Analysis of Student's Mathematical Problem Solving Skills on the Topics of Square and Rectangle in Elementary School

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Abstract. Mathematics learning has five aspects of mathematical proficiency that every student must have. These five aspects of mathematical proficiency are not abilities that students already have naturally, but are a combination of knowledge, skills, abilities and beliefs that students have and are obtained with the help of teachers through the learning process. One of the abilities that students must have is problem solving ability. Mathematics lessons that are closely related to everyday life are square and rectangle. The purpose of this study is to see how students' problem solving skills on the topics of square and rectangle in elementary school. This research uses the Systematic Literatul Review (SLR) method or literature review. Data collection in this study was carried out by collecting relevant articles related to students' problem solving skills in square and rectangle materials. The results of this study indicate that students' problem solving skills on the topics of square and rectangle still need to be improved. This statement is supported by various theories and research on how students' problem solving skills on square and rectangle materials.

Keywords: Mathematical Proficiency, Mathematical ability, Problem solving, Square, Rectangle.

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INTRODUCTION

Education is a process where students receive knowledge, information and skills obtained from the learning process. Learning basically includes two basics that are interrelated with each other, namely learning and teaching (Fadilah, Noviyanti, Soleha, Muji, & Taofik, 2023), this means that in the learning process an interrelated relationship between students and teachers is needed. One of the educational units included in the compulsory education programme is elementary school. Learning in elementary school has benefits that have a big impact on student development. Learning in primary schools aims to provide basic abilities to students in the form of knowledge, skills and attitudes that are useful for students according to their level of development in order to continue to the next level (Satuti, Fajriyah, & Damayani, 2023).

Mathematics is one of the lessons that has a role in helping and providing a basis for students to train students to think logically, critically and practically. This is in accordance with Sulistiani's (2016) opinion which states that mathematics has an important role in shaping and developing students' logical, systematic and critical thinking skills. In learning mathematics students must also cover 5 main aspects known as mathematical skills. Mathematical skills consist of five, namely, Conceptual understanding; Procedural fluency; Strategic competency; Adaptive reasoning; and Productive disposition (Kilpatrick, Swafford, & Findel, 2021). The five standards are a unity that must be in line with each other and should not be separated from each other. These five standards of mathematical skills are not skills that students already have naturally or from birth, but these mathematical skills are a combination of knowledge, skills, abilities and beliefs that students have and are obtained with the help of teachers through the learning process (Irawan B. P., 2018). Mathematics learning can be said to be successful when students can have these five aspects of mathematical skills.

Mathematics learning is closely related to everyday life (Hardiarti, 2017). One of the materials in mathematics learning that is closely related to everyday life is square and rectangle. In addition, the concept of square and rectangle is also the basis for learning the material of building spaces such as blocks, cubes, pyramids and other building spaces, so the material of square and rectangle is very important as basic knowledge for students. Teacher-centred learning can cause misunderstanding of the concepts given to students, especially in the material on squares and rectangles, so that students will find it difficult when the concept is related to everyday problems (Fitriyanti, Lukito, & Siswono, 2016). Students must understand the basic

concepts of square and rectangle, both from the definition, properties, strategies and various information used to determine the area and perimeter, with a good understanding of the concept will also have a good impact on further learning.

One of the abilities that students must have is problem solving ability. Problem solving in mathematics learning is an ability that students must have to overcome an obstacle and find a solution, so that problem solving skills are important for students to have in learning mathematics so that students are accustomed to using their mindset to solve the problems given (Indriyani & Ruqoyyah, 2022). However, in reality, many students think that mathematics lessons are difficult to understand. The form of problem solving problems such as concrete images, story problems or other non-routine problems makes it difficult for many students if they are given exercise problems that are slightly different from the examples given by the teacher and the examples in the book. Generally, students consider mathematics a lesson that is quite difficult and less fun, however, mathematics lessons are very important to learn (Siregar, 2017). To solve a problem, there are several stages that can be done by students, namely: understanding the given problem, planning the solution or strategy to be used, implementing the plan or strategy that has been determined, and re-examining the results of the answer (Amaliah , Sutirna, & Zulkarnaen, 2021).

