building a combination of relevant mathematical elements. In addition, it can help students find the right solution in solving the math problem. The essential characteristic of the SPS learning model is to develop creative thinking and problem-solving skills through profound and selective analogy thinking to enrich personal knowledge so that it can be transferred to different situations. The SPS is suitable for improving the ability to solve mathematics problems because the SPS learning model focuses on teaching and problem-solving skills followed by strengthening skills (Sak, 2011). Teachers can use SPS to teach in the learning process. This model can stimulate students in thinking, starting from inferring. Thus, students can take meaning from the SPS learning process. In the learning process, students use all their thoughts, have a solution strategy, and process until they find a solution to a problem from SPS learning (Kirisci et al., 2020).

According to previous research related to applying the word problems learning model to mathematical problem-solving skills, the word problems learning model greatly influences elementary school students' problem-solving ability (Amir, 2015). In previous studies, the aspects studied focused more on students' experiences than had been studied before. This article discusses SPS in solving problems in everyday life. The SPS learning in learning is the most useful concept to realize in transferring meaningful mathematics learning knowledge. The SPS model uses a learning activity model by training students to

https://doi.org/10.51276/edu.v4i3.521

face various problems, be they individual or group problems, to be solved alone or together, so it is necessary to apply SPS to solve students' problems in everyday life.

The application of SPS develops critical and creative thinking skills in solving word problems to teach students problem-solving effectively and efficiently. In addition, this learning aims to shape the mindset of students. Using the SPS method in learning can train students to deal with various problems, both individual and group problems, and develop thinking skills, especially in finding cause and effect in the purpose of a problem. This research is to find out the description of SPS math skills. The SPS has several stages: understanding the problem, planning, problem-solving, implementing problem-solving, and looking back. This method will determine the completeness of student learning taught with the SPS learning model to obtain an overview of students' mathematics problem-solving skills in the SPS learning.

Literature Review

Selective Problem-Solving Learning

The particular problem-solving (SPS) learning model is a learning model that focuses on teaching skills in SPS followed by strengthening the skills themselves. The SPS learning model emphasizes the active learning process and invites students to take part in finding solutions to solve problems that will be faced. Problem-solving students can develop critical thinking, creative, and problem-solving skills to become more independent in learning. Problem-solving learning positively impacts the development of students' competence in solving problems. Applying the problem-solving learning model is an alternative solution to improve problem-solving skills. This is because problem-solving learning can solve problems. The advantages of problem-solving, namely, can make educators at school more relevant in life, accustom students to face and problem-solve skillfully and stimulate the development of students' willingness to think creatively and thoroughly. Problem-solving is not planned to help teachers provide students with as much information as possible but to help students develop thinking, problem-solving, and intellectual skills, learn various roles through real experiences, and become independent learners. The problem-solving learning model is expected to help students pay attention and analyze a problem that can then be adequately solved. Problem-solving is suitable for learning because it can train thinking and reasoning in concluding and developing problem-solving skills (Al Adawiyah et al., 2021).

Teachers are expected to know how to use the correct method suitable for learning. The problem-solving learning method aims to discuss problems to find solutions or answers. This method helps students improve their scientific attitudes. With this method, students must learn to think freely and independently according to each student's character and abilities. It encourages logical, critical, caring, creative, and disciplined attitudes and can help students develop self-confidence and try to understand students' ideas about mathematics in problem-solving. In the learning process, students must focus on exploring and developing the most significant potential in students with learning that prioritizes

https://doi.org/10.51276/edu.v4i3.521

children in problem-solving learning. This learning method encourages creativity, effectively achieves goals and quality, and is fun, allowing students to understand the material. So that the teacher only partially leaves students in learning, students must be guided in building knowledge so that students understand the concept of problem-solving. Under the teacher's guidance, students can be guided to achieve satisfactory learning goals. Problem-solving is the use of methods in learning activities by training students to face various personal or individual problems and group problems to be solved together. The problem-solving method is also known as the brainstorming method because it is a method that stimulates and uses insight without seeing the quality of the opinions submitted by students. Teachers are advised not to be oriented to this method, but teachers only see the way students and students' opinions convey thoughts and motivate students to express their opinions, and occasionally teachers should not disrespect students' opinions, even if the student's opinion is wrong according to the teacher (Sak, 2011)

