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THE STUDENTS' MATHEMATIC PROBLEM SOLVING PROFILE REVIEWED ON GENDER DIFFERENCES

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Abstrak

The purpose of this research is to clarify how gender differences affect students' ability to solve mathematical problems. This research uses a descriptive methodology and is classified as qualitative research. Students in SMA Batik 2 Surakarta's eleventh grade for the 2020/2021 academic year are the research's subjects. Retrieval of the challenge is finished by way of snowball sampling technique. The strategies of gathering statistics are executed by using the written check of college students' problem fixing and interview. The research employed problem understanding, answer planning, troubleshooting as deliberate, and re-examining the solution's outcome as indicators of problem solving. The consequences of the research display that female students can do all trouble solving tiers of mathematics at the same time as male students only perform a little trouble solving stages of mathematics.

INTRODUCTION

The era of the industrial revolution 4.0 has become a new milestone for the development of human life. This development has many influences in many aspects of life, both positive and negative (Hariastuti, 2017). In this era, problem solving ability is an indispensable ability in facing life (Ariawan, 2017). Mathematics helps solve problems in the era of Industrial Revolution 4.0 through school learning. Problem solving helps in solving everyday problems because humans cannot escape from mathematical processes in their daily activities (Arfiana & Wijaya, 2018). Problem solving ability is very important and is the main awareness for students to have and broaden through studying mathematics in schools. The main purpose of learning mathematics is to solve mathematic problem (Christimayani, 2020). Problem-solving skills are the most important element that students must acquire

when learning mathematics. When learning mathematics, it's also important to develop problem-solving skills.

Students' problem solving abilities have not been properly trained. In the process of learning mathematics, students only memorize the knowledge provided by the teacher and students are less able to use the knowledge if they encounter problems in real life. Mathematics learning that is mostly carried out in schools which is still teacher centered as information provider, while students only listen, take notes, and memorize so that students still have difficulty solving a mathematic problem. According to the results of the Program For International Student Assessment (PISA), approximately 71% of students no longer met the minimal stage requirement for competency in mathematics. This indicates that a large number of Indonesian students struggle to deal with situations that call for the application of mathematics to solve problems.

The National Council of Teachers of Mathematics (NCTM) establishes five standards for mathematical abilities that students must have, namely problem solving, reasoning, communication, connection, and representation (NCTM, 2000). The ability of mathematical problem solving is one of the most important abilities in learning. Problem solving is part of a very important need in the learning process and it is expected that the students gain experience in using the knowledge and skills they have to apply it for solving problems faced in daily life and non-routine problems (Davita, 2020). Problem solving skills are abilities that can be used in obtaining a solution to a problem that requires non-routine steps or procedures and it is in the form of text, non-routine puzzles and situations that exist in real life (Zulfah, 2017).

The process of solving problems is a complex one that requires adaptable and creative thinking. Students can apply a variety of strategies to solve the challenges they confront (Nur, 2018). Since problem solving is a vital skill in mathematics, students must be taught problem solving from the beginning to ensure that the desired results are achieved (Purwaningsih, 2020). The indicators of solving mathematical troubles consist of expertise the problem, planning the answer, solving the problem according to plan, and re-checking the consequences of the answer again (Polya, 1957). Based on this explanation, it's clear that problem-solving skills are very important and essential, especially in the era of globalization. The ability to solve problems also determines success in learning mathematics.

One of the influencing factors in mathematic problem solving is gender difference. Gender is a characteristic that differentiates students in learning and processing information. Gender differences can be a factor that differentiates a person in thinking and determining the solutions to the problems that are taken. Gender differences lead to differences in the psychology of student learning (Nugraha, 2019). Men and women different in their ability to solve mathematic problems, and the difference lies in the way they solve math problems. Gender differences affect not only ability in mathematics but also acquiring mathematical knowledge (Aliyah, 2019). Based on these description, this study aims to explain solving high school students' mathematics issues in phrases of gender differences.