Based on the explanation above, the researcher is interested in conducting research, namely analysing and describing students' problem solving skills on the topics of square and rectangle in elementary schools. This research aims to see how students' results and responses when given problem solving questions on square and rectangle materials. The researcher also wants to see what factors influence students' problem solving ability on square and rectangle materials. The results of this analysis are expected to provide an overview of the problem solving skills of students on the topics of square and rectangle

METHOD

This research was conducted using the Systematic Literature Review (SLR) method or literature review. Literature review is a written summary of articles sourced from journals, books or other documents in the form of information or descriptions of theories and also organises the literature into the topics needed (Nursamira, Hermansyah, & Susanti, 2022). The purpose of the Systematic Literature Review method is to evaluate, review and recognise previous research that is relevant so that it can answer the questions in this study. In compiling a literature review, researchers can cite articles that use qualitative and quantitative methods (Creswell, 2012). This research was conducted by identifying, reviewing and evaluating all available articles. The researcher reviewed and identified articles systematically. To complete this study, the researcher collected several articles sourced from Harzing's Publish or Perish with online database sources derived from google schoolar and scopus.

The research technique used in this study was to search for articles related to students' problem solving skills on square and rectangle materials in elementary schools. The search was conducted using keywords, namely: Problem solving ability of elementary school students on square and rectangle materials. Data analysis was conducted using descriptive analysis method. Research using descriptive qualitative analysis techniques is research conducted by collecting data in the form of words and images derived from interview scripts, field notes, photographs, videotapes, personal documents and other official documents (Moleong, 2021). From the articles obtained, they are then read and understood in order to find conclusions from the results of previous research. The descriptive analysis method is a method that describes the facts obtained and then analyses them, which not only describes the results of the research, but also provides understanding with explanations.

RESULTS

Students' thinking skills can be developed through problem solving. Through problem solving, students will be required to think critically, systematically, logically, and have an unyielding attitude to find solutions to the problems given (Astutiani, Isnarto, & Hidayah , 2019). The problem solving questions given to students must be contextual, real and close to students' daily lives. This is in line with the opinion of Nengseh, et al. (2019) who argued that problem solving problems must be developed in scientific situations related to events in everyday life or

that can attract students' attention. Problem solving problems can also be non-routine problems to see the extent to which students can apply previously learned knowledge to new situations or new problems.

Polya explained that there are several stages of thinking that students must go through in solving problems, including: (1) students are able to understand the problem by mentioning what is known, asked and required in the problem; (2) students are able to determine the problem solving strategy by connecting the information obtained in the problem with the abilities that students have in previous lessons; (3) Students are able to solve these problems using a predetermined strategy; (4) students are able to re-examine the results based on existing stages and students must have strong reasons that the answers they give are correct (Nengseh, Susiswo, & Sa'dijah, 2019). From this explanation it can be said that in solving problem solving problems students must have a good understanding of the concepts obtained from the previous learning process, students are also expected to be able to determine, use and re-examine the right and correct strategies to solve the given problem.

The results of Fauzi & Aristyawan's research (2020) state that the results of the student problem solving ability test on the perimeter and area of flat shapes, especially on square and rectangle material, are still relatively low. In the test, the percentage of students who answered the perimeter of flat shapes correctly was 15.3% and the percentage of students who answered the area of flat shapes correctly was 3.8%. Some of the difficulties faced by students in solving these problem solving problems are the inability of students to remember the terms or symbols that exist in the concept of perimeter and area of flat buildings. This is due to the habit of students who are asked to memorise formulas instead of understanding the concept of area and perimeter of flat buildings, students also have difficulty in determining relevant things in flat building images so that students are unable to apply the correct solution strategy for the given problem. Several other researchers also stated that there are still many students who are less able to solve problem solving problems. Students' problem solving abilities are also found in the research results of several previous researchers as in the table below:

No	Research and Year	Method	Journal	Research Results
1.	Analysis of Student Learning Difficulties in Geometry in Elementary School (Fauzi & Aristyawan, 2020)	Qualitative research	KREANO Jurnal Matematika Kreatif-Inovatif	The results of this research show that students' problem solving skills on the perimeter and area of flat shapes are still relatively low, especially in squares and rectangles. The percentage of students' answers after being given problem solving questions on the area and perimeter of flat shapes is only 15.3% of students who are able to answer the perimeter of flat shapes correctly and only 3.8% of students who are able to answer the area of flat shapes correctly.
2.	Analysis of Students' Mathematical Problem Solving Ability in Solving Mathematical Problem Solving for Students in Grade IV of SD 1 Burikan (Rifqi, Arofah, Surroyah, & Amaliah, 2023)	Qualitative research	Jurnal Matematika dan Ilmu Pengetahuan Alam	This research describes that of the 21 students given problem solving questions on flat building material, these students can be grouped into three categories, namely 12 students or 60% of students in the low category who have scores 0-55, 5 students or 25% of students in the medium category with scores 56-65 and 3 students or 15% of students in the high category with scores 66-100. From the results of the research obtained, students' problem solving skills are still relatively low and need to be

No	Research and Year	Method	Journal	Research Results
				improved by giving non-routine problems that require students to get used to thinking at a high level.
3.	Analysis of Mathematics Problem Solving Ability Flat Buildings Material in grade IV MI Al Fatah Singkawang (Arista, Hendriana, & Nurhayati, 2023)	Qualitative research	Jurnal Renjana Pendidikan Dasar	The results of this study say that there are 9 students in the high problem solving ability category with an average score of 84.11, 15 students in the sufficient problem solving ability category with an average score of 72.53 and 6 students in the low problem solving ability category with an average score of 52.16. It can be concluded that the average problem solving ability of all students is classified in the sufficient category with an average score of 72.
4.	Analysis of The Problem Solving Method Ability in The Subject of Plane Geometry For 6th Grade Elementary School (Unaenah, Istikharah, R, & Heruni, 2023)	Technique combined with a subjective approach to methodology	International Journal On Advanced Technology, Engineering, And Information System (Ijateis)	The results of this study say that in solving problem solving problems there are still many students who have difficulty understanding the abstract concepts in the problems given, this is because students' understanding of the concept of flat buildings is still lacking, students have difficulty determining and applying the formula to be used to solve this problem is also due to the lack of students' concept understanding abilities and students are not used to more complex problems. Therefore, the role of a teacher is very important to build students' concept understanding at the beginning of learning and provide problem solving problems so that students' problem solving skills can improve.
5.	Online learning about the perimeter of flat buildings to measure the problem solving ability of students in class IV using the Realistic Mathematics Education approach. (Indriyani & Ruqoyyah, 2022)	Qualitative research	COLASE Creative of Learning Students Elementary Education	The results of this research explain that there are still some difficulties experienced by students in solving problem solving problems in flat building material. Based on the results of the tests given, students are less able to determine the strategy or formula that will be used to solve the given problem and when doing calculations related to moving places in flat building problems where the perimeter is known, students must find the unknown side and vice versa students look for the perimeter or area if the side is known.
6.	Analysis of Mathematical Problem Solving Ability on the Material of Mirroring Flat Buildings in Grade 5	Qualitative research	Jurnal Widya Karya	In this study students were given 3 problem solving problems with different levels of difficulty. In the first problem whose difficulty level is classified as low, many students were able to solve the problem correctly. In the second and third problems only

