

Analysis of Junior High School Students' Mathematical Problem Solving Ability on SPLDV Material

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ABSTRACT

This study aims to analyze the problem-solving ability of junior high school students in solving the Two-Variable Linear Equation System (SLSE) based on Polya's problem-solving stages. The subjects of this study were grade VIII students at SMP Negeri 2 Cilongok. The research method used was descriptive qualitative with instruments in the form of problem-solving tests and interviews. The results showed that students' problem-solving abilities varied, with most students having difficulty at the stage of understanding the problem and re-checking the solutions obtained. Factors that influence students' difficulties include low understanding of the basic concepts of SLSE and inadequate arithmetic operations. The recommendation in this study is the importance of implementing problem-solving-based learning methods to improve students' abilities.

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1. INTRODUCTION

Mathematics is one of the subjects that plays an important role in developing students' logical, critical, and creative thinking skills (Dalimunthe & Ariani, 2023). One of the materials in the junior high school mathematics curriculum that is directly related to everyday life is the Two-Variable Linear Equation System (SPLDV) (Muharomi & Afriansyah, 2022). This material emphasizes students' ability to understand the relationship between two variables, construct mathematical models of contextual problems, and find solutions using appropriate methods.

According to the National Council of Teacher Mathematics or NCTM in (Sarwoedi, Marinka, Febriani, & Wirne, 2018) there are five competencies in mathematics learning, namely: mathematical problem solving, mathematical communication, mathematical reasoning, mathematical connections, and mathematical representation. One of the things that must be considered from these five competencies is problem-solving skills. Polya in (Nuraini, 2019) defines problem solving as an effort to find a way out of a difficulty in order to achieve a goal that is not so easy to achieve.

Mathematics learning in schools is studied from elementary school to college to realize the goals of mathematics learning. The objectives of mathematics learning in the copy of the Junior High School/MTs Subject Syllabus. Permendiknas No. 22 of 2013 states that the goal of junior high school mathematics is for students to be able to understand mathematical problems which include the ability to understand problems, design mathematical models, solve and interpret the models obtained. Holmes in (Nuraini, 2019) states that a

person needs to learn to solve mathematical problems so that they are able to compete with their life needs, become more productive workers, and understand complex issues related to the global community.

Problem-solving skills are not only the goal of mathematics learning in junior high school but the heart of mathematics because they have an important role and are basic abilities in learning mathematics. According to (E.S, 2015) problem solving is a process or individual effort to respond to or overcome obstacles or constraints when an answer or answer method is not yet clear. Through the problem-solving process, students can develop their critical thinking skills.

In the SPLDV learning process, problem-solving skills are very important skills (Rahayu & Afriansyah, 2015). According to Polya, problem solving involves four stages, namely understanding the problem, planning a solution, implementing the plan, and re-checking. These four stages require students to not only master the SPLDV concept but also be able to think systematically in solving a problem.

However, in reality, students' problem-solving abilities are still relatively low (Nurul Fadilah & Haerudin, 2022). Based on initial observations, many students have difficulty understanding SPLDV questions in the form of contextual problems. Students tend to only memorize procedural steps without really understanding the basic concepts of SPLDV. In addition, other factors such as low arithmetic operations skills, lack of problem-solving practice questions, and lack of learning motivation also affect students' ability to solve SPLDV (Hasil et al., 2022).

This low problem-solving ability is a challenge for teachers in developing effective and innovative learning. Learning that only focuses on providing examples of questions and routine exercises is often not enough to train students to think critically and solve real problems (Nugraha & Mahmudi, 2015). Therefore, an analysis of students' problem-solving abilities in solving SPLDV problems needs to be carried out to determine the extent of students' understanding and skills in solving these problems.

Through this study, it is hoped that students' abilities in solving SPLDV based on Polya's problem-solving stages (Rofi'ah et al., 2019) can be identified, as well as identifying factors that influence students' difficulties. The results of this study can later be used as a reference in improving the mathematics learning process to be more effective, creative, and able to improve students' problem-solving abilities.