Analogy-Based Learning

The analogy-based learning approach provides insight to convey a message so that a concept or definition becomes more accessible or straightforward. The analogy can discuss two things that are different but have similarities that can be compared to recognize a problem and then analyze the relationship so that it can learn concepts that are still unfamiliar. Learning and studying concepts that are often still unknown by analogy what is already known, that is, using an analogy, really helps increase knowledge and understanding, for example, in the context of learning, such as transferring information from teacher to student. Learning with an analogy approach is a way of delivering messages so that a concept or definition is more straightforward for the better. Analogy helps students understand the material, so all new knowledge and experience become problematic if it concerns something other than existing knowledge and experience, hence the need for knowledge transfer. The analogy is the similarity in thinking about two different concepts. The first concept is known, while the second is a foreign concept. The analogy has the appeal to explain a new teaching material that learning is not an activity of collecting facts and interacting with objects, experiences, and their environment. It is a progression of thinking to create a new framework of understanding that is preceded by matching ancient knowledge. The analogy is essential in inductive reasoning based on structured comparison and mental health. More specifically, in the argumentation process, students compare the source problem and the target problem. The source problem is a problem that thinking understands better than the target problem. In this case, students use an analogy in mathematics. Students need new information as information to facilitate conclusions about the target problem. Thinking of analogy can also help with transferring knowledge. Students must understand the object problem that has yet to be discovered before. Thus, an analogy can help students solve problems; therefore, students must recognize similarities in the source problem (Nurlaila & Amir, 2023).

https://doi.org/10.51276/edu.v4i3.521

Analogy ability, as the core of cognitive development, consists of placing the structure of an element to other structures with appropriate relationships. Analogy ability is drawing conclusions based on the similarity of a given process. The essence of using an analogy in learning mathematics is to solve problems by students applying known knowledge to solve new problem-solving. In general, an analogy is a process of drawing temporary conclusions by comparing the similarity of processes between an idea or concept that is already known with an idea or concept that is not yet known. The development of analogy skills involves source problems and target problems. In using analogy skills, students must recognize the target concept and be able to review analog concepts. The usefulness of the analog concept is as information in terms of linking and comparing with the target problem so that it can apply the structure of the source problem to the target problem (Duane, 2012). Hence, students' ability to analyze mathematical problems is an essential indicator in elementary school teaching, especially in measuring students' mathematical analogy abilities, which must be reviewed from internal and external factors. Where internal factors originate from students, the difficulty of students comparing and connecting a problem to the target problem, and external factors from outside the student, for example, the learning model used by the teacher in delivering learning materials and applications.

Improving the quality of education requires rethinking to form the basis for further training. Improving the quality of teaching is achieved through learning. There is still a learning process that focuses only on the teacher and less on students. Therefore, more emphasis is placed on teaching than learning in teaching and learning activities. Teaching tends to prioritize the interests of the teacher, while learning tends to prioritize the interests of students. For the learning process to run effectively, the teacher must be able to carry out his duties as a teacher correctly. One of the steps applied is to use the creative learning model of word problems. The word problem model is learning that focuses on teaching and problem-solving skills. Followed by increased competence. When presented with a problem, students can use word problem skills to select and develop their answers. Because of students' ability to solve math test questions (Griffin & Care, 2015).

Word Problems

Learning mathematics in elementary school is not only suggested to improve students' ability in counting but also to improve their ability in word problems, both mathematical problems and other problems that contextually use mathematics to solve them. From the mathematics objectives in elementary school, word problems appear essential in learning mathematics, so it is clearly stated in the mathematics curriculum. The implementation of learning word problems in elementary school is not as easy as thought, and some factors hinder the optimal implementation of learning word problems, not only teacher factors but curriculum guidance factors that make teachers with limited time so that they do not focus on the ability of word problems. Students' success in solving word problems can be considered a vital source to reduce the difficulty of word problems so that

https://doi.org/10.51276/edu.v4i3.521

students' success in solving word problems increases. Mathematical representation can reduce the difficulty and help students succeed in solving word problems (Muttaqien, 2016).

