

Analysis of Mathematical Problem Solving Ability of Junior High School Students on Relation & Function Material with Polya's Strategy

Erva Erviana¹, Yunika Lestaria Ningsih², Putri Fitriarsari³

¹Universitas PGRI Palembang, Indonesia

Email: ervaerviana2403@gmail.com

² Universitas PGRI Palembang, Indonesia

Email: yunikaletari@univpgri-palembang.ac.id

³ Universitas PGRI Palembang, Indonesia

Email: putrifitriarsari20@gmail.com

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Abstract

This research aims to describe the mathematical problem solving skills of junior high school students in relationship materials and functions with Polya strategy. The method used in research is a qualitative descriptive method. This research was conducted at SMP Negeri 35 Palembang with a class XI.6 research sample of 30 people. The research subjects were taken by 6 students, who were grouped into three categories, namely high, medium and low who were taken 2 people each from each category.. The data collection techniques in this study are tests, interviews and documentation. The results of the data obtained are then analyzed using data reduction analysis techniques, data presentation and verification. So the results of the study show that: 1) students who have high category problem solving skills are able to carry out all stages of problem solving, 2) students who have problem solving skills category are able to carry out the problem solving stages of the problem, but at the stage of carrying out planning and problem solving students make mistakes in operation and are not able to perform the stage of planning the answer correctly, 3) students who have low category problem solving skills are only able to carry out one stage that is understanding the problem and not being able to carry out the stage of planning the solving strategy planning and troubleshooting and re-examining the answers obtained correctly.

Keywords: Problem Solving Capabilities, Polya Strategies, Relationships & Functions

INTRODUCTION

One of the objectives of learning mathematics lies in problem solving (Latif & Akib, 2016). Problem solving is a basic skill in learning mathematics (Jumroh, Mulbasari and Fitriarsari, 2018). According to Roebyanto and Harmini (2017: 16) solving mathematical problems is an attempt to find ways to solve mathematical problems based on mathematical concepts, skills and processes. In the process of solving mathematical problems, students are encouraged to determine solutions and develop different strategies in solving a problem (Winarti, Waluya, Rochmad & Kartono, 2019). One of the strategies that can be used in solving mathematical problems is Polya's strategy which includes understanding problems, determining problem solving strategies, implementing strategies in solving problems, and checking answers again. (Nurkaeti, 2018). According to Masrurotullaily, Hobri and Suharto (2013) in their research, the ability of students of SMK Negeri 6 Jember on the subject of financial mathematics based on Polya's strategy found that there were 52, 97% high-ability students, 15.87% medium-ability students and 30.16% low-ability students. However, in reality the students' ability in solving mathematical problems is very low, this can be seen from the results of the 2015 TIMSS survey (Trend in International Mathematics and Sciences Study) published by the Ministry of Education and Culture, which states that in the field of mathematics Indonesia is ranked 45th out of 50 countries with the average score of participants who were at the low level was 397.

In line with the results of observations and observations of researchers during the Field Practice (PPL),

the daily math test scores of students in the odd semester of the 2018/2019 academic year in class VIII.8 of SMP Negeri 35 Palembang. Students' ability in solving mathematical problems is still low, especially in relation to material and functions. Relation and function material is one of the materials studied in mathematics learning at the junior high school level (Suhartati, 2016). It can be seen from the results of daily tests of relations and functions, there are 50% of students who have not reached the minimum completeness of the KKM 70. Based on this, the authors want to know the extent to which the level of problem solving abilities of junior high school students in relation material and functions in solving problems according to Polya's strategy

RESEARCH METHODS

The method used in this research is qualitative research using descriptive analysis method. This study will describe the facts related to students' mathematical problem solving abilities with Polya's strategy based on the aspects of understanding problems, planning problem-solving strategies, implementing planning and problem solving, and checking the answers obtained. Data collection techniques in this study were tests, interviews and documentation.