2. METHOD

The type of research used is qualitative descriptive research. Research using this method aims to describe the conditions that occur during the learning process on the material of two-variable linear equation systems. The instrument used is a problem-solving ability test in the form of 3 essay questions. The data collection technique for the mathematics problem-solving ability score according to Arikunto in (Suci Ariani, 2017) The population in this study were grade VIII students of SMP Negeri 2 Cilongok. The sampling technique used the purposive sampling method, namely selecting subjects based on certain criteria that are relevant to the research objectives (Subhaktiyasa, 2024). The number of participants consisted of 6 students, who were grouped into three ability categories based on the results of the initial evaluation: students with High Ability, Medium Ability, and Low Ability, each consisting of 2 people.

The instrument used in this study contains 3 questions related to SPLDV material that measures students' problem-solving abilities. The questions have been validated by two mathematics education experts to ensure the validity of the content and reliability of the instrument.

Table 1. Problem Solving Ability Scoring Indicators

Rated aspect	Reaction to Questions	Skor
Understandig the Problem	No answer at all	0
	Writing known/asked/sketch/model but	1
	wrong or not understanding the problem at all	2
	Understanding information or problem inaccurately/completely	3
Develop a resolution plan	There is no sequence of completion steps at all	0
	Strategy/solution steps exist but are not relevant	1

	Strategy/solution steps lead to a correct but incomplete answer or wrong answer	2
	Presenting the correct solution steps	3
Completing the settlement plan	There is no resolution at all	0
	There is a solution, but the procedure is unclear/wrong	1
	Using certain procedures is correct but	2
	Incorrect/incomplete calculations	3
Check again	If you do not write a conclusion and do not re-check the process and results answer	0
	If you write a conclusion and/or check the process incorrectly Or	1
	If you only write a conclusion or check the process correctly	2

So based on the references above, researchers can provide an assessment of student work results and can be scored well.

The research procedure was carried out through several stages. In the preparation stage, the research instrument was prepared in the form of questions, interview guidelines, and observation sheets, as well as instrument validation tests by mathematics education experts. Furthermore, research participants were determined based on the results of the initial evaluation. In the implementation stage, students were asked to complete SPLDV questions within 60 minutes. The students' work process was observed and recorded to see the strategies used. The data collection stage was carried out by collecting students' answers to be analyzed based on problem-solving indicators, namely understanding the problem, planning a solution, and implementing the plan, as well as the results of observations recorded in the form of descriptions.

Data analysis was carried out using the Miles and Huberman (2014) method, which includes three stages (1) Data Reduction: Sorting data based on ability categories (high, medium, low) and focusing on three aspects: understanding the problem, planning a solution, and implementing the plan. (2) Data Presentation: Presenting data in the form of tables and descriptive narratives to describe students' abilities in each category. (3) Conclusion Drawing: Drawing conclusions based on students' mathematical problem-solving ability patterns.

This study has limitations due to the small sample size, so the results of the study cannot be generalized widely. In addition, this study only focuses on data presentation materials, so it does not cover mathematical representations in other materials.

3. RESULT AND DISCUSSION

The results of this study are the scores obtained by students on the essay test on mathematical problem solving abilities given to grade VIII students and 6 students were taken as research samples. The test results of this study are as follows:

Table 2: Results of Student Problem Solving Ability Assessment

Student Name	Ability	Understanding the Problem (Score)	Develop a resolution plan (Score)	Completing the settlement plan (Score)	Check again	Total score
Camelia	Tall	4	4	4	4	16
Aila Azra A	Tall	4	4	4	4	16

Student Name	Ability	Understanding the Problem (Score)	Develop a resolution plan (Score)	Completing the settlement plan (Score)	Check again	Total score
Felina Syeril	Medium	3	3	3	3	12
Ikbali Adi Muzaki	Medium	3	3	3	3	12
Yusuf Meru	Low	1	1	1	1	4
Decha Lorian	Low	1	1	1	1	4

Note: Scores are calculated based on the criteria of understanding the problem, planning a solution, implementing the plan, and re-checking. The maximum score per category is 4, with a maximum total of 16.

