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The Effectiveness of the Application of Problem-Solving Learning Models to Mathematical Problem-Solving Abilities

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Abstract: Many factors cause the low ability of students to solve mathematical problems, including teacher-centered learning and learning habits. Students are only used to learning by memorization, whereas this method does not train mathematical problem-solving skills. This study aims to determine the effectiveness of the Problem Solving learning model on mathematical problem-solving ability. This study used a literature review method using data collection techniques. The steps to analyze the data of this study are to reduce the data, then present the data and draw conclusions. The results of the study showed that from 10 articles about solving mathematical problems using the Problem Solving model, it was found that the Problem-Solving learning model affected improving mathematical problem-solving skills. In other words, the Problem Solving learning model effectively improves problem-solving skills in mathematics learning.

Keywords: Effectiveness, Problem Solving Learning Model, Problem Solving Ability, Mathematics.

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A. INTRODUCTION

In today's era of knowledge creation, the ability to think at a higher level of mathematics can be an essential foundation for overcoming various challenges and demands. Therefore, there is a need for development in mathematics learning abilities. These abilities include solving problems, arguing logically, reasoning, explaining and justifying, using information sources, communicating, cooperating, and drawing conclusions from various situations. A study conducted by the International Student Assessment Program (PISA) 2012 found that Indonesian students' mathematical and problem-solving skills are still in a weak range. According to the results of PISA 2015, Indonesia only ranks 64 out of 65 countries, and its achievement is still below average compared to other participants. Indonesia is ranked number 63 on a scale of one to 69. Several studies list variables contributing to this, including the scarcity of good learning resources, traditional teaching techniques, boring teaching paradigms, and difficulty learning mathematics (Amir, (2015): 13-14).

Therefore, the government strives to improve mathematical skills through the Ministry of Education and Culture. In Permendikbud No. 21 of 2016, it is stated that one of the objectives of learning mathematics is to solve problems, which requires understanding problems, developing mathematical models, solving models, and interpreting results. As we know, 21st century education requires students to develop the ability to think critically, solve problems, and make reasonable decisions (Pertiwi &; Rizal, 2020). Thus, 4C skills (Critical thinking and Problem Solving, Communication, Collaboration, and Creativity and Innovation) are critical

for students. One of the skills that students must have according to the 2013 curriculum is the ability to solve problems.

Solving problems is one method to determine the way out of problems that cannot be done to achieve goals, examples of learning that require students to be able to solve problems are mathematics subjects. In Permendiknas No. 22 of 2006, it is stated that mathematics subjects must be available to all students from elementary school level to secondary school level. The aim is to ensure that every learner has the necessary abilities to engage in critical, logical, analytical, creative and collaborative thinking. One of the objectives of learning mathematics is to help students to be able to solve problems starting from understanding problems, designing mathematical models, completing mathematical model designs and interpreting the results obtained.

However, facts in the field show that the ability to solve mathematical problems in students is meager, which is that in the learning process teachers emphasize more on achieving results instead of processes, not training students to solve problems, more solving routine problems as feedback from what they have learned so as not to challenge reason and high-order thinking processes HOTS (higher order thinking skills). This condition is in line with research conducted by Rostika (2017) which shows that students have difficulty solving mathematical problems related to fractional material. The low ability of students to solve mathematical problems, because in their learning teachers do not accustom students to think more creatively. Teachers only provide the fastest formula so that students can solve math problems that are conceptual, not problem-solving.

According to Hadi (Syaiful, 2012: 37), teacher-centered learning and learning habit factors are some of the characteristics defining educational practices in Indonesia. Learners are only familiar with memory-based learning, which does not train learners to learn how to solve math problems. This approach arises from how teachers traditionally teach mathematics: by illustrating mathematical concepts and operations, giving examples of problems, and asking students to do problems similar to those the teacher has exemplified. The emphasis in this learning model tends to be on memorizing mathematical concepts and procedures used in solving problems.

Implementing the Problem Solving learning model is one way to allow students to gain new experiences and skills to solve mathematical problems. According to Abdul Majid (2013), the Problem Solving model is a teaching method by inviting students to pay attention, see, and further evaluate a problem as part of its solving efforts. The Problem Solving learning model is considered capable of teaching students how to think creatively when faced with personal or group challenges that must be solved individually or together. The teacher's task in this learning model is to give learners a problem to solve to teach themselves how to recognize and solve difficulties. This is supported by the results of research from Husna and Burais (2019), that students who learn Problem Solving look better able to solve mathematical problems than students who use traditional teaching methods. Based on the explanation described above, to help students become more proficient in solving mathematical problems, researchers focus on reviewing the literature on the Problem Solving learning model. This literature review aims to ascertain the impact of the Problem Solving model in improving mathematical problem

solving skills so that teachers and researchers can then use it as a reference and apply it in the teaching and learning process

B. METHOD

The methodology used in this study is a literature review. A literature review involves collecting data from notes, books, papers and journal articles (Witarsa et al., 2020). In this study, the data obtained were sourced from articles related to being the object of research. From 10 articles, essential data will be taken to determine the effectiveness of the Problem Solving learning model on the ability to solve mathematical problems. Data collection techniques in this study by searching for articles on google schoolar. Here are the categories of articles that can be used in this study:

1. Articles used for the last 11 years, ranging from 2011- 2022
2. Student or general researchers create the articles used.
3. The article concerns the Problem Solving learning model for solving mathematical problems.
4. The illustrations used in this research are elementary and secondary school levels.
5. The scope of the article used is the Indonesian region.

