Mathematical Problem Solving Abilities Viewed by Intelligence Quotient and Gender Grade 5th

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Article Info	Abstract
	Problem solving is part of a very important mathematical curriculum. Through this aspect of mathematical ability such as the application of rules on non-routine issues, pattern discoveries, etc. can be developed better. The purpose of this research are: (1) to analyze mathematical problem solving ability viewed by IQ; (2) to analyze the mathematical problem solving ability viewed by gender. This type of research is qualitative. Research subjects consisted of 6 students VB grade SD Nusaputera Semarang 2016 school year. Qualitative analysis includes data reduction, display data, and conclusion drawing. The results of this study are (1) there are three categories of IQ that is high average, average, and low average, which has the ability to solve the best math problem that are high average, then average, and the last is low categories which refers to their ability to solve mathematical problem solving; (2) based on the total number of indicators that can be fulfilled by male gender and female' gender in this study, it shows that female's mathematics problem solving ability is better than that of male. Important finding of this research is that IQ and gender determine the level of problem solving ability of math student. This research can be used as a guide in giving learning to students in improving problem solving ability of math based on IQ and gender difference.

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INTRODUCTION

Problem-solving is part of a very important mathematical curriculum because students are enabled to gain experience using the knowledge and skills they already have to apply to non-routine problem-solving. Aspects such as the application of rules to non-routine issues, pattern discoveries, generalization, mathematical communication, etc. can be better developed through these activities (Suherman, 2003). Problem-solving is specifically addressed as a process-oriented standard that should be part of a math class at all levels (Reiss & Torner, 2007).

In real problems show that most students do not master problem-solving abilities. Students have difficulties in working out the problems that use the sentence (essay) especially for students who have less problem solving abilities. One of the lessons that are considered difficult by students is geometry. The problem of geometry is also found in Nusaputera Elementary School. Most students have difficulty in learning geometry and tend to memorize the formula (Chanifah, 2015). Geometry is a branch of mathematics which is taught to students. The purpose is to persue the students to be able to understand the characteristics and relationships between elements of geometry and can be a good problem solver (Safrina, 2014).

The difficulties faced by the students occurred because students do not understand the problem (Hudojo, 2003). Students have difficulty expressing their thoughts in answering problem-solving tasks. Students try to operate the numbers in question, but students do not understand what the problem is (Ozcan, et al, 2017). In addition, Rosyida (2013) stated that student obstacles in solving problem-solving if viewed from the taxonomy of SOLO: (1) Students do not know what is asked about, students do not understand the problem or do not understand what is asked about, (2) Students do not have any plan in solving problem, (3) Students are not able to use information from questions, (4) Students do wrong calculation, (5) Students try to apply formula or process yet those formula and process are not appropriate to solve the problem,

(6) Students are not accustomed to reviewing the answers and the questions. The problem of abilities in solving a problem is also found in class of VB Nusaputera Semarang Elementary School. The results of interview toward teachers and students of class VB is that most of the students troubled in working on problem-solving questions. Students often do not understand what is known and asked in problem-solving questions and how to solve it. The lesson that is considered difficult by students is geometry.

One of the reasons of research on math problem solving viewed from IQ and gender aspects is the research of Moenikia (2010) which suggests a significant correlation between mathematical attitudes, academic motivation, and IQ as a predictor of mathematical achievement. Scarborough & Parker (2003) says in different IQs, there are significant ability differences between groups which are able in mathematics and group which are not both verbal and nonverbal skills. Anjum (2015) also stated that differences in IQ and gender differences can determine differences in students mathematics achievement, especially in solving math problems. The significant differences between mathematics achievement of male students and female students occurred at a high school level.

One of the factors that determine the time taken of the individual in solving the problem is the factor of intelligence (Walgito, 2005). Intelligence is the ability of someone to think and act. The higher person's intelligence, the higher his cognitive ability (Sunarto and Hartono, 2008). Psychologists develop a variety of measuring instruments to declare a person's intelligence level known as intelligence quotient (IQ). After IQ score, the determined level of intelligence of children by using a certain scale. Among the various IQ scales put forward by various experts, the most widely used is the scale developed by Wechler Bellevue that classifies the intelligence of children in more detail into 9 categories: very superior, superior, high average, average, low average, borderline, lower extreme (Groth & Marnat, 2003). Gender is also an important factor in solving math problems. Gender is the sociocultural and psychological dimension of

men and women. The role of gender is a social expectation that defines how men and women should think, feel, and do (Santrock, 2008).

The purpose of this study is to: (1) analyze the students' math problem-solving abilities in terms of IQ; (2) analyzing students' mathematical problem-solving abilities in terms of gender. The benefits of this research are to be a guide in providing learning to students in improving the ability to solve mathematical problems based on IQ and gender differences.

METHODS

The type of the research in this study is qualitative research. This research was conducted in class VB of Nusaputera Semarang Elementary School in the second semester of academic year 2016/ 2017. The subjects of this study are class VB students who have different IQ according to IQ category and gender differences of men and women.