This research was conducted at SMP Negeri 35 Palembang in August, with a research sample of class IX.6 totaling 30 people. The subjects in this study were 6 students taken from three categories of students who have high, medium and high category mathematical problem solving abilities. low selected by purposive sampling technique. From the subject of this study, students' answers will be analyzed with analysis techniques which include data reduction, data presentation and verification.

RESULT AND DISCUSSION

The research was conducted on students of class IX.6 SMP Negeri 35 Palembang which consisted of 30 students. Students who are the research sample are given a written test of their ability to solve problems in relation to material and functions based on the Polya stages which include the stages of understanding the problem, planning problem solving strategies, implementing problem-solving plans and checking the answers obtained.

Based on the results of the study, it was found that the students' problem-solving abilities in working on the matter of relations and functions with the Polya strategy were: The number of students who obtained interval scores of 76-100 or met the high category was 6 students or 23.33%, who obtained interval scores 61-75 or included in the moderate category were as many as 9 students or 30.00% and those who obtained scores at the interval 0-60 or included in the low category were 19 people or 46.67%.

From each of these categories, 1 student was taken based on each high, medium and low category, then the research subjects were interviewed about the test. After all data were concluded, data triangulation was carried out. Following are the results of the analysis of the subjects representing each category.

Analysis of Problem Number 1

Question number 1: When Arda comes home from school, Huri, Mika and Nia talk about their free time to practice playing pianica together. Arda can practice Monday, Tuesday and Friday. Huri can't practice Tuesday, Wednesday, Saturday. Mika must be at home on Monday and Thursday. Nia can practice Monday, Tuesday and Friday. And none of them can practice on Sundays. On what day can Arda, Huri, Mika and Nia train together?

1a. Dik: - Arda dapat berlatih hari Senin, Selasa, dan Jumat
 - Huri tidak dapat berlatih hari Selasa, Rabu, Sabtu
 - Mika harus dirumah pada hari Senin dan Kamis
 - Nia dapat berlatih hari Senin, Selasa, dan Jumat
 - Dan dari mereka tidak ada satu pun yang dapat berlatih di hari Minggu

b. Dengan cara mengurutkannya dalam bentuk diagram Panah

c. Dik: A = {Arda, Huri, Mika, Nia} B = {Senin, Selasa, Rabu, Kamis, Jumat, Sabtu, Minggu} Dapat berlatih Tidak dapat berlatih

A	B
Arda	Senin
Arda	Selasa
Arda	Jumat
Huri	Senin
Huri	Selasa
Huri	Rabu
Huri	Kamis
Huri	Jumat
Huri	Sabtu
Huri	Minggu
Mika	Senin
Mika	Kamis
Nia	Senin
Nia	Selasa
Nia	Jumat

Dari keterangan diatas menunjukkan bahwa mereka dapat berlatih pada hari "Jumat"

d. Pendapat yang benar adalah Pendapat Siska

Nama	Hari						
	Senin	Selasa	Rabu	Kamis	Jumat	Sabtu	Minggu
Arda	✓	✓	✓	✓	✓	✓	✓
Huri	✓	✓	✓	✓	✓	✓	✓
Mika	✓	✓	✓	✓	✓	✓	✓
Nia	✓	✓	✓	✓	✓	✓	✓

Dari tabel diatas menunjukkan pada hari Jumat mereka dapat berlatih. Permainan bersama karena mereka memiliki waktu luang untuk berlatih. Permainan bersama

Students in the high category can carry out the stages of understanding the problem, at the stage of planning problem-solving strategies only answer with one strategy even though in question 1 it is asked with two problem-solving strategies, namely with arrow diagrams and sequential pairs. At the stage of carrying out planning and problem solving and checking the answers obtained, students can go through it.

1. Arda → Senin
 Huri → Selasa
 Mika → Rabu
 Nia → Kamis
 Arda → Jumat
 Huri → Sabtu
 Mika → Minggu
 Nia → Senin

a. Arda bisa hari = Senin, Selasa, dan Jumat.
 Huri tidak bisa hari = Selasa, Rabu, dan Sabtu
 Mika harus dirumah = Senin dan Kamis
 Nia bisa hari = Senin, Selasa, dan Jumat.

b. Menggunakan diagram Panah jika semua menunjukkan jam yg sama maka pada hari itu lah mereka bisa bermain latihan Pianika.

c. Hari Jumat.

d. Pendapat siska yg benar = hari Jumat, karena Huri dan nia tidak bisa hari Selasa.

