



Description of The Ability of Social Arithetical Stories by Study Problems by Students VIII SMP Reviewed from The Polya Stage

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Abstract

Every student in solving mathematical problems in the form of story problems has a unique solution. This uniqueness encourages research conducted to describe the problem-solving ability of social arithmetic stories by junior high school students from Polya stage. Stage Polya consists of understanding the problem, making plans, implementing plans and re-checking. The approach of this research is descriptive qualitative with subject as many as 3 students of class VIII SMP namely that each one student with different level of ability. The results show that high-ability students can go through all stages of Polya. Moderate students can only go through 3 stages namely, understand the problem, make plans and make plans. This student can not solve the problem correctly and there is an error in the calculation. Low-ability students can not pass through all stages Polya, because this student does not understand what is known and asked from the problem so that in the next stage can not be through it. It is expected that this research become one of the reference to optimize student problem solving abilities.

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INTRODUCTION

Mathematics is one of the subjects taught at every level of school, both elementary school (SD), junior high school (SMA), high school (SMA) until college. One of the goals of mathematics is to equip students with problem-solving skills. As stated in the Education Unit Level Curriculum (KTSP) states that to improve problem solving skills students need to develop problem-solving skills, create mathematical models, solve problems and interpret their solutions (MoNE, 2006). One of the mathematics learning that can train and develop student problem solving abilities is learning about the story (Rudtin, 2013). Problem solving material in social arithmetic is the material that there are various problems in the form of problem solving and presented the problem in the form of a story problem, which is a mathematical problem presented in sentence form and related to daily problems. According to Utomo (Ifanali, 2014) that math-shaped questions are difficult to solve, this is due to a lack of students' ability to defend problems, including the lack of students' ability to convert verbal sentences into mathematical models and the lack of ability to interpret mathematical solutions into real problems. Students must be able to understand concepts, use reasoning and be able to solve problems in learning mathematics.

The process of learning one student with another student is not the same, each student has a different way of understanding the material explanation, especially mathematics subject matter. So also in solving the problem of mathematics problems between students with one another different. Ifanali (2014) also states that each student has different intellectual abilities, this can be seen from the way students solve the given story. There are students who think that in solving the problem of math problems is difficult, this is because they do not understand the purpose of the matter. Nurhayati (2013) states that some obstacles faced by students is difficult to translate the textual language of mathematics into the everyday language used by the students themselves, the students feel still familiar with the scientific term of mathematics encountered in the problem, and students' ability to analyze the problem is still low, As well as difficult to translate the command of the story into the mathematical model so that it is wrong in solving it.

Problem solving in math problems requires systematics in its solution. Understanding on any problem math problem is very necessary, with understanding will facilitate students in solving mathematical problems. Tangio (2015) argues that one of the obstacles faced is that most students can not change the story given into the mathematical model. To improve the ability to solve mathematical problems, it is necessary to develop problem-solving skills, create mathematical models, solve problems and interpret the solutions.

According to Herman (2000), a problem usually contains a situation that encourages a person to solve it, but does not know directly what to do to solve it. Moursund (Lidinillah, 2008), said that a person is considered to have and face problems when facing 4 conditions, namely (1) Understand clearly the condition or situation that is happening. (2) Understand clearly the intended purpose. Have a variety of goals to solve problems and can lead to a single goal of completion. (3) Understand a set of resources that can be utilized to cope with situations that occur in accordance with the desired goals. This includes time, knowledge, skills, technology or certain goods. (4) Have the ability to use various resources to achieve goals.

Some scholars find several ways to solve mathematical problems, one of which is the problem-solving stage according to Polya. Polya finds practical steps and systematically arranged in solving problems so as to facilitate students in solving a mathematical problem. Polya (1973: xvi) sets out four steps in solving math problems from four steps, namely understanding the problem, devising a plan, carrying out the plan, and looking back. Polya step provides a well-organized framework that can help students in solving the story. In addition, according to John Dewey (in Harlinda, et al, 2014) steps in problem solving are problem-solving (Confront Problem), Diagnose or Define Problems, collecting multiple solutions (Inventory Several Solutions) and Test Consequences.