The subject was taken by purposive sampling. Based on IQ data obtained then selected on 3 categories of children that is the high average, average, low average. Each category was chosen by 2 students, 1 male student, and 1 female student. So the subject of the study amounted to 6 students. SP-01 is a high-grade male student, SP-02 is a high-grade female student, SP-03 is male in the average category, SP-04 is average female students, SP-05 is the male students' low-grade category, and SP-06 are low-grade female students.

The sources of the data to analyze mathematical problem-solving abilities in this research is the result of the students 'math problem-solving test, the result of interviewing the students' math problem-solving ability and the field note during the learning process. Data collection techniques include tests, interviews, and field notes. Qualitative analysis includes data reduction, display data, and conclusion drawing.

The analysis of students math problem solving answer results was analyzed based on indicators inferred from Polya, Sumarmo and NCTM's opinions with the following details: (1) identifying known and questioned elements;

(2) selecting and explaining strategies for solving problems; (3) solving problems using selected strategies; (4) choosing another strategy to solve the problem; (5) summarizing the results of the problem solving.

RESULTS AND DISCUSSION

Here is a recapitulation of student achievement outcomes based on each of the IQ categories of students presented in the following Table 1.

Table 1. Recapitulation of Results of Problem Indicators in terms of IQ

Bloom Categories	Student's achievements					
	High average		Average		Low average	
	Male	Female	Male	Female	Male	Female
C3	4	4	4	4	2	4
C4	5	5	2	2	0	1
C5	5	5	5	4	0	4
C6	4	4	4	4	0	0
Total	18	18	15	14	2	9

Math problem solving ability test was made by bloom categories with different difficulty level of math to know how high math problem solving ability of student . In Bloom categories C3 level is application, C4 level is analysis, C5 level is evaluation, and C6 level is creation.

Students with high, average, and low-average IQs have different levels of mathematical problem solving abilities. The number of scores obtained by high students is 36, while the average student is 29, and the low average student is 11. Based on the general interview result, the high IQ category students can answer all questions. SP-01 and SP-02 do not find it difficult to work on the math problem solving ability test, while the average IQ students can work on the math problem solving ability test even though the result is not perfect. SP-03 and SP-04 find it difficult to work on the problem at C4 level. The low average IQ category students cannot do most of the TKPM questions perfectly. SP-05 and SP-06 find it very difficult to do the problems at the C4, C5 and C6 levels.

Even on a particular matter the students only get to the stage of understanding the problem. There are several levels of ability in

solving mathematical problems. Level 1 is not critical at all that can only identify the facts given clearly, level 2 less critical can identify facts in the problem and can know the appropriate knowledge to solve the problem, level 3 critical can identify the facts in the problem, know the right knowledge to solve the problem, solve the problem but less accurate in steps and can identify facts in problems, level 4 critical know the appropriate knowledge to solve problems, solve problems accurately (Rasiman, 2015).

In line with the opinion of Irham & Zaenuri (2016) that upper group students are able to understand well on any given problem, describe each step used, and make a settlement. Students of the middle group are able to understand the problem well, make a settlement plan, make a settlement but have difficulties with problems with the high difficulty level. The lower group students are able to understand the problem and plan the settlement on the problem with the low difficulty level but on the problem with the higher difficulty level students have difficulty. Darojat & Kartono (2016) argues that quitter students with adversity quotient or someone's intelligence to face low difficulty in solving problem-solving skills only to understand the problem only.

When the students were being asked further things that make students feel difficult in doing the problem is the students do not understand the problem. This is in accordance with the opinion of Hudojo (2003) which states that the difficulties faced by students because students do not understand the problem. In terms of procedures for settling the matter of math problem solving test almost no difference found in the way used in solving the problem. All students finished by using the formula and apply the formula to the problem. This is in accordance with the opinion of Che (2012) which states that there is almost no difference in the procedure in working on problems solving mathematical problems.

Results of field notes SP-01, SP-02, SP-03, SP-04, and SP-05 showed no significant differences. The students follow the lesson well. However, there is a very striking difference with

the results of SP-06 field notes. SP-06 did not follow the lesson well. SP-06 only do 1 problem at C2 level. During the lesson, he only annoys his friend and goes to the toilet several times until the time to do the math problem solving test ends. Students' math problem solving abilities with high-average IQs are better than those with IQ average.

Students with an IQ average are better than students with low-average IQ. The conclusion of the above analysis is the level of problem-solving ability of the best mathematics is the students with high-average IQ, then students with IQ average, and the last is the students with low-average IQ. The findings based on IQ are in line with the opinion of Walgito (2005) which states that one of the factors that determine the fast or slow individual in solving the problem is the intelligence factor of the individual concerned. Further Sunarto & Hartono (2008) states that the higher one's intelligence the higher the cognitive ability. In relation to mathematical problem solving, Anjum (2015) stated that IQ difference is one of the factors that can determine the difference in student's mathematics achievement that is in solving math questions.