The word problems learning model can be characterized by using real-world problems to help students learn. Using the word problems model, students are expected to acquire more skills than knowledge. Starting with word problem-solving skills, critical thinking, and teamwork skills. Word problems encourage students to learn and work cooperatively to get solutions critically. Word problems are a way of learning by confronting students with a problem to be solved or solved conceptually in learning. To improve student learning outcomes, teachers apply word problems so that students easily understand the reasoning, especially regarding mathematical calculations and problem-solving. However, field facts show that the learning strategies applied by teachers have yet to be able to improve student learning outcomes. This can be seen in students who tend to be less enthusiastic about participating in teaching and learning activities in mathematics because they feel challenged, need help understanding the lesson, are not confident, and tend to be passive in class. Some other problems found are that students are still slow in thinking, often lagging in understanding math learning, so they cannot keep up with other friends who already understand. This will cause inequality for students in achieving learning goals. Thus, the teacher's word problems strategy has yet to be able to realize to achieve learning goals for all students. The ability in word problems needs to be developed because by solving word problems, students will be trained to understand a problem well, reason well, analyze, have the right strategy in solving problems, and evaluate what has been taught. In teaching word problems, students must pay attention to four steps: understanding the problem, planning the solution, solving the problem according to the plan, and checking back because the ultimate goal of learning is to produce students who have knowledge and skills in word problems faced in everyday life. In general, some factors cause failure in the word problems learning model, the teacher's ability to understand or apply the model in learning, and the incompatibility of model selection with the characteristics of the material (Keri & Elbatarny, 2021).

B. Method

Research Design

This research uses quantitative methods with experimental types. The quantitative approach is used to research and produce data based on numbers that are carried out objectively. Obtaining data aims to determine students' ability to solve problems. The data obtained comes from the test questions that have been given.

Figure 1. Research Method (Tjandra & Selvianita, 2023)

https://doi.org/10.51276/edu.v4i3.521

Research Subject

The subjects of this study were fifth-grade elementary school students of SDN 188 Gresik, using saturated sampling. The research subjects consisted of 25 students. Researchers use this technique to make generalizations with minimal errors.

Instrument and Indicator

This research instrument uses tests because it measures students' problem-solving abilities. The written test is used as written data on student work on the SPS test questions, and the written test is in the form of 5 question items.

Table 1. Problem-Solving Skill Test

No	Problems
1	Siti bought 2 pencils, 3 notebooks, 1 eraser, and 1 ruler. Suppose the price of 1 pencil is Rp1,500. The price of 1 book is Rp1,000.00 more than a pencil. The price of 1 eraser is Rp1,000. The price of 1 ruler is the same as 1 book. Siti paid with 2 ten thousand notes, then the refund was?
2	Ratna bought 4 pencils, 2 ballpoint pens, 2 erasers, 2 rulers, and some notebooks. The price of each pencil is Rp2,000.00, the ballpoint pen is Rp3,000.00, and the eraser is Rp2,000.00 cheaper than the ballpoint pen. The ruler costs Rp1,000.00 more than the pencil, and each notebook costs Rp2,000.00. Ratna paid with two twenty-thousandth notes and got Rp4,000 back. How many notebooks did she buy?
3	Mr. Salam has 2 material stores. In material 1, there are 290 packs of ceramics. Mr. Salam plans to move all the ceramics to material store 2, then Mr. Salam's men bring 100 packs of ceramics to move to material store 2. How many more have yet to be moved?
4	Five chicken eggs cost Rp6,000. What is the price of 15 chicken eggs?
5	Two kg of shallots costs Rp5,000. Find the price of 4 kg of shallots!