No	Research and Year	Method	Journal	Research Results
	at 11 Penabur Christian Elementary School in the 2022/2023 Academic Year (Purnomo, Pradevi, Putri, & Adzima, 2023)			about 66.6% of students were able to solve the problem because in the second and third problems the level of difficulty of the problem was higher and students did not understand the relationship between what was known in the problem with the knowledge that students had before.
7.	Analysis Of Students' Misconceptions In Solving Mathematics Problems On Flat Construction Materials (La Ili, 2022)	Qualitative research	Eduvest – Journal of Universal Studies	This study describes the level of student misconceptions in solving problem solving problems on rectangular material seen from the category of students' mathematical abilities. Students' difficulties in identifying the problem solving problems given are due to the misconceptions about the concepts of square and rectangle experienced by students.

DISCUSSION

Based on some of the research results described in the table above, it can be said that most students' problem solving skills are still in the low category. It can be seen from some of the research results that the comparison between students' problem solving skills in the high, sufficient and low categories is still dominant in the low and sufficient categories. From the description in the table above, there are several factors that cause the low problem solving ability of students on the topics of square and rectangle in elementary schools, including: students' concept understanding ability in previous learning is still low, this causes students to have difficulty understanding the meaning of problem solving problems in square and rectangle material given and students are unable to remember some of the terms used in the concept of square and rectangle. The difficulty experienced by students in solving problem solving problems in square and rectangular material related to verbal is that students are unable to use concepts or principles in square and rectangular material (Fauzi & Aristyawan, 2020). So it can be said that students' initial understanding of the concepts of square and rectangle is very influential on students' problem solving ability in square and rectangle material.

The description above is also supported by the results of research conducted by Rifqi, et al (2023) which explains that 60% of 21 students are still in the low category, 25% of students are in the medium category and only 15% of students are in the high category when given problem solving questions on square and rectangle material. Arista, et al (2023) in their research also said that students' problem solving skills on flat building material were classified in the sufficient category. This can be caused by the habit of students working on problems that are in accordance with the examples given by the teacher and those found in books or teaching modules which cause students to be unfamiliar when faced with problem solving problems that are different from the examples previously obtained. To improve these problem-solving skills, students must be trained to answer problem-solving problems or non-routine problems so that students are trained to think at a higher level and students' problem-solving skills can increase.

The role of a teacher in the learning process is needed in improving students' problem solving skills. The learning process provided by the teacher greatly affects the results obtained by students. Problem solving ability is closely related to students' understandings obtained from the initial learning process such as concept understanding ability, reasoning ability and students' representation ability of the learning provided. This is in line with research conducted by Unaenah, et al (2023) which states that students have difficulty understanding abstract concepts contained in problem solving problems and students have difficulty determining what strategies or formulas to use to solve these problem solving problems. The misunderstanding of concepts

obtained by students in the learning process is also one of the influences that cause students' problem solving skills in flat building material to remain in the low category. The level of difficulty of the problem solving problems given to students can also illustrate the condition of students' problem solving abilities that are different for each student. Some students are unable to solve problem solving problems in flat building material because the problem solving problems given to students have a high level of difficulty, but in problems with a low level of difficulty most students are able to solve the problem correctly (Purnomo, Pradevi, Putri, & Adzima, 2023). To find out the extent to which the level of students' problem solving ability can be done by giving several problem solving problems or non-routine problems with different levels of difficulty.

Student misconceptions also affect students' problem solving skills. Students who have misconceptions about the concepts of square and rectangle will have difficulty identifying the problems given in the problem and students have difficulty determining the solution strategy to be used in problem solving problems. Misconceptions experienced by students include: (1) students experience errors in distinguishing between square and rectangular shapes; (2) students' errors in representing problems in the form of images and errors in applying relationships between formulas that will be used in solving problems; (3) students are also wrong in determining or writing units of the perimeter and area of squares and rectangles. A teacher must know the extent of knowledge already possessed by students to serve as a benchmark in preparing further learning so that students do not experience misconceptions (La Ili, 2022). Misconceptions that occur in students must be addressed so as not to hinder student knowledge. Training students' problem solving skills is important. As has been described from several previous research results that students' problem solving skills are influenced by their understanding of concepts, students' habits of answering non-routine problems or problem solving problems, the level of difficulty of the problems given to students, and the learning process provided by the teacher.