Based on the description above, the purpose of this research is to describe the problem solving ability in solving the arithmetic story problem by the students of class VIII SMP based on Polya stage.

METHODS

This research was conducted at Pangudi Luhur Junior High School Salatiga year 2016/2017. This type of research is qualitative research. Subject consisted of 3 students with criteria of high, medium and low ability students. Subject selection subjectively based on UAS grade VIII. The subject with the criteria to be studied can be seen in table 1.

Table 1. Subject Decision based on Semester Final Exam Results

Initials of Subject	UAS Score	Range of Score	Category of Mathematics Mastery
ST	92	76-92	High
SS	75	71-75	Medium
SR	70	55-74	Low

Data were collected from written tests, interviews, observations and documentation. Triangulation methods are used to obtain valid data. Each subject does two arithmetic material test questions about advantages and disadvantages, followed by an unstructured interview. The collected data were analyzed using Polya stages. The Polya stage indicator used to describe the three subjects can be seen in table 2.

Table 2. Indicators of Problems

Problem Solution	Explanation	Indicator
Understanding Problems	The way students receive information that is on the subject mentions or writes things that are known and asked. The student's way of sorting out important and unimportant information.	Students can recognize problems easily. The student rewrites the necessary information on the problem (can write down what is known from the problem). Understand what is being asked.
Making Plan	The way the students know the linkage between the information. The student's way of checking if all important information has been used.	Students can make problem-solving plans based on the questions asked.
Making Plan	Students can make correct solving steps. The student's way of checking each step of the settlement.	Students can work on the matter as planned. Students can solve the problem used with the correct results.
Rechecking	The way students do things back in different ways.	Students look again at the answer. Consistent in concluding the answer

Description done on student's answer from each stage of problem solving that has been done, either true or not true. The student's answer is the written answer on the answer sheet provided and the subject's answer during the interview.

RESULTS AND DISCUSSION

Description of Solving Problems by High Achiever

Subjects were given 2 related questions about the problem of loss and profit. The following explanation of the subject in solving the problem based on Polya steps.

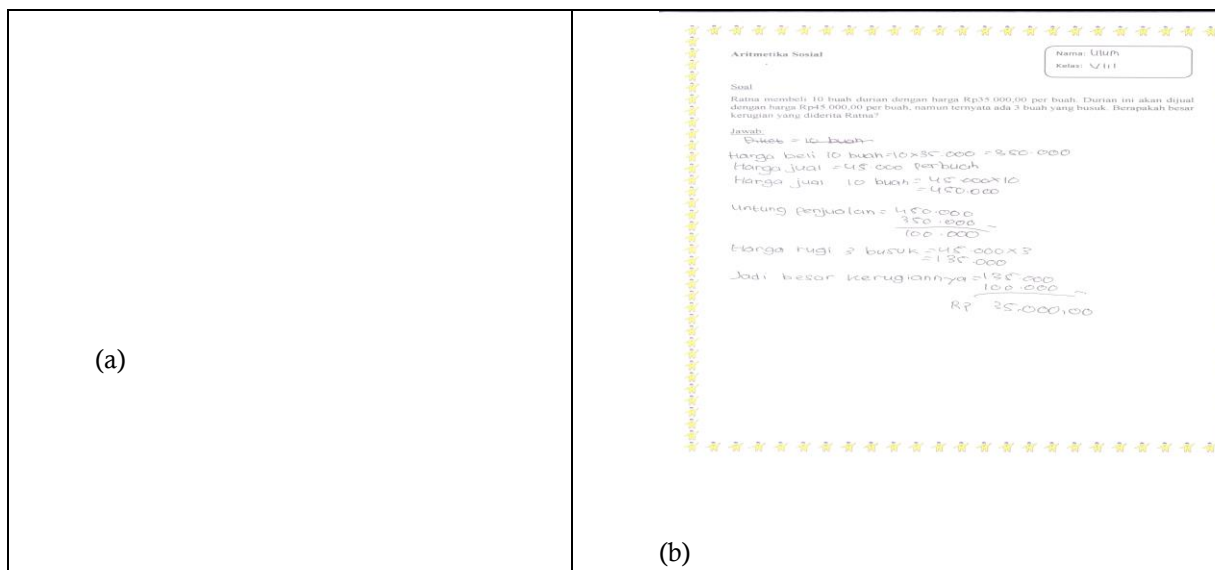


Figure 1. Results of ST written test a. Problem about Benefits, b. Problem about Disadvantage