RESEARCH METHOD

The type of research of descriptive qualitative research. The research was conducted at SMA Batik 2 Surakarta. The subjects of the research were eleventh grade students MIPA 2. The subject selection was carried out using the snowball sampling technique, namely 2 male students and 2 female students. The purpose of this study was to describe the

mathematics problem solving eleventh grade high school students in terms of gender differences. The main instruments in this study were mathematical problem solving tests and interviews. The collecting data in this study using triangulation methods. To collect the data, the researcher carried out a math problem solving test on the matrix material and continued the interview with the subject. Students are selected based at the effects of the mathematics teacher's issues in the classroom, because the teacher knows better approximately the characteristics in their students. Students also are decided on based on their excellent conversation skills because researchers want students who're able to provide or convey thoughts and reasons well, so that the researcher can understand deeper into their solving mathematical issues. Palapasari & Anggo (2019) found that, according to Polya, the indicators of problem solving are : understanding the problem, creating a plan or path to the solution, resolving the problem, and reviewing the results achieved through the work .In this study, the problem solving signs are:

Table 1. Table of Mathematic Problem Solving Indicators

No	Indicators	Criteria
1	Problem Understanding	When students are able to determine the information that is recognized and asked in the questions and when they are able to perceive the information from the questions, they are classified as having understood the problem.
2	Solution Planning	Students are categorized to plan the solution while the students are capable to make models of the tale problems and students are in a position to plot completion strategies which might be appropriate for solving problems.
3	Problem Solving as Planned	When a student can correctly perform the calculation and follow the steps necessary to solve the problem, they are classified as having solved it according to plan.
4	Re-examining the result of the Solution	When students are able to determine the final answer to a problem, draw conclusions from the solution, and verify the results of their solution once more, they are categorized to re-examine the answers in their answers.

RESEARCH RESULTS AND DISCUSSION

The result of the study were obtained based on the data of students' mathematic problem solving tests and interviews in order to determine the profile of students' mathematical problem solving in terms of gender differences. The following is presented the students' mathematic problem solving problems.

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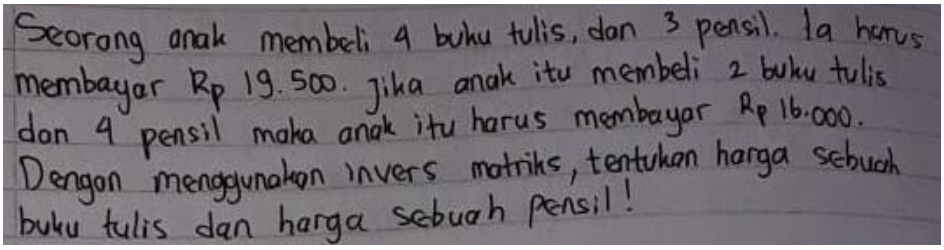
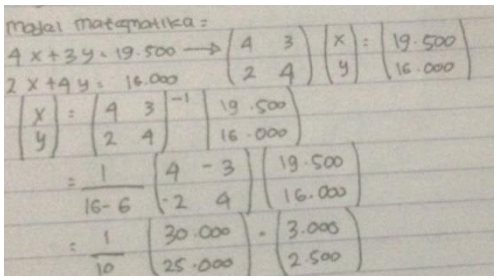


Picture 1. Mathematical Problem Solving Question

Profile of Male Students' Mathematical Problem Solving

Based on the given test questions, here are the answers from the subject (S1).