CONCLUSION

Based on the literature review that has been done above, it can be concluded that students' problem solving skills on square and rectangular materials in elementary schools are still in the low category. This is caused by several factors, namely: (1) students are not accustomed to being given non-routine problems or problem solving problems so that students are unable to identify the problems given in the problem; (2) understanding of the concepts of square and rectangle owned by students is still lacking so that students find it difficult to find relevant things in the problem and determine the strategy to be used to solve the problem; (3) the level of difficulty of the problems given to students also affects to train students' problem solving skills; (4) and some misconceptions in square and rectangle material experienced by students also affect students' problem solving skills. The role of a teacher in the learning process is needed to improve students' problem solving skills. Therefore, this research is expected to be a reference for other researchers or for teachers in elementary schools to use learning strategies, models or relevant learning approaches, especially in square and rectangle learning to improve students' problem solving skills in square and rectangle materials in elementary schools.

REFERENCES

Amaliah , F., Sutirna, & Zulkarnaen, R. (2021). Analisis kemampuan pemecahan masalah matematis siswa pada materi segiempat dan segitiga. *AKSIOMA: Jurnal Matematika dan Pendidikan Matematika*, 10-20.

Arista, Y., Hendriana, E., & Nurhayati. (2023). Analisis Kemampuan Pemecahan Masalah Matematis MATERI BANGUN DATAR IV MI AL FATAH SINGKAWANG. *Jurnal Renjana Pendidikan Dasar*, 10-16.

Astutiani, R., Isnarto, & Hidayah , I. (2019). Kemampuan Pemecahan Masalah Matematika dalam Menyelesaikan Soal Cerita Berdasarkan Langkah Polya. *Seminar Nasional Pascasarjana UNNES*, 297-303.

Creswell, J. (2012). *Fourth Edition Educational Reaserch.* University of Nebraska–Lincoln : Pearson.

Fadilah, N., Noviyanti, A., Soleha, D. S., Muji, N. C., & Taofik. (2023). UPAYA MENINGKATKAN KEMAMPUAN MENYELESAIKAN SOAL CERITA MATEMATIKA PADA SISWA SDN PULO GEBANG 06. *GENTA MULIA JURNAL ILMIAH PENDIDIKAN*.

Fauzi, I., & Aristyawan, A. (2020). Analisis Kesulitan Belajar Siswa pada Materi Geometri di Sekolah Dasar. *KREANO Jurnal Matematika Kreatif-Inofatif*, 28-35.

Fitriyanti, I. R., Lukito, A., & Siswono, T. Y. (2016). PENGEMBANGAN PERANGKAT PEMBELAJARAN MATEMATIKA REALISTIK TOPIK LUAS DAN KELILING BANGUN DATAR KELAS III SEKOLAH DASAR. *Jurnal Review Pendidikan Dasar:Jurnal Kajian Pendidikan dan Hasil Penelitian*, 304-310.

Hardiarti, S. (2017). ETNOMATEMATIKA: APLIKASI BANGUN DATAR SEGIEMPAT PADA CANDI MUARO JAMBI. *AKSIOMA*, 99-110.

Indriyani, & Ruqoyyah, S. (2022). PEMBELAJARAN DARING MATERI KELILING BANGUN DATAR UNTUK MENGUKUR KEMAMPUAN PEMECAHAN MASALAH SISWA KELAS IV SD MENGGUNAKAN PENDEKATAN REALISTIC MATEMATICS EDUCATION. *COLASE Creative of Learning Students Elementary Education Journal of Elementary Education*.