Mathematics students' problem-solving skills are compared before and after receiving SPS learning. The test was given to students through a math problem-solving instrument. Researchers used scoring based on Polya's solve-the-problem steps in Table 2 to measure students' problem-solving abilities. Furthermore, the researcher converts the total student score to the value interval 0-100 to interpret the problem-solving ability.

Table 2. Problem-Solving skill-scoring rules

Aspects	Reaction to problems	Score
Understanding the problem	– Does not understand the problem/no answer	0
	– Not observing the problem conditions/interpretation of the problem is not correct	1
	– Not wrong answer	2

https://doi.org/10.51276/edu.v4i3.521

Aspects	Reaction to problems	Score
Planning the solution	– No solution strategy plan	0
	– Strategy is not relevant	1
	– Using one particular strategy but cannot proceed/missteps	2
	– Using one particular strategy but leads to the wrong answer	3
	– Using several correct strategies that lead to the correct answer	4
Implement settlement	– No solution at all	0
	– There is a solution, but the procedure is not clear	1
	– Using one specific procedure that leads to the correct answer	2
	– Using one particular procedure that is correct but incorrect in the calculation	3
	– Using a specific correct procedure and the correct result	4
Rechecking the answer	– Not checking answers	0
	– Checking only on the answer (calculation)	1
	– Checking only on the process	3
	– Checking both the process and the answer	4

Adopted (Amir, 2015)

From Table 2, with a value interval of 0-100, the researcher can classify the level of problem-solving ability based on the score obtained by students in solving the problem in Table 3.

Table 3. Problem-solving skill level

Score Intervals	Skill Levels
$69 < L \leq 100$	Able
$40 < L \leq 69$	Quite capable
$0 \leq L \leq 40$	Not capable

Description:
L = Problem-solving skill level

Research Procedure

This research procedure follows the steps of data collection by giving tests. The first step is that the researcher explains the test word problems. The second step is giving the test to all students and then answering the word problems test questions that have been given.

Data Analysis

Before analyzing the hypothesis test data to determine whether or not there is an effect after being given treatment in the form of SPS learning on problem-solving skills, researchers will conduct a pre-requisite test, namely the data normality test to determine whether the population where the problem-solving ability data is taken is usually

https://doi.org/10.51276/edu.v4i3.521

distributed. Hypothesis testing is used by researchers using the t-test formula. SPS learning affects problem-solving ability if $t_{count} > t_{table}$ at a significant level of 5%. Otherwise, if $t_{count} < t_{table}$ at a significant level of 5%, then SPS learning is said not to affect solving ability. To determine the level of ability of SPS learning on problem-solving skills. Convert the price of t to the category of influence level.

C. Result and Discussion

Result

Based on the results of student work obtained from 25 students, 4 students scored 24, 3 students scored 40, 1 student scored 52, 2 students scored 64, 13 students scored 68, and 2 students scored 72.

