ANALYSIS OF STUDENT'S ERROR IN PROBLEM-SOLVING ON THE SOCIAL ARITHMETIC MATERIAL

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ABSTRACT

Based on the author's observation, many students have difficulty in solving the story problem. This study aims to determine student errors and the causes of student error using the Polya method. Polya error analysis is a method used to analyze mistakes made by students with four stages. This research is qualitative research with a type of descriptive research. This research is the students of class VII-B State Junior High School (SMP N) 5 Banguntapan Bantul. The object of this research is the student's mistake in solving the problem based on Polya. Data collection techniques in this research are problem-solving and interview. According to Miles and Huberman, data analysis techniques using data analysis, namely data reduction, data presentation, and conclusion. The results showed that the types of students' mistakes made by the research subjects on solving problem question of social arithmetic form were 50% misconceptions, 65% for made a settlement plan, 70% for executed a settlement plan, and reviewed the process and results by 65%. The most common mistake is at the stage for executed a settlement plan. Factors that cause errors are made because students are not careful in problem-solving.
Keywords: Student Error, Polya, Problem about Arithmetic Social story.

INTRODUCTION

Education is one of the most important and indispensable things in social life. Education in carrying out its functions always hopes to form quality human resources in the face of development in an era full of challenges and competition. Mathematical knowledge is one of the fields of study taught since primary education students have a considerable influence and role in other fields of study. Mathematical learning can be used to solve problems in various aspects of life. To gain the ability to solve problems, one must have much experience in solving various problems.

From the results of interviews with one of the mathematics subjects in SMP N 5 Banguntapan, it was found that the ability of students who were considered to be still low was the ability of students to solve mathematical story problems. The researcher obtained information that most students could not understand the questions, could not apply mathematical formulas, were not careful in working on the problems, and could not solve mathematical problems according to the problem-solving procedure. Thus it means that a series of errors can occur so that systematic steps are needed so that the settlement process is directed, one of which is the problem-solving step, according to Polya.

Polya, G (1973: xvi) sets four steps that can be taken to focus on solving mathematical problems, namely understanding the problem, devising the plan, carrying out the plan, and looking back. According to Suherman, Erman, et al. (2003: 91), the four steps of the settlement phase according to Polya, namely understanding the problem, planning the solution, resolving the problem according to plan, and re-checking all the steps worked. Understanding the problem (understanding the problem), students write what is known and asked (Marlina, Leni, 2013: 51). In making a plan (devising plan), students make strategies or determine how to solve problems. In carrying out the plan (carrying out the plan), students work on problems in a predetermined way. In checking back (looking back) on his work, students have re-checked his work's truth at every step with the desired problem. According to Rahim, Abdul (2016: 184), there are several factors causing errors based on the steps to solve a story problem, including mistakes in understanding the problem, mistakes in making mathematical models, mistakes in making calculations, and mistakes in concluding. Factors causing errors include mistakes in understanding problems, making mathematical models, errors in calculations, and concluding errors.

Therefore, knowing the types and factors that cause students' mistakes in solving social arithmetic material problems, it is hoped that this can minimize the same mistakes and make students more careful in solving story problems.

METHODS

This research is qualitative research with a descriptive research type. This study's subjects were students of class VII-B SMP N 5 Banguntapan Bantul consisting of 30 students. The object of his research was the students' mistake in solving problems based on Polya. Data collection techniques in this study in the form of problem-solving tests and interviews. As for knowing the validity of the data, researchers used triangulation techniques. According to Miles and Huberman, data analysis using data analysis, namely data reduction, data presentation, and concluding.

RESULTS AND DISCUSSION

The selection of the subject of this study was based on the purposive sampling technique. According to Sugiyono (2017: 300), purposive sampling is the technique of determining the data source sample with specific considerations. For example, this particular consideration is the person who is considered to know what we expect or maybe he as a ruler to be more comfortable for researchers to explore the object or situation under study. Alternatively, in other words, sampling is taken based on research needs. The following are the results of a written test for class VII B students conducted in March 2018.