Understanding Problem

The consistency of subject answers from written results and interview results. In both given questions, ST can understand the problem well that ST can write down what is known and what is asked. This can be seen in Figure 1. ST's understanding of the matter of profit and loss can be clarified by the interview conducted. According to ST is known from the problem is the number of fruits per kg and the price per kg. ST also explains what is asked of each question is how much profit and losses suffered.

From the explanation given by ST through interviews, it can be seen that ST is able to expose all sufficient terms and conditions necessary to work on the problem, that is to know what is known from the problem and can mention what is asked from the problem appropriately so that ST can be declared has gone through the stage of understanding problem.

Making Plan

After understanding the problem the next step is to plan for troubleshooting. The following is a proof of ST's work in making the problem-solving plan.

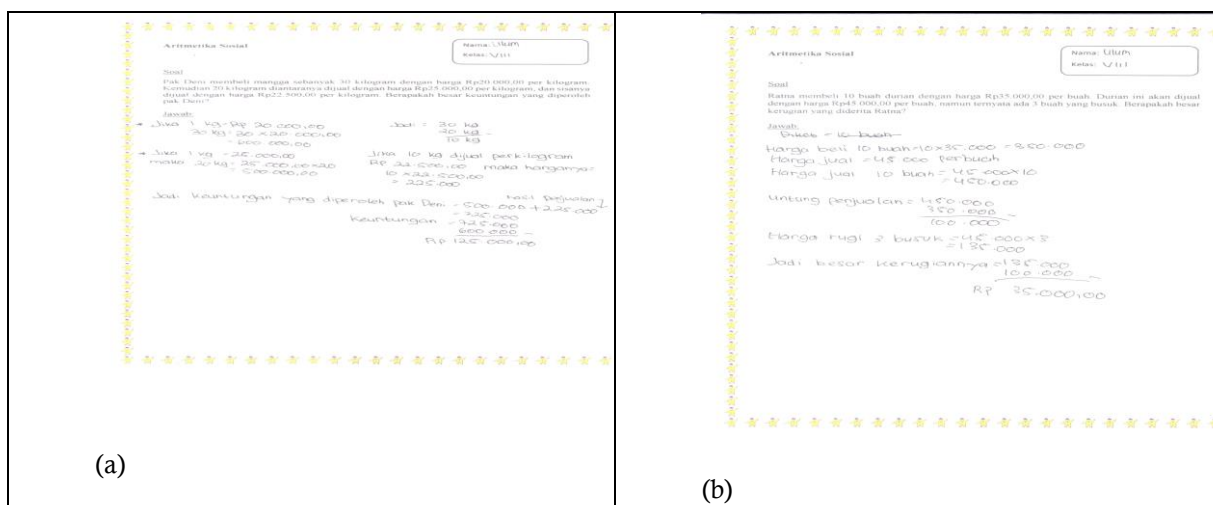


Figure 2. Results of ST Written Test on Planning to Solve Problem a. Problem about Benefits, b. Problem about Disadvantage

Based on figure 2 it can be seen that ST is able to plan problem solving by being able to know the relationship between what is known and asked. Explanation ST can be seen from the interview. When interviewed ST can know the connection between the known and the asked. According to ST the known price can be used to solve the problem.

Initially ST hesitate when giving statements related to the plan undertaken, but after the interview ST can explain the steps used in solving the problem well. Based on ST's work in writing and interview results, it is known that ST already knows the connection between what is known and asked and ST understands that what is known can be used to seek the benefits asked.