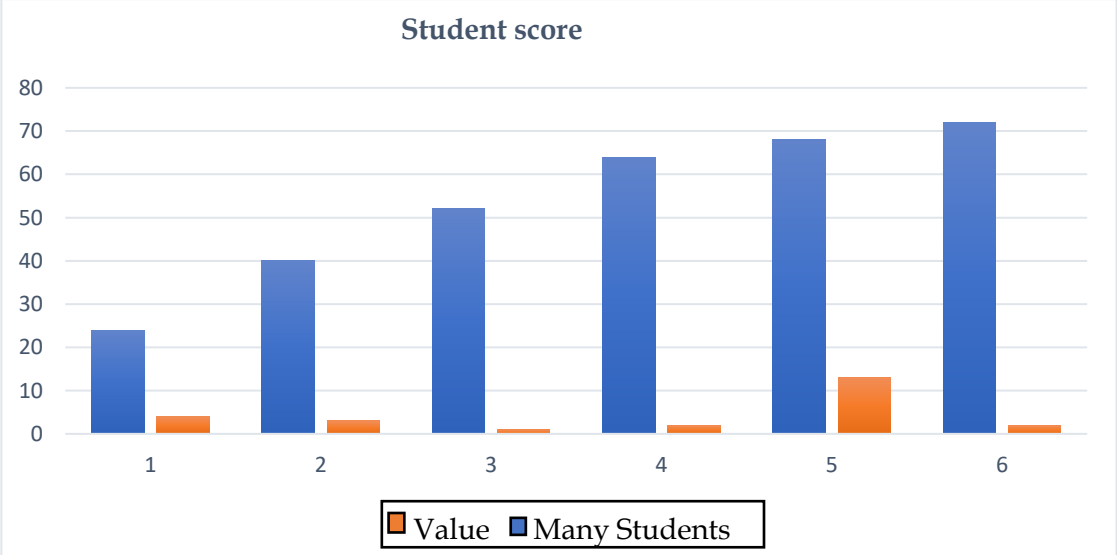

Figure 2. Student Score Result

The results of data analysis to determine whether or not there is an effect of SPS learning can be seen in Table 4.

Table 4. Selective problem-solving learning on the skill to solve word problems

Description	Postest	t_{count}	t_{table}
Score	1620		
Average score	68,9	4.102	2,0930
Level	Able		

In Table 4, the average post-test score of students is 68.9, meaning that students' average problem-solving skill is at a capable level before being given treatment in the form of SPS learning. This can interpret that there is an increase in students' abilities after being given treatment in the form of SPS learning.

https://doi.org/10.51276/edu.v4i3.521

The results of the calculation of the t-test formula obtained t count of 4.102, while the ttable value at a significant level of 5% is 2.0930. t_{table} at a significant level of 5% is 2.0930, and it can be concluded that $t_{count} > t_{table}$ means SPS learning affects student abilities.

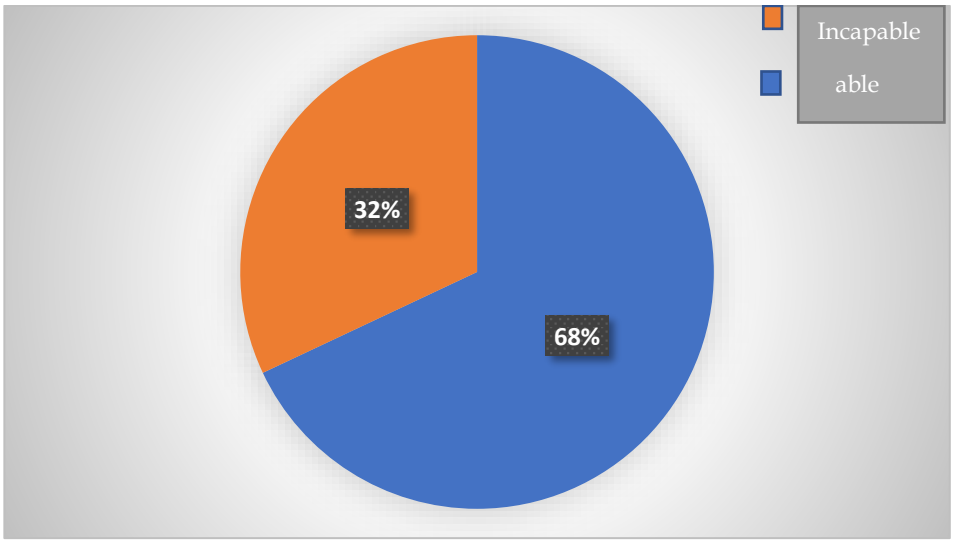

Figure 3. Student Work

According to research conducted on 25 students, 68% of students could solve post-test questions, and 32% could not solve SPS post-test questions. Students who can solve problems by understanding word problems that researchers have answered according to the instructions given. Students who are unable to have difficulty understanding the word problems given, so that students cannot solve the instructions given by the researcher.