Table 1. List of Grade VII Mathematics Test B

No	Students Code	Score
1	B-01	75
2	B-02	26,6
3	B-03	51,6
4	B-04	66,6
5	B-05	55
6	B-06	75
7	B-07	61,6
8	B-08	50
9	B-09	56,6
10	B-10	50
11	B-11	55
12	B-12	56,6
13	B-13	51,6
14	B-14	48,3
15	B-15	56,6
16	B-16	51,6
17	B-17	81,6
18	B-18	58,3
19	B-19	55
20	B-20	61,6
21	B-21	68,3
22	B-22	68,3
23	B-23	31,6
24	B-24	75
25	B-25	60
26	B-26	56,6
27	B-27	56,6
28	B-28	51,6
29	B-29	81,6
30	B-30	71,6

Based on the Table 1, the researcher took the research subject based on the lowest test scores obtained while working on the questions. So the researchers chose subjects B02 for study 1, B14 for study 2, and B23 for study 3. The three students were chosen to be the subject of interviews based on making many mistakes based on their results.

From the results of tests and interviews in question number 1 at the stage of understanding the problem, some subjects experienced errors in mentioning what was known and asked in the questions and did not write the unit of currency on each answer result because of lack of accuracy. Figure 1 shows examples of errors on the answer sheet by subject B23.

Figure 1. Answers from Subjek B23

From the results of tests and interviews in question number 2 at the stage of planning the problem-solving problem, a subject did not write down the formula because of forgetting. Figure 2 shows examples of errors on the answer sheet made by subject B02.
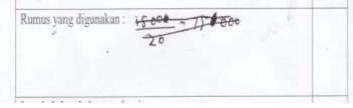

Figure 2. Answers from Subjek B02

From the results of tests and interviews in question number 3 at the stage of implementing the problem-solving plan, some subjects can solve it. However, the subject has difficulty in changing the answers to percentages. Figure 3 shows errors on the answer sheet made by subject B14.

Figure 3. Answers from Subjek B14 for number 3

From the results of tests and interviews in question number 4 at the stage of implementing the problem-solving plan, some subjects experienced errors due to lack of accuracy. Figure 4 shows examples of errors on the answer sheet made by subject B14.
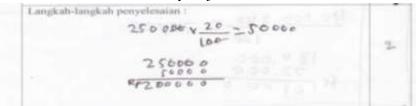

Figure 4. Answers from Subjek B14 for number 4

From the results of tests and interviews in question number 5 at the stage of checking the process, and the subject's results did not re-check the settlement results, some answers experienced errors.

At the stage of understanding the problem, the error that occurs this stage is that students can read the problem but cannot understand its purpose. In other words, students can not mention what is known and asked about the problem. Error in the stage of understanding the problem in the form of students' mistakes due to writing what is known but not quite right, not writing what is known, writing what is asked but not quite right, and not writing what is asked on the problem. This can occur because students are less careful and not careful in reading the questions. This is by research conducted by Hidayah, Shofia (2016: 189).

At the stage of compiling a settlement plan, errors often occur at this stage. Students can not write or mention the formula by the completion of the problem. Most students write incorrect formulas, and some students do not write the formulas used. This can occur because students rarely face problem-solving problems. The teacher gives more questions in the form of multiple choice and short content, less practice in working on questions in the form of stories, and difficulties in applying mathematical concepts in daily life. The mistake at this stage is when students cannot write down or mention a formula that is by the question request.

When carrying out a problem-solving plan, an error at this stage is when students cannot perform calculation steps correctly. However, errors can occur at this stage because of errors in determining the formula to prepare the problem-solving plan. This can occur because students are rarely given questions in the form of problem-solving problems. Besides that, students also lack an understanding of questions. They are not careful in knowing the purpose of the questions in their completion. As Pujisari's research results, Anisa & Rita (2016: 7) stated that students' lack of understanding of the concept makes students forget the formulas that should be used. Most students make mistakes in solving problems, especially in the writing unit and calculation section. This can occur because students are not accustomed to solving problems in order and meticulously.