The next stage is the stage of doing a split plan. At this stage ST has solved the problem of social arithmetic correctly, and uses the steps coherently and produces the right answer. ST can be declared to have gone through the stage of doing the plan well. This can be proven from the results of interviews, according to ST is used correctly. First look for the price of 10 pieces, To find the purchase price of 10 pieces means 10 timesRp35.000 equal to Rp350.000 the selling price of Rp45.000 per fruit so the sale price of 10 fruit Rp45.000 multiplied 10 equal to Rp450.000 profit of sales equal to Rp450 Less Rp350,000 equal to Rp100,000 loss price 3 rotten Rp45.000 multiplied 3 equal to Rp135.000 so big losses Rp135.000 minus Rp100.000 equal to Rp35.000.

Based on ST's explanation through interviews, it appears that ST really understands the questions asked. This can be seen from ST's explanation of the steps taken while working on social arithmetic. ST knows the amount of fruit sold at each different price and ST also calculates what is asked from the given problem.

The last stage is the re-examination stage. ST did not write down the way to do the re-examination, only ST wrote the conclusions of the matter about profit. Results ST answers can be seen in the following figure.

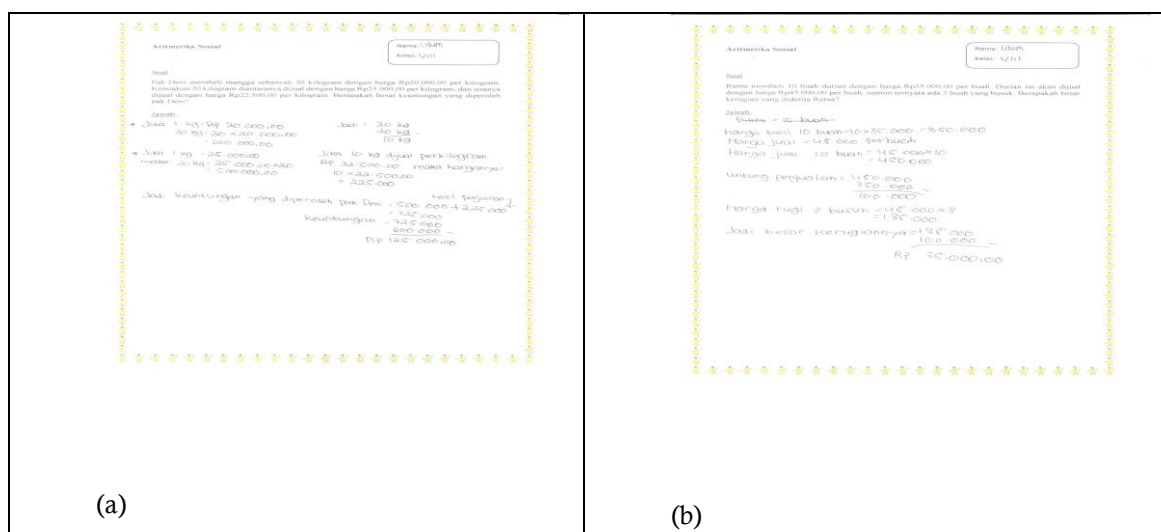


Figure 2. Results of ST Written Test on Rechecking a. Problem about Benefits, b. Problem about Disadvantage

Based on Figure 3, it appears that ST can work on the problem correctly and believe that the answer is correct. To find out more about how ST did check back then conducted a deep interview, ST explained that to check the answer ST read back and then corrected back the answer by way of recalculated.

ST in solving the problem has met all the indicators of problem solving based on polya stages that can mention all the information provided from the question so that it can be said that ST has gone through the stage of understanding the problem. In the second stage, ST has also met all the indicators in planning the problem solving proved by ST has a problem-solving plan and know the reasons for its use and able to use all the important information to solve the problem so that it can be said ST has gone through the stage

of preparing a problem-solving plan. The third stage is the stage of doing the problem-solving plan, the ST has met all the indicators that ST has solved all the problems provided with the correct results and using the appropriate troubleshooting steps. Thus ST can be said to have carried out the stage of doing a problem-solving plan based on Polya stage. In the last stage of the re-examination stage, ST does not write how to conduct a re-examination, but when the ST interviews do explain how to re-check. Thus ST can be said to have gone through the stage of re-checking the problem solving based on Polya stages.