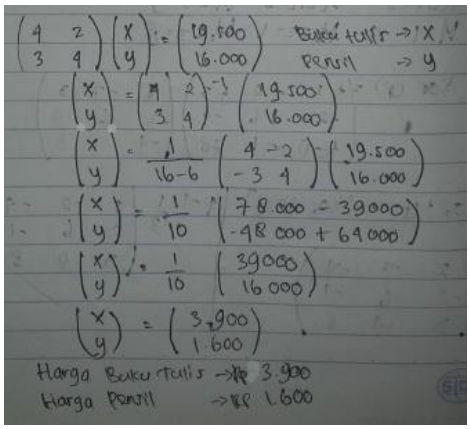


Picture 2. Work Result S1

At the stage of understanding the problem, S1 is able to determine the information that is known and asked about the problem given. At the stage of planning the solution, the S1 is able to make a mathematical model of the story problem and transform it into a matrix but is still lacking in writing the explanations on the problem. In the results of the work, the S1 writes a mathematical model immediately and does not write an explanation first. S1 are able to plan appropriate solutions to solve problems. At the stage of solving the problem according to plan, the S1 is able to operate the steps to solve it. S1 do not experience obstacles in operating the count. At the stage of re-examining the results of the solution, the S1 is able to determine the final answer to solve the questions. The S1 has not written a conclusion from the completion of the problem.

Strengthened by interviews, at the stage of understanding the problem, the S1 subject states that in the questions given, the S1 has understood the problem and knows what information is contained in the questions. Then at the stage of planning the solution, the S1 is able to change the story problem into a mathematical model and is able to make a problem-solving plan to solve the problem. At the stage of solving the problem according to plan, the S1 subject also said that the S1 could calculate well and the S1 also explained the steps in working on the problem. Then at the rechecking stage, the S1 said that he did not re-check the answer. This is line with research conducted by Nur & Palopo (2018) which stated that male subjects were able to understand and plan problems well.

The answer to the subject (S2) is



Picture 3. Work Result S2

At the stage of understanding the problem, the S2 is able to determine the information that is known and asked about the problem given. At the stage of planning the solution, the S2 has not been able to change the story problem into a matrix form because there are still misconceptions in changing into matrix form. S2 has written an explanation on the problem. S2 is able to plan appropriate solution strategies to solve problems. At the problem solving stage according to plan, the S2 is able to operate the steps for solving it. S2 did not experience obstacles in counting but there were misconceptions that the result is not correct. At the stage of re-examining the results of the solution, S2 is able to determine the final answer to solving the problem and write down the conclusion of the problem solving.

Strengthened by the interview, at the stage of understanding the problem, S2 stated that he had already understood the problem and knew what the information was contained in the questions. Then at the stage of planning the solution, the S2 was able to change the story problem into a matrix form and was able to make a problem-solving plan to solve the problem. In the S2, there was a misconception in changing to a matrix form which caused errors. At the stage of solving problems according to plan, the S2 also said that he could count well but there were errors in answers due to a misconception in the form of the matrix. The S2 said that he had explained the steps in working on the problem. Then, at the rechecking stage, the S2 said that she did not check her answer again and the S2 subject had given the conclusion.

Profile of Female Students' Mathematical Problem Solving

Based on the test questions, here are the answers from the subject (S3).

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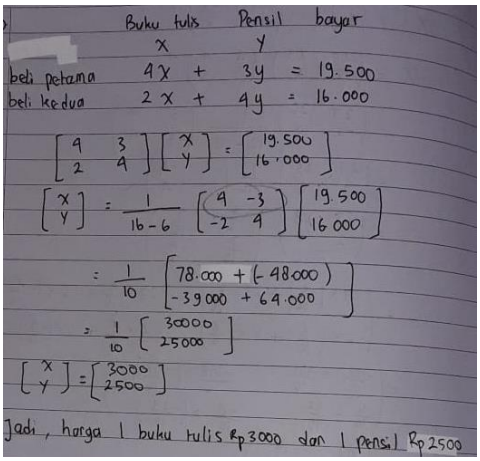
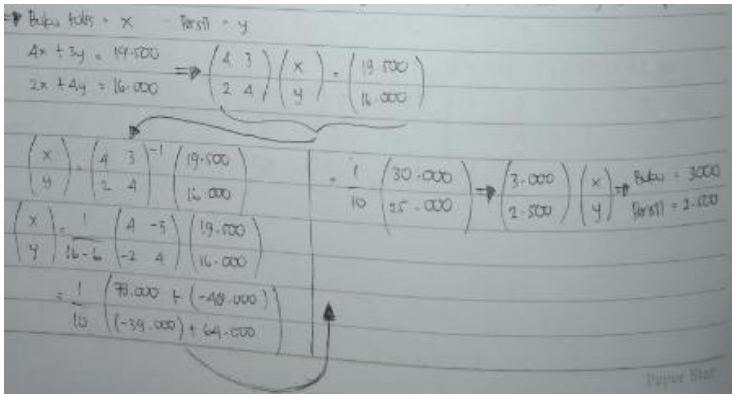