Table 5. Recapitulate Problem-Solving Skill

		P1	P2	P3	P4	P4	Total
P1	Pearson Correlation	1	.042	-.502*	-.179	-.255	-.060
	Sig. (2-tailed)		.843	.011	.391	.218	.775
	N	25	25	25	25	25	25
P2	Pearson Correlation	.042	1	.303	.179	.510**	.625**
	Sig. (2-tailed)	.843		.141	.391	.009	.001
	N	25	25	25	25	25	25
P3	Pearson Correlation	-.502*	.303	1	.289	.390	.642**
	Sig. (2-tailed)	.011	.141		.161	.054	.001
	N	25	25	25	25	25	25
P4	Pearson Correlation	-.179	.179	.289	1	.000	.724**
	Sig. (2-tailed)	.391	.391	.161		1.000	.000
	N	25	25	25	25	25	25

https://doi.org/10.51276/edu.v4i3.521

		P1	P2	P3	P4	P4	Total
P5	Pearson Correlation	-.255	.510**	.390	.000	1	.461*
	Sig. (2-tailed)	.218	.009	.054	1.000		.020
	N	25	25	25	25	25	25
Total	Pearson Correlation	-.060	.625**	.642**	.724**	.461*	1
	Sig. (2-tailed)	.775	.001	.001	.000	.020	
	N	25	25	25	25	25	25

*. Correlation is significant at the 0.05 level (2-tailed). P1-P5 = Problem 1 – Problem 5
**. Correlation is significant at the 0.01 level (2-tailed)

The total column indicates the validity of each item. Based on the r table, the minimum Pearson Correlation value is 724 because it uses 25 respondents (N) with a limit of 0.05. It can be seen that all Pearson correlation values for each item are above 724. This is indicated by the ' or " sign in the Total column in the output table. So that these 5 post-test items are valid, these results show the validity of the data results.

Discussion

Learning is done with the SPS learning can be seen from the learning objectives of mathematics in elementary school. In connection with students' SPS mathematics ability, the role of the teacher is significant to form students who have good problem-solving skills, obtain satisfactory learning results, and ensure the learning objectives set can be achieved. Teachers as facilitators need to design a learning process that can develop skills in SPS. The SPS learning model aims to develop creative thinking and problem-solving skills through analogical, profound, and selective thinking to enrich personal knowledge so that it can be transferred to different problem situations. The SPS learning model requires students to solve problems by linking the knowledge they already have so that it makes students' memories strong and learning transfer is easily achieved so that the process of connecting new information with relevant and appropriate concepts makes students strong to learn easily achieved (Ariyani & Tego, 2021).

Students are given the math problem-solving ability test to determine the completeness of mathematics learning of students taught with the SPS learning model and also used as a consideration in choosing research subjects. Mathematical problem-solving skills can develop if students understand concepts well and can orient previously acquired knowledge with new information to develop mathematical problem-solving skills. Students can understand the problem well, which is indicated by being able to solve problems on the SPS ability test questions with the guidance that has been given and knowing the problem correctly. At the SPS stage, students can solve the problem-solving ability test questions. This is influenced by students' understanding of the problems given and being able to solve the problem according to the complete and correct formula.

https://doi.org/10.51276/edu.v4i3.521

D. Conclusion

Based on data analysis and discussion, it can be concluded as using analogy-based-selective problem-solving learning improves the ability of grade five students and help students solve their mathematics. Meanwhile, selective problem-solving learning has an excellent level of influence on the problem-solving skills of elementary school students. Selective problem-solving learning can achieve learning completeness. The ability to solve students' math word problems obtained from learning outcomes can carry out word problems, but they still need to see as a whole.

Suggestions that can be contributed related to the results of this study for further research are it is necessary to cultivate learning to develop elementary school SPS abilities, and teachers need to pay attention to the difficulties faced by students in mathematics SPS so that they can remind students not to make the same mistakes when solving problems. Students need to get attention or guidance so that students continue to strive to improve particular problem-solving skills in mathematics, students need to get advice from teachers regarding their accuracy in solving problems, and students need to get attention or guidance so that students continue to try to improve particular problem-solving skills in mathematics by providing feedback and providing varied selective problem-solving exercises regularly.