Description of Problem Solving by Medium Achiever

Subjects are given 2 questions relating to the problem of profit and loss. The following explanation of the subject in solving the problem based on Polya steps.

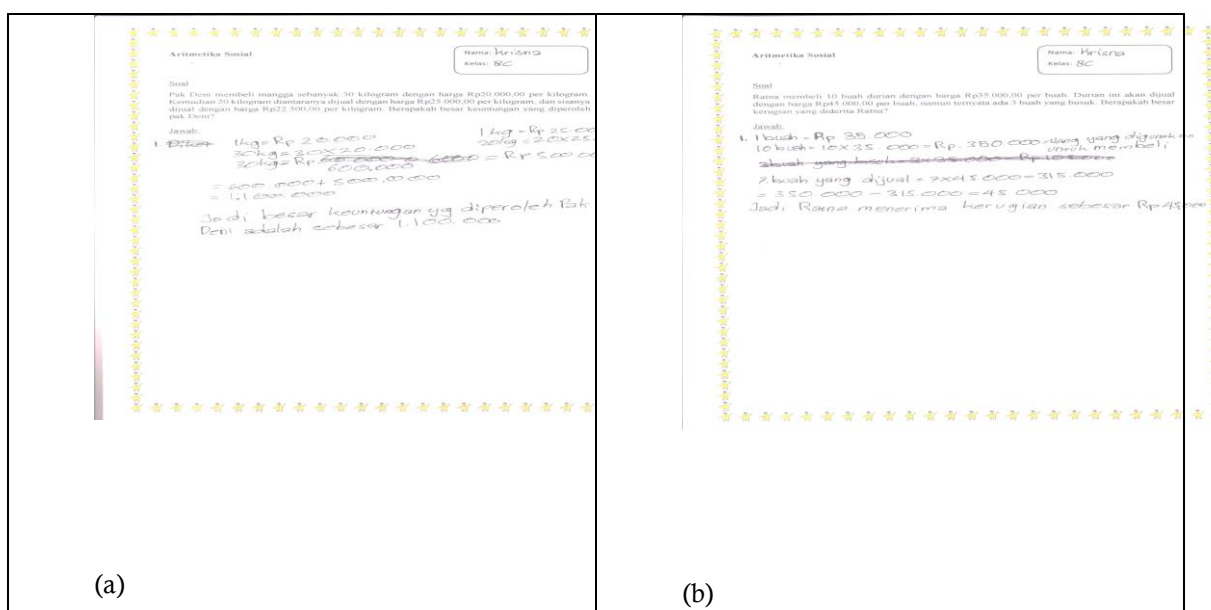


Figure 4. Results of SS Understanding Problems a. Problem about Benefits, b. Problem about Disadvantage

Understanding Problems

Based on Figure 4 it appears that the SS can understand the problem given this can be seen from the SS answers that write down what is known and asked of the question. To know the understanding of SS in depth then do the interview, according to SS known from problem (a) is 30 kg and with price of Rp20.000 kg then 20 kg of them resold with price Rp25.000 per kg and the rest sold with price Rp22.500 Per kg. While that is known from the problem (b) is Ratna buy 10 durian fruit at a price of Rp35.000 and sold at Rp45.000 but there is a rotten 3 pieces. SS also explained that from question (a) asked is how much profit obtained and problem (b) is how much loss suffered.

Based on the explanation of SS through interviews it appears that the SS is able to expose all sufficient terms and conditions necessary to work on the problem, and can mention what is known and that is asked from the problem appropriately so that SS can be declared to have gone through the stage of understanding the problem.

Planning

In writing the SS does not write in making a problem-solving plan, but after SS interviews can explain in making a problem-solving plan. According to the SS the number known is multiplied by each price per kg of fruit. Based on the SS description, it appears that the SS has been able to plan for problem solving. Thus it can be said that the SS can go through the planning phase of problem solving, the next stage is the stage of doing problem solving.