When checking the process and results, errors at this stage occur when writing the final answer. Errors at this stage occur when students write down conclusions at the final answer stage. This happens because students are not thorough and are not used to checking answers. As Hidayah's research results, Shofia (2016: 188) states that this error occurs because students are not accustomed to re-checking the solutions he obtained. Table 2 shows the results of examining the subject's work when making a mistake based on Polya's method.

The error-implementing completion plan is the most massive error made by the subject from the table's data. As the results of Hidayah's research, Shofia (2016: 188) states that the most errors are found at the stage of implementing the completion plan because students do not carry out the plan according to the plans that have been prepared previously and students are not careful in doing mathematical calculations. At the stage of understanding the problem obtained the percentage of student errors by 50%. At the stage of making the problem-solving plan, the percentage of error is 65%. At the stage of implementing the problem-solving plan, the percentage of errors is 70%. At the stage of checking the process and the results obtained, an error percentage of 65%.

Table 2. Percentage of Mistakes Results in Subject Work

Subject	No Question	Troubleshooting Phase			
		TS 1	TS 2	TS 3	TS 4
B02	1	S	-	S	-
	2	S	S	S	S
	3	S	S	S	S
	4	S	S	S	S
	5	S	S	S	S
B14	1	-	S	S	S
	2	-	-	-	-
	3	-	S	S	S
	4	-	S	S	S
	5	-	S	S	S
B23	1	S	S	S	S
	2	S	S	S	S
	3	S	S	S	S
	4	S	S	S	S
	5	S	S	S	S
Amount		10	13	14	13
Percentage of Error		50%	65%	70%	65%

Information:

S is the subject of mistakes.

TS 1 is a mistake in understanding the problem.

TS 2 is a mistake in making a settlement plan.

TS 3 is a mistake in carrying out the settlement plan.

TS 4 is an error in checking the process and results.

CONCLUSION

According to Polya, this study aims to determine the types of errors and the causes of errors in solving problems on the subject matter of Social Arithmetic. Based on the results of research and discussion of chapter IV, the following conclusions can be drawn:

1. The types of mistakes made by research subjects as follows.
    a. Misunderstanding the problem: students do not write exactly what is known from the problem, do not write what is known in the problem, students write what is asked about the problem but not quite right, and students do not write what is asked about the problem. Percentage of errors understanding the problem by 50%.
    b. Errors in preparing problem-solving plans: students cannot determine the formula that is appropriate for the problem, students do not write the formula correctly, and students do not write the formula in the problem. Percentage of errors in preparing a problem-solving plan of 65%
    c. Errors in carrying out problem-solving plans: student errors in calculations and student errors do not write down the completion process. The percentage of errors in implementing the problem-solving plan is 70%.
    d. Student mistakes in checking again: students write the final answer but do not re-check, students write the final answer but do not match the contents of the problem, and students do not write the conclusions on the final answer and do not re-check. The percentage of errors in checking processes and results is 65%.
2. Factors causing students to make mistakes at each stage will be described as follows:

a. Stage of understanding the problem:
   1) Students are less careful in understanding the problem.
   2) Lack of student understanding of problem questions
   3) Lack of interest in reading students so that writing what is known and asked is not quite right.
b. Stage of preparing a problem-solving plan:
   1) Students are wrong in determining the formula.
   2) Students cannot find solutions to work on problems.
   3) Students forget or do not know the formula used.
   4) Students lack practice in working on the form of story problems.
c. Stage of implementing the problem-solving plan:
   1) Students are not thorough.
   2) Students cannot do calculations.
   3) Students lack practice in working on story problems.
d. Stage of checking the process and results:
   1) Students do not re-check the final answer before it is collected.
   2) Students cannot solve problems, so they do not write the final answer.

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