Based on the results of written test answers and interviews on the first question students can carry out the problem solving stage, namely the stage of understanding the problem by writing down what is known from the questions, the stages of planning problem solving strategies students only use 1 method, they should write 2 ways to solve the problem, namely with the arrow diagram and consecutive pairs, at the planning stage the students should make an arrow diagram instead of directly determining the day and at the problem solving stage and checking the answers of students not writing down the reasons correctly and not looking for other ways to check answers.

Analysis of Problem Number 2

Question Number 2: Toni saved money in the bank with an initial savings of Rp. 750,000.00. If Toni regularly saves every month with the same amount as the initial savings and every month gets an interest of Rp. 2,000.00. So how much is Toni's savings in the 8th month?

Student I answer:

2. a. Diketahui : tabungan awal : Rp 750.000,00
 Bunga : Rp 2.000,00
 ditanya : jumlah tabungan pada bulan ke-8 ?

b. Cara mencarinya : tabungan awal \times bulan + bunga \times bulan
 $f(n) : 750.000,00 \times 8 + 2.000,00 \times 8$

c. $f(8) = 750.000(8) + 2.000(8)$
 $= 6.000.000 + 16.000$
 $= 6.016.000$

d. Pendapat yang benar adalah Pendapat Amar karena jumlah uang tabungan Toni pada bulan ke 8 adalah Rp 6.016.000,00

Based on the results of written test answers and interviews on the two questions, the S-08 subject can carry out the stages of understanding the problem, the stages of planning problem-solving strategies, the stages of implementing planning and problem solving and checking the answers according to the concept of relations and functions

Student II answer:

2. a. Toni menabung uang di bank dengan tabungan awal Rp 750.000,00
 mendapatkan bunga setiap bulannya sebesar 2.000,00

b. dengan cara $= 750.000,00 \times 8 + 2$
 $= 6.002.000$

c. 6.002.000

d. Zela, karena jumlah tabungan Toni adalah 6.002.000,00

Based on the results of written test answers and interviews on the two questions, the S-30 subject can carry out the stages of understanding the problem correctly in their own sentences. S-30 is not able to determine the problem solving strategy appropriately so that at the stage of implementing problem solving planning and checking the answers again it also gets incorrect results

Student III answer:

2. Toni = tabungan awal Rp 750.000 = a
 bunga = Rp 2.000
 S8 = ?

a. jumlah tabungan dan bunga

b. Rumus : $Sn = n \{ 2a + (n-1)b \}$
 $Sn = \frac{n}{2} \{ 2 \cdot \text{Rp } 750.000 + (8-1) \text{ Rp } 2.000 \}$
 $= 4 \cdot \{ 1.500.000 + 14.000 \}$

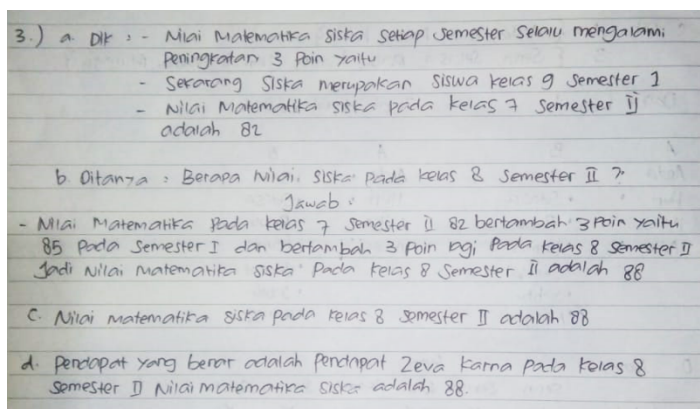
Based on the results of written test answers and interviews on the second question, at the stage of understanding the S-17 problem, you can write down what is known and asked from the questions correctly. at the stage of planning a problem-solving strategy S-17 chose an incorrect strategy so that the answer was wrong. At the stage of implementing planning and problem solving and checking the answers obtained by S-17, it did not carry out.