Planning

When interviewed the SS said "My answer is not there because it is not careful." This is very interesting because during the interview SS can explain that when solving the SS problem is not accurate so the result of SS problem solving in writing is not correct, but SS realized if the result of the solution is not True and the SS can explain back correctly and correctly through the interview.

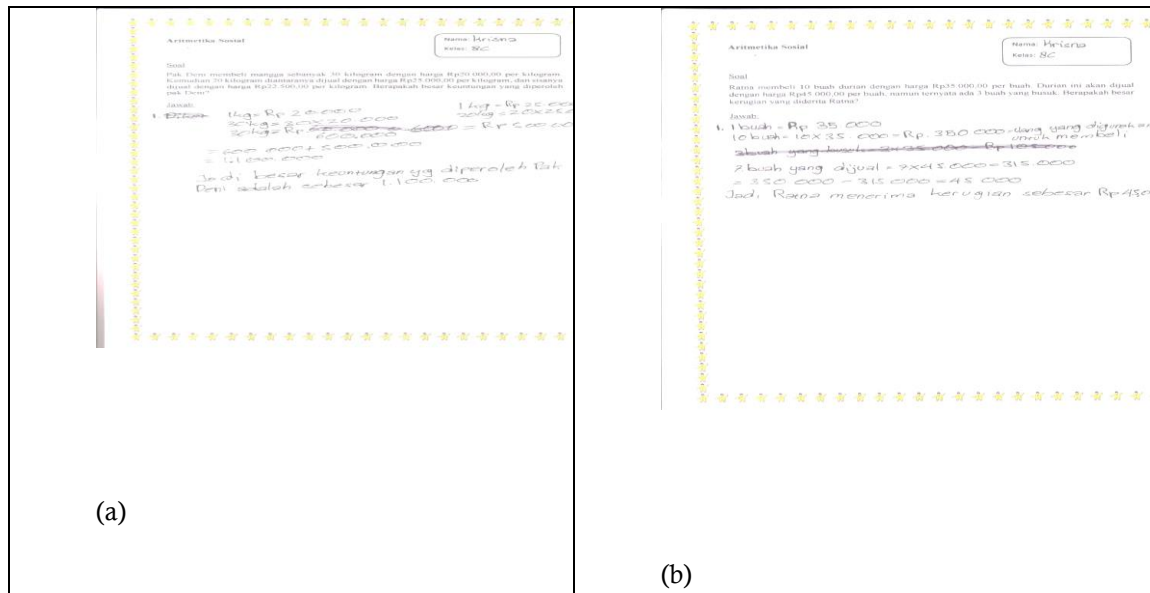


Figure 5. Results of SS Written Test on Planning to Solve Problem a. Problem about Benefits, b. Problem about Disadvantage

In Figure 5 SS has been able to do the planning well and has done the calculation in solving the problem, only the final result is not accurate. To find out more why the answer was wrong then the interview was done again, SS realized that the answer he was doing was wrong due to miscalculation and forgot to solve it. But when asked to explain again, SS can solve the problem correctly and correctly.

Based on the SS's explanation through an interview conducted by the SS explaining that the SS is not careful in solving the problem and after the SS explained it appears that the SS actually can solve the problem and can solve the problem correctly. Thus the SS can be said to plan and do the planning well although in the process SS can explain through interviews and explanations given the SS can answer the problem appropriately.

Rechecking

In the next stage of the re-examination stage, SS also did not conduct re-examination. Based on the explanation of the SS through interviews conducted, the SS said that the SS is less thorough in the problem but after being asked to explain the SS can answer correctly the results of the matter about loss. At the last stage of the re-examination stage, SS does not conduct a re-examination. Thus it can be said that the SS has not conducted a re-examination based on Polya stage.