4. CONCLUSION

This study shows that the mathematical problem-solving ability of students in the high category is much better than that of students in the medium and low categories. Students with high ability are able to understand problems, plan solutions, implement plans, and recheck answers to questions well, while students with low ability have difficulty using the three forms of representation. More contextual and representation-based learning is needed to help students develop these abilities, especially for students with medium and low abilities.

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Hopefully this research can provide useful contributions in the development of mathematics learning, especially in the aspect of students' mathematical representation.

REFERENCES

- Dalimunthe, A., & Ariani, N. (2023). Peningkatan Kemampuan Berpikir Kritis Matematis Siswa melalui Model Pembelajaran Missouri Mathematics Project. *Jurnal Basicedu*, 7(1), 1023–1031. <https://doi.org/10.31004/basicedu.v7i1.4812>
- Hasil, P., Siswa, B., Model, M., Kontekstual, P., Setting, D., & Ramli, H. (2022). 209-Hasil Penelitian-257-1-10-20221006. 8(September).
- Kase, F. M. Y., Nesti, R. D. H., Senid, P. P., Senia, M. E., & Djawa, R. (2021). Analisis Kesulitan Siswa Berdasarkan Kemampuan Pemahaman Matematis dalam Menyelesaikan Soal Cerita Pada Materi FPB dan KPK. *Fraktal: Jurnal Matematika Dan Pendidikan Matematika*, 2(2), 29–42. <https://doi.org/10.35508/fractal.v2i2.5638>
- Muharomi, L. T., & Afriansyah, E. A. (2022). Kemampuan Koneksi Matematis dan Kemandirian Belajar Siswa pada Materi Sistem Persamaan Linear Dua Variabel. *Leibniz: Jurnal Matematika*, 2(2), 45–64. <https://doi.org/10.59632/leibniz.v2i2.174>
- Nugraha, T. S., & Mahmudi, A. (2015). Keefektifan Pembelajaran Berbasis Masalah Dan Problem Posing. *PYTHAGORAS: Jurnal Pendidikan Matematika*, 2(1), 107–120.
- Nurul Fadilah, A., & Haerudin. (2022). Analisis Kemampuan Pemecahan Masalah Matematis Siswa Kelas IX pada Materi SPLDV Berdasarkan Tahapan Polya. *Jurnal Pembelajaran Matematika Inovatif*, 5(4), 1049–1060. <https://doi.org/10.22460/jpmi.v5i4.1049-1060>

- Rahayu, D. V., & Afriansyah, E. A. (2015). Meningkatkan Kemampuan Pemecahan Masalah Matematik Siswa Melalui Model Pembelajaran Pelangi Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, 4(1), 29–37. <https://doi.org/10.31980/mosharafa.v4i1.326>
- Rofi'ah, N., Ansori, H., & Mawaddah, S. (2019). Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Cerita Matematika Berdasarkan Langkah Penyelesaian Polya. *EDU-MAT: Jurnal Pendidikan Matematika*, 7(2), 120. <https://doi.org/10.20527/edumat.v7i2.7379>
- Subhaktiyasa, P. G. (2024). *Menentukan Populasi dan Sampel : Pendekatan Metodologi Penelitian Kuantitatif dan Kualitatif*. 9, 2721–2731.
- Sarwoedi, S., Marinka, D. O., Febriani, P., & Wirne, I. N. (2018). The effectiveness of ethnomathematics in improving students' mathematical understanding abilities. *Rafflesia Journal of Mathematics Education*, 3(2), 171-176.
- Nuraini, F., & Novitaningtyas, I. (2022). Pengaruh harga dan kualitas pelayanan terhadap keputusan pembelian pada Mie Gacoan Cabang Magelang. *Jurnal Nasional Manajemen Pemasaran & SDM*, 3(2), 50-57.
- Albiger, B., Glasner, C., Struelens, M. J., Grundmann, H., & Monnet, D. L. (2015). Carbapenemase-producing Enterobacteriaceae in Europe: assessment by national experts from 38 countries, May 2015. *Eurosurveillance*, 20(45), 30062.
- Rahayu, V. D., & Afriansyah, A. E. (2015). Improving Students' Mathematical Problem Solving Ability through the Rainbow Mathematics Learning