Analysis of Problem Number 3

Question number 3: Siska's math score every semester always increases by 3 points. Now, Siska is a

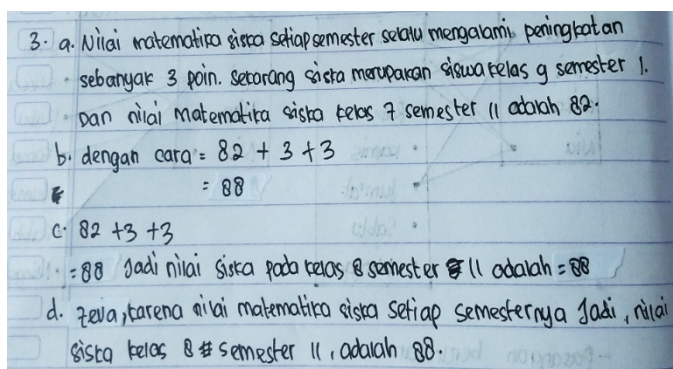
grade 9 student in semester I. If Siska's math score in grade 7 in semester II is 82, then how much is Siska's grade in grade 8 in semester II?

Student I answer:



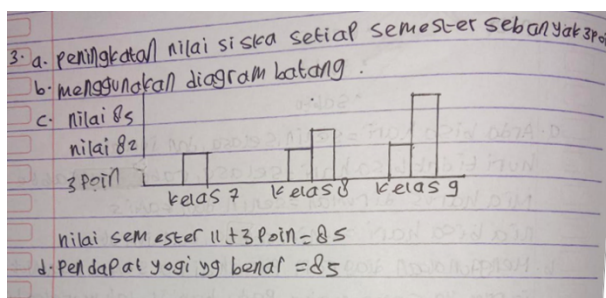
Based on the results of written test answers and interviews on the third question, the S-08 subject can carry out the stages of understanding the problem, the stages of planning problem-solving strategies even though they do not use the concept of function. At the stage of implementing the problem solving plan S-08 did not do it clearly because there was no clear way from where to get the results 88 and S-08 also did not check the answer correctly.

Student II answer:



Based on the results of written test answers and interview questions, the three S-30 subjects can carry out the stages of understanding the problem, the stages of planning problem-solving strategies, implementing planning and solving problems correctly. But the S-30 did not check the answer correctly because it did not write down the reasons why Zela chose Zela's opinion

Student III answer:



Based on the results of written tests and interviews, the S-02 subject was unable to carry out the stages of understanding the problem, determining problem-solving strategies, carrying out problem-solving plans and checking the answers correctly in accordance with the concept of function. This is because students do not understand the concept of function material at all

CONCLUSION AND SUGGESTION

Based on the description of the results of the analysis and discussion above, it can be concluded that the mathematical problem solving abilities of junior high school students in relation and function materials are divided into 3 categories, namely high category mathematical problem solving ability, medium category mathematical problem solving ability and low category mathematical problem solving ability. Students who have high category mathematical problem solving skills are 7 students or 23.33%. There are 9 students who have the ability to solve mathematical categories or as much as 30.00%. There are 14 people or as many as 46.67% of students who mean the ability to solve mathematical problems in the low category.

Suggestion to Teacher, Due to the lack of students' ability to operate the planned strategy and they cannot check the answers they get. Therefore the teacher must pay more attention to students' abilities at this stage. Schools are expected to provide support in improving students' mathematical problem solving abilities by facilitating and holding deliberations with mathematics subject teachers to develop problems related to problem solving. Researchers need to carry out further research on high, medium and low level schools with different material on students' mathematical problem solving abilities so that they can be used as a comparison in improving mathematics learning and the quality of education.

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