SS in solving the problem has not met all the indicators at the polya problem solving stage. SS is only able to go through the stage of understanding the problem of profit although in depth interviews SS can work on the problem correctly about the benefits. For the problem of the loss of the SS is able to go through the stage of understanding and planning the problem solving, for the stage of planning SS does not do well because it is still not regular in doing so the final result of problem solving is less precise and not check back the problem done but in the process after SS interview Can explain correctly in solving the problem. This is because SS is not careful in solving the problem. From the two problems done by the SS it

can be seen that consistency in the planning stage of splitting up to the re-examination stage of the SS did not perform well, this is because the SS is not careful in solving the problem even though in the process ssat interviewed SS realized his mistake and can explain correctly Problem given.

Description of Problem Solving by Low Achiever

Subjects are given 2 questions relating to the problem of profit and loss. The following explanation of the subject in solving the problem based on Polya steps.

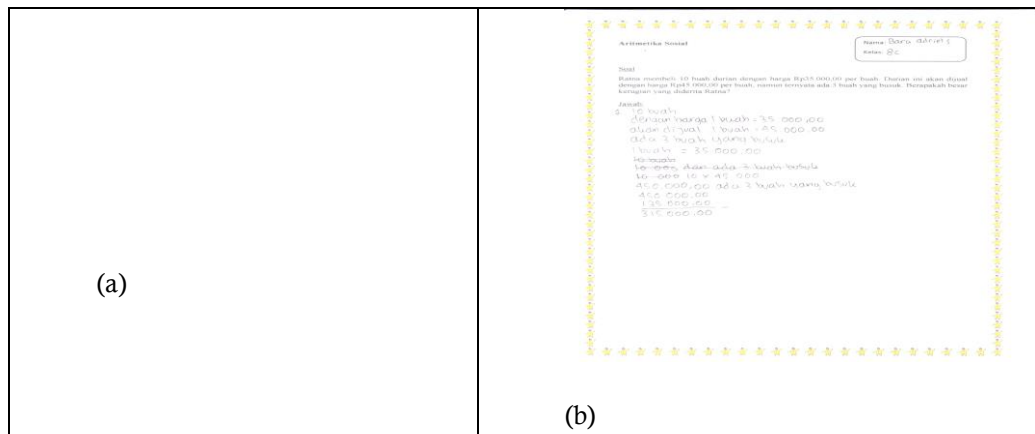


Figure 6. Results of ST Written Test on Understanding Problem a. Problem about Benefits, b. Problem about Disadvantage

Based on the picture 6 SR can not understand the problem well given, it can be seen that SR can not write down what is known from the problem and SR did not write down what was asked, to know deeply then conducted an interview on the understanding of SR in solving the problem. According to SR that is known from the problem is a big advantage and so also with the questioned is the big advantage, from the explanation of SR through interviews conducted, it appears SR is still confused in understanding the problem. According to SR's explanation that what is known and what is asked is the same, it can thus be said that SR has not been able to understand the given problem.

Planning

The next stage is the planning phase of problem solving. At this stage SR can not get through it well, it can be seen in Figure 7 (a) that SR does not plan the price of the sold fruit from the rest. In Figure 7 (b) SR is still difficulty in determining how to solve the problem. Thus SR can be said not yet through the planning phase of the solution, so for the next stage can be ascertained that the SR has not been able to pass it well.