The results of this study have implications for mathematics learning using analogy-based particular problem solving can be used by elementary school teachers who not only help improve problem-solving skills in word problems. But also analogy-based particular problem solving fosters a fundamental understanding of concepts for elementary school students.

References

Al Adawiyah, K., Huliatunisa, Y., & Azhar, S. (2021). Pengaruh Metode Pembelajaran Problem Solving terhadap Hasil Belajar Matematika Kelas V Sekolah Dasar Negeri. *Jurnal Halaqah, 3*(4), 100-105.

Amir, M. F. (2015). Pengaruh Pembelajaran Kontekstual terhadap Kemampuan Pemecahan Masalah Matematika Siswa Sekolah Dasar. In *Prosiding Seminar Nasional Pendidikan*, 34-42.

Awofala, A. O. (2016). Effect of Personalisation of Instruction on Students' Motivation to Learn Mathematics Word Problems in Nigeria. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *7*(3), 486-509. https://doi.org/10.16949/turkbilmat.267339

Boonen, A. J., de Koning, B. B., Jolles, J., & Van der Schoot, M. (2016). Word Problem Solving in Contemporary Math Education: A Plea for Reading Comprehension Skills Training. *Frontiers in psychology*, *7*(191), 1-10. https://doi.org/10.3389/fpsyg.2016.00191

https://doi.org/10.51276/edu.v4i3.521

Boteanu, A., & Chernova, S. (2015, February). Solving and Explaining Analogy Questions Using Semantic Networks. In *Proceedings of the AAAI Conference on Artificial Intelligence, 29*(1), 140-1466. https://doi.org/10.1609/aaai.v29i1.9400

Căprioară, D. (2015). Problem solving-Purpose and Means of Learning Mathematics in School. *Procedia-Social and Behavioral Sciences*, *191*, 1859-1864. https://doi.org/10.1016/j.sbspro.2015.04.332

Duane, M. R. (2012). *Encyclopedia of the Sciences of Learning*. New York: Springer. https://doi.org/10.1007/978-1-4419-1428-6

Ellianawati, E., Subali, B., Khotimah, S. N., Cholila, M., & Darmahastuti, H. (2021). Face to Face Mode vs. Online Mode: A Discrepancy in Analogy-Based Learning During COVID-19 Pandemic. *Jurnal Pendidikan IPA Indonesia*, *10*(3), 368-377. https://doi.org/10.15294/jpii.v10i3.30037

Farida, A., Kasiyun, S., Ghufron, S., & Djazilan, M. S. (2022). Pengaruh Model Pembelajaran Analogy terhadap Keterampilan Berpikir Kritis pada Mapel Bahasa Indonesia Siswa Elementary School. *Jurnal Basicedu, 6*(2), 2922–2930. https://doi.org/10.31004/basicedu.v6i2.2407

Felmer, P. L., Pehkonen, E., & Kilpatrick, J. (2016). *Posing and Solving Mathematical Problems*. Suiza: Springer International Publishing.

Gentner, D., & Maravilla, F. (2017). *Analogycal Reasoning. International Handbook of Thinking and Reasoning*. UK: Routledge.

Griffi, P., & Care, E. (2015). *Assessment and Teaching of 21st Century Skills*. Australia: Springer. https://doi.org/10.1007/978-94-017-9395-7

Jitendra, A. K., Petersen-Brown, S., Lein, A. E., Zaslofsky, A. F., Kunkel, A. K., Jung, P. G., & Egan, A. M. (2015). Teaching Mathematical Word Problem Solving: The Quality of Evidence for Strategy Instruction Priming The Problem Structure. *Journal of Learning Disabilities*, *48*(1), 51-72. https://doi.org/10.1177/0022219413487408

Jupri, A., & Drijvers, P. (2016). Student Difficulties in Mathematizing Word Problems in Algebra. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(9), 2481-2502. https://doi.org/10.12973/eurasia.2016.1299a

Kashefi, H., Alias, N. A., Kahar, M. F., Buhari, O., & Mirzaei, F. (2015). Visualisation in Mathematics Problem Solving Meta-Analysis Research. In *E-Proceeding of the International Conference on Social Science Research,* 803-812.