Irawan, B. (2018). KECAKAPAN MATEMATIS (MATHEMATICAL PROFICIENCY) SISWA DALAM PEMBELAJARAN OPEN-ENDED DI SEKOLAH MENENGAH PERTAMA. *Jurnal Perspektif Pendidikan*.

Irawan, B. P. (2018). KECAKAPAN MATEMATIS (MATHEMATICAL PROFICIENCY) SISWA DALAM PEMBELAJARAN OPEN-ENDED DI SEKOLAH MENENGAH PERTAMA. *Jurnal Perspektif Pendidikan*, 60-71.

Kilpatrick, J., Swafford, J., & Findel, B. (2021). *HELPING CHILDREN LEARN MATHEMATICS.* NATIONAL REASERCHCOUNCIL.

La Ili. (2022). ANALYSIS OF STUDENTS' MISCONCEPTIONS IN SOLVING MATHEMATICS PROBLEMS ON FLAT CONSTRUCTION MATERIALS. *Eduvest – Journal of Universal Studies*, 475-483.

Lisnani, & Inharjanto, A. (2023). Students' Problem-Solving Ability Using Picture Story Contexts. *Mosharafa: Jurnal Pendidikan Matematika*, 100-112.

Moleong, L. (2021). *METODOLOGI PENELITIAN KUALITATIF.* PT REMAJA POSDAKARYA.

Nengseh, L., Susiswo, & Sa'dijah, C. (2019). Kemampuan Pemecahan Masalah Matematika Siswa Sekolah Dasar dengan Gaya Kognitif Field Dependent. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, 143-148.

Nursamira, Hermansyah, & Susanti, D. (2022). STUDI LITERATUR: KEMAMPUAN BERPIKIR KREATIF MATEMATIS SISWA. *Mathematic Education And Aplication*, 44-55.

Purnomo, P. I., Pradevi, Y. E., Putri, A., & Adzima, K. (2023). ANALISIS KEMAMPUAN PEMECAHAN MASALAH MATEMATIS PADA MATERI PENCERMINAN BANGUN DATAR KELAS 5 DI SD KRISTEN 11 PENABUR TAHUN PELAJARAN 2022/2023. *Jurnal Widya Karya*, 273-277.

Rifqi, A., Arofah, S., Surroyah, N., & Amaliah, F. (2023). Analisis Kemampuan Pemecahan Masalah Matematis Siswa Dalam Menyelesaikan Soal Materi Bangun Datarsiswa Kelas IV SD 1 Burikan. *Jurnal Matematika dan Ilmu Pengetahuan Alam*, 6-13.

Satuti, H. W., Fajriyah, K., & Damayani, A. T. (2023). ANALISIS KEMAMPUAN PEMECAHAN MASALAH MATEMATIKA SISWA BERDASARKAN TAHAPAN POLYA DALAM MENYELESAIKAN SOAL CERITA BANGUN DATAR. *Jurnal Wawasan Pendidikan*.

Satuti, H. W., Fajriyah, K., & Damayani, A. T. (2023). ANALISIS KEMAMPUAN PEMECAHAN MASALAH MATEMATIKA SISWA BERDASARKAN TAHAPAN POLYA DALAM MENYELESAIKAN SOAL CERITA BANGUN DATAR. *Jurnal Wawasan Pendidikan*, 595-608.

Siregar, N. R. (2017). Persepsi siswa pada pelajaran matematika: studi pendahuluan pendahuluan. *PROSIDING TEMU ILMIAH X IKATAN PSIKOLOGI PERKEMBANGAN INDONESIA*, (hal. 224-232). Semarang.

Unaenah, E., Istikharah, M., R, N., & Heruni, Q. (2023). ANALYSIS OF THE PROBLEM SOLVING METHOD ABILITY IN THE SUBJECT OF PLANE GEOMETRY FOR 6TH GRADE ELEMENTARY SCHOOL. *International Journal On Advanced Technology, Enginering, and Information System (IJATEIS)*, 99-105.