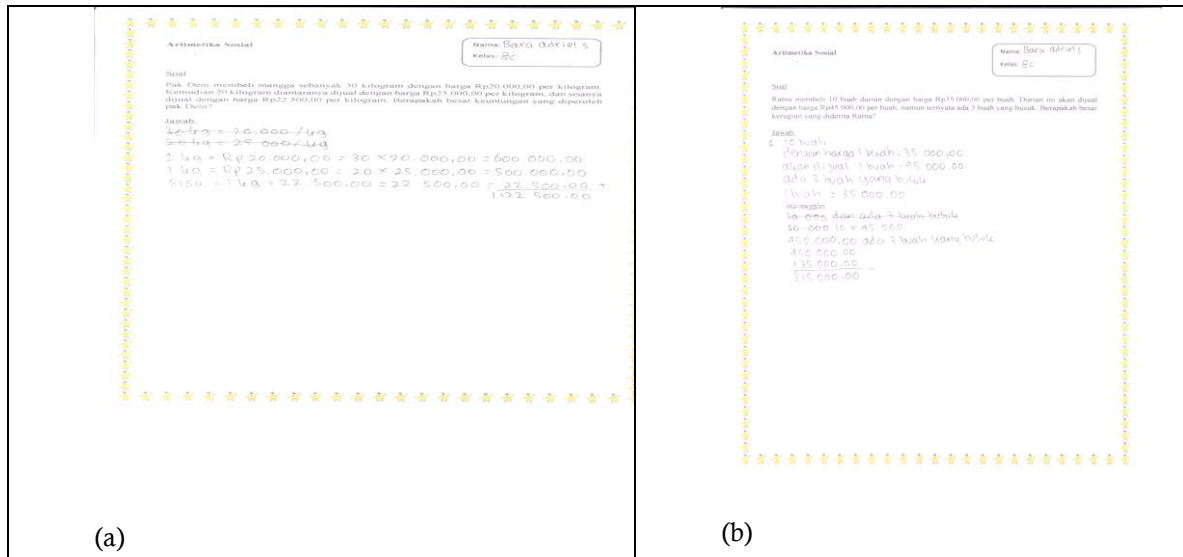


Figure 7. Results of ST Written Test on Planning to Solve Problem a. Problem about Benefits, b. Problem about Disadvantage

SR in solving the problem has not met all the indicators at the polya problem solving stage. SR is not able to go through the stage of understanding the problem on both questions, this is because SR does not have a good plan and difficulty in determining how to solve problems so as not to get the results of problem solving correctly.

Discussion

Polya states that understanding the problem means that students can determine what is known and asked. The high-ability and moderate subjects in this study can understand the problem given, they can mention what is known and asked, so this research is in line with the Polya step. While a low-ability subject can not understand the problem given properly.

Highly and moderately capable subjects can go through the stages of making a plan that can use information from the known and asked. For low-ability subjects do not plan for troubleshooting. Low-ability subjects still have difficulty in using the information obtained to make the next move.

Highly capable subjects can do a problem-solving plan properly and use the steps regularly. Subjects capable of being able to do the planning well and perform calculations in accordance with the planned, then the subject is capable of performing a good problem-solving plan even though the written answer is not accurate but when interviewed in depth the subject can explain the answer correctly. Low-ability subjects do not plan the problem. Based on research conducted Tangio (2015) states that students with a high predicate able to solve the problem of the problem systematically and correctly and obtain the correct results, while the predicate is showing that students are able to solve the problem of the problem given systematically but not accurately or the student Able to solve the problem of the problem but the result is wrong then for the low predicate indicates that in the student problem solving erroneously in determining the settlement steps and results penyelesaiannyapun mistaken or the student does not at all solve the problem of the given problem.

High-ability subjects did a re-examination of the problem solving done, explanation of the subject in doing a re-check described in the interview. Furthermore, the subject of moderate and low ability does not perform steps to re-examine solving the problem solving. This makes the subject is not careful in solving the problem. Based on Zaiif's research, et al (2013) stated that students' weaknesses are in the re-examination stage because students are more rigid in the way teachers teach without developing a way to solve a problem in their own way.

Based on research conducted by Tarigan (2012) found that students with sufficient reasoning ability and high will produce good problem solving, while students with low reasoning ability will result in problem solving that is less good. Meanwhile, according to research results Tangio (2015) found that students' math problem solving skills are still moderate and there are factors that affect each indicator of math problem solving ability.

CONCLUSION

Based on research done can be concluded that ability in problem solving each subject differ from one to another. Moderate students can only go through 3 stages namely, understand the problem, make plans and make plans. This student can not solve the problem correctly and there is an error in the calculation. Low-ability students can not pass through all stages Polya, because this student does not understand what is known and asked from the problem so that in the next stage can not be through it. It is hoped this research become one of the reference to optimize student problem solving ability. For other researchers may use this research as a basis in conducting classroom action research or other research.

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