C. RESULTS AND DISCUSSION

This study used 10 articles on the influence of *the Problem Solving* learning model on the ability to solve mathematical problems. Information from these articles will be analyzed and determined as the core of the research results.

Table 1. Analysis of the Effect of Problem Solving Learning Models on Mathematical Problem Solving Ability

No	Researcher Name	Year	Method	Research Title	Research Results
1.	Angga Ismail, Tego Prasetyo	2021	Meta-Analysis	Meta-Analysis of the Effectiveness of Using *the Problem Solving Learning Model* on the Ability to Solve Elementary Mathematics Problems 2020/2021	The Problem Solving *learning model* improves elementary schools' ability to solve mathematical problems efficiently.
2.	Yushinta Saputri, Krisma Widi Wardani	2021	Meta-Analysis	Meta Analysis: The Effectiveness of *Problem Solving* and *Problem Based Learning Models* in terms of Elementary Mathematics	The learning model *of Problem Solving* and *Problem Based Learning* exceptionally influences the ability to solve elementary mathematics problems.

				Problem Solving Ability	
3.	Sabina Ndiung, Princess Yunita Suniarti Tecing, Eliterius Senne	2021	Literature Research	The Effectiveness of *the Problem Solving* Approach in Developing the Mathematical Problem Solving Ability of Elementary School Students	The effectiveness of the *Problem Solving* approach is: • To improve learning outcomes, learning achievement, activity and student response, • Improve students' understanding of mathematical concepts and communication skills, • Can improve students' mathematical problem solving skills, • Can improve students' critical thinking skills.
4.	Indri Anugrahen	2019	Experimental research using quantitative methods	The Effect of Polya *Model Problem Solving* Learning on the Ability to Solve Mathematics Problems of Students	There is a significant difference between the group of mathematical problem solving skills using the Polya *model Problem Solving* learning with the group that applies the conventional learning model.
5.	Silva Ayu Indah Permata, Widha Sunarno and Harlita	2021	Interviews and Literature Studies	*Double Loop Problem Solving* (DLPS) Literature Study on Science Problem Solving Ability of Junior High School Students	Applying the DLPS learning model is suitable for improving students' problem-solving ability.

6.	Ratna Rustina , Yeni Heryani	2018	Quantitative Research	The Effectiveness of the Application of *the Creative Problem Solving* (CPS) Learning Model to Increase the Mathematical Problem Solving Ability of Students	The Creative Problem Solving *Learning Model* is more effective than the direct learning model in improving students' mathematical problem solving abilities.
7.	M.Widiastika,N. M.S.Mertasari I. M. Ardana	2019	Quasi Experiment Research	The Effectiveness of *Double Loop Problem Solving Approach* with *Scaffolding* in Improving Mathematical Problem Solving Ability	The mathematical problem solving ability of students who follow learning with a *Double Loop Problem Solving* approach with *Scaffolding* is better than that of students who follow a conventional approach.
8.	Guntur Maulana Muhammad1, Ari Septian2, Mastika Insani Sofa	2018	Quasi Experimental	Use of *Creative Problem Solving* Learning Models to Improve Students' Mathematical Problem Solving Skills	Improving the mathematical problem solving ability of students who use the *Creative Problem Solving* learning model is better than students who use ordinary learning models.
9.	Kokom Komariah	2011	Classroom Action Research	Application of Polya *Model Problem Solving* Learning Method to Improve Problem Solving Skills for Class IX J Students at SMPN 3 Cimahi	The Polya *Model Problem Solving* method can improve students' mathematical problem-solving abilities.
10.	Septiyan Halel Wijaya, Suhandi Astuti.	2022	Meta-Analysis	Meta Analysis of *Problem Based Learning* and *Problem Solving Learning* Models on Mathematical Problem Solving Abilities	The Problem Solving *model* is more effective than *Problem Based Learning* in grade IV elementary school math case solving skills

Based on the results of information analysis from 10 relevant articles that have been obtained, it can be seen that there is an influence in the ability to solve mathematical problems using the Problem Solving learning model. This research was conducted to determine the effectiveness of the Problem Solving model on the ability to solve mathematical problems. So it can be concluded, that the application of the Problem Solving learning model is effectively used to improve the ability to solve mathematical problems

D. CONCLUSIONS AND SUGGESTIONS

This research was conducted to determine the effectiveness of the Problem Solving learning model on the ability to solve mathematical problems. Moreover, based on the results of information analysis from 10 articles, the Problem Solving learning model influences on improving students' mathematical problem solving abilities. So it can be concluded that applying the Problem Solving learning model effectively improves students' mathematical problem solving ability.

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