Picture 4. Work Result S3

At the stage of understanding the problem, the S3 is able to understand the problems given. At the stage of planning the solution, the S3 is able to make mathematical models of story problems and transform them into a matrix. The doctoral subject is able to plan appropriate solutions to solve the problems. At the stage of solving the problem according to plan, the S3 is able to operate the steps to solve it. Subject S3 does not experience obstacles in counting. At the stage of re-examining the results of the solution, she is able to determine the final answer to solving the problem and write down the conclusions of the problem solving.

Related to the interview, at the stage of understanding the problem, the S3 states that in the questions given, the S3 already understands the problem and determines what information is known and asked about the problems given. The S3 already knows what information is contained in the questions. Then at the stage of planning the solution, the S3 is able to transform the story problem into a mathematical model and transform it into a matrix. The S3 is able to make problem-solving plans to solve these problems. At the problem solving stage as planned, the S3 also said that the S3 could calculate well and the S3 also explained the steps in working on the problem. Then at the rechecking stage, subject S3 delivered the final answer and subject S3 had checked the answer again.

The answer to the subject (S4) is



Picture 5. Work Result S4

At the stage of understanding the problem, S4 is able to understand the problems given. At the stage of planning the solution, S4 was able to make a mathematical model of the story problem and transform it into a matrix. S4 is able to plan appropriate solution strategies to solve problems. At the stage of solving the problem as planned, S4 is able to operate the solving steps. S4 experienced no obstacles in operating the count. At the stage of re-examining the results of the solution, the S4 is able to determine the final answer to solving the problem and write down the conclusions of the problem solving.

Reinforced by the interview, at the stage of understanding the problem S4 stated that she already understood the problem and determined the information that was known and asked about the problems given. S4 already knows what information is contained in the questions. Then at the stage of planning the solution, S4 was able to convert the story problem into a mathematical model and convert it into a matrix. S4 was able to make problem-solving plans to solve these problems. At the problem solving stage as planned, S4 also said that S4 could calculate well. S4 also explained the steps in working on the problem. Then at the rechecking stage, S4 delivered the final answer and S4 had checked the answer again. This is line with what Lestari (2021) did, namely that in examining the process and results, female students are more capable of reaching the level of examining the process and results as proven by the accuracy in the students' answers. Male student are less careful in counting.

Related to the research results, the researcher found that male and female students had different stages of mathematical problem solving abilities. Gender differences can be a differentiating factor for someone in thinking and determining the solution to the problem they take. When faced with problems based on problem solving, male and female students have different problem solving tendencies (Lestari, 2021). Gender differences cause physiological differences in learning so that male and female students have many differences in learning mathematics (Amir, 2013). Gender differences not only result in different mathematical problem solving abilities but also how to acquire mathematical knowledge (Alifiani, 2018).

CONCLUSIONS

Based on the results of the research conducted, it is concluded that male and female students have different stages of mathematical problem solving abilities. Mathematics problem solving is a skill that female students possess at all levels. These include problem understanding, problem planning, problem solving according to plan, and reviewing work. In contrast, male students only complete the first three steps of solving mathematics problems-that is, comprehending the issue, formulating a solution, and completing the problem-based plan.

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