Keri, Z., & Elbatarny, H. S. (2021). The Power of Analogy-Based Learning in Science. *HAPS Educator*, *25*(1), 13-20.

Kirisci, N., Sak, U., & Karabacak, F. (2020). The Effectiveness of the Selective Problem Solving Model on Students' Mathematical Creativity: A Solomon Four-Group Research. *Thinking Skills and Creativity*, *38*, 100719. https://doi.org/10.1016/j.tsc.2020.100719

https://doi.org/10.51276/edu.v4i3.521

Kribbs, E. E., & Rogowsky, B. A. (2016). A Review of the Effects of Visual-Spatial Representations and Heuristics on Word Problem Solving in Middle School Mathematics. *International Journal of Research in Education and Science*, *2*(1), 65-74.

Maarif, S. (2016). Improving Junior High School Students' Mathematical Analogical Ability Using Discovery Learning Method. *International Journal of Research in Education and Science*, *2*(1), 114-124.

Manah, N. K., Isnarto, I., & Wijayanti, K. (2017). Analysis of Mathematical Problem Solving Ability Based on Student Learning Stages Polya on Selective Problem Solving Model. *Unnes Journal of Mathematics Education*, *6*(1), 19-26. https://doi.org/10.15294/ujme.v6i1.10855

Muttaqien, A. (2016). Representasi Matematis pada Pemecahan Word Problem Perbandingan Inkonsisten. *Jurnal Review Pembelajaran Matematika, 1*(2), 99–116. https://doi.org/10.15642/jrpm.2016.1.2.99-116

Nurlaila, F., & Amir, M. F. (2023). Proses Analogi Siswa Sekolah Dasar dalam Mengajukan Masalah Luas Daerah. *Euler: Jurnal Ilmiah Matematika, Sains dan Teknologi*, *11*(1), 111-123. https://doi.org/10.34312/euler.v11i1.20046

Prayudi, A., Fathirma'ruf, F., Supriyaddin, S., Arifin, A., & Jama'ah, J. (2023). Studi Literatur: Penggunaan Model Analogi dalam Proses Pembelajaran. *Ainara Journal (Jurnal Penelitian Dan PKM Bidang Ilmu Pendidikan)*, *4*(1), 22–28. https://doi.org/10.54371/ainj.v4i1.203

Sak, U. (2011). Selective Problem Solving (sps): A Model for Teaching Creative Problem-Solving. *Gifted Education International*, *27*(3), 349-357. https://doi.org/10.1177/026142941102700310

Sari, M. Z., & Hermawati, E. (2020). Pengembangan Metode Pembelajaran Berbasis Sinektik Analogi Personal dalam Meningkatkan Kemampuan Berpikir Kreatif Siswa Sekolah Dasar di Kabupaten Kuningan. *Attadib: Journal of Elementary Education*, *4*(2), 58-68. https://doi.org/10.32507/attadib.v4i2.827

Sumirattana, S., Makanong, A., & Thipkong, S. (2017). Using Realistic Mathematics Education and the Dapic Problem-Solving Process to Enhance Secondary School Students' Mathematical Literacy. *Kasetsart Journal of Social Sciences, 38*(3), 307–315. https://doi.org/10.1016/j.kjss.2016.06.001

Tjandra, C., & Selvianita, D. (2023). The Impact of Face-Face Learning after the Pandemic on the Attention and Independence of Elementary School Students. *Edunesia: Jurnal Ilmiah Pendidikan*, *4*(2), 920-937. https://doi.org/10.51276/edu.v4i2.452

Tjoe, H. (2015). Giftedness and Aesthetics: Perspectives of Expert Mathematicians and Mathematically Gifted Students. *Gifted Child Quarterly*, *59*(3), 165–176. https://doi.org/10.1177/0016986215583872