Almost the same as Anjum's opinion, Moenikia (2010) emphasizes that IQ is one of the predictors in determining mathematical achievement. He explains that there is a significant correlation between mathematical attitudes, academic motivation, and IQ as a predictor of mathematical achievement. Scarborough & Parker (2003) says that in different IQs there are significant differences in ability between mathematics-capable groups and those who can not afford mathematics either verbal or non-verbal skills.

The five opinions agree that the higher the intelligence possessed by the individual, the higher the ability to solve math problems. Similarly, the lower the intelligence possessed by a person the lower the ability to solve math problems.

Here is a recapitulation of student achievement outcomes based on each of the student gender categories presented in the following Table 2.

Table 2. Recapitulation of Results of Problem Indicators in terms of Gender

Category	Male	Female
High average	18	18
Average	15	14
Low average	2	9
Total	35	41

Based on the research data, the total score obtained by male students is 35 and the number of scores obtained by female students is 41 from maximum score of 60. The achievement of indicators between SP-01 and SP-02 and SP-03 and SP-04 are not much different. The way the students work on solving the math problem solving questions is only a little different. However, female students tend to ask more questions than male students when working on math problem solving questions. The student asks the teacher because they do not understand the meaning of the problem. But sometimes they ask teacher just to make sure that the settlement steps they take are correct. In accordance with the opinion of Devine (2012) that there is no gender difference in mathematical performance, although female have higher mathematical anxiety than male. In line with that Ekawati & Wulandari (2011) states that there is no gender difference between male and female in the mastery of mathematical materials, especially geometry.

The striking thing that distinguishes the achievement of the question indicator in terms of gender is that the SP-05 only gets a score of 2 and SP-06 gets a score of 9. The field notes at the time of the study showed that the factors causing the difference were SP-05 had no interest in learning. SP-05 is does not care and does not want to do any problems. But, he often moved seats without the permission. He also often asked permission to go to the bathroom. In addition, he tends to play and talk to his seatmate friends. He is a typical person who likes to make noise in class. SP-06 is a fairly diligent student. She pays attention to the lesson. Although she feels confused and often asks the teacher, she has a high learning interest. She has a motivation to do math problem solving questions.

From the results of study, it is obtained that between male students and female students have different levels of problem-solving skills of mathematics. Amir (2013) suggests that gender differences lead to differences in physiology in learning so that male and female students have many differences in learning mathematics. Gender differences not only result in different abilities in mathematics but also how to acquire mathematical knowledge.

The difference is seen in the math problem solving test results between male and female students of the low average category. Female students are better at math problem solving skills than male students. Anjum (2015) argues that gender differences can determine differences in mathematics achievement of students, especially in solving math problems. He explains that there is a significant difference between the mathematical achievement of male students and female students at the high school level.

Furthermore, Amir (2013) suggests that male students have a high ability in math, but female students are superior in their affective aspects (diligent, thorough, meticulous). In addition, in mathematical problem solving, male students are superior in solving new problems, but female students are superior in solving common problems. So that female students get higher grades in mathematics learning where the problem presented in the problem is a familiar problem. Female students are better at problem-solving than male students because they apply what they learn in the classroom (Gallager & Kaufmann, 2005).

Math problem solving done by students is a problem that they have learned during the learning process before students do math problem solving test, they have been given provisions in advance about how to do math problem solving. So the above opinion reinforces further that female students are superior to male students in doing math problem solving. The new thing in this study is that among the three categories of IQ that is high average, average, and low average, which has the ability to solve the best mathematical problems in IQ is high average category, then below is average category, and last

is low-average category. Then between male and female student, math problem solving ability of female students better than that of male students. This is because the interest of female students is higher than male students' interest in learning. In addition, female students get higher grades in mathematics learning because the problems presented in the problem are familiar issues. Female students are better at problem solving than male students because they apply what they learn in the classroom.

The benefits of this research are the results of this research can be used as a reference in providing learning to students to improve problem-solving skills based on IQ math and gender differences. The lessons given to students must be in accordance with the IQ stage and their gender differences. Especially for male students with low IQ category should get more treatment in order to increase their mathematical problem-solving ability. Based on the data of interviews on SP-05 indicates that the students have low learning interest because students do not understand what is known and asked from the question of math problem solving test, the students also do not know how to do the calculation. For that, teachers need to teach to students with low-average IQ categories every step of polya step by step until the students understand how to solve math problem solving.

CONCLUSION

There are three categories of IQ to draw the students' the ability to solve the best math problems, they are high average category, average category, and low average category. Based on their results of math problem solving test, high average category can achieved scores 18 for male student and scores 18 for female student. Average category students can achieved scores 15 for male student and scores 14 for female student, low average category students can achieved scores 2 for male student and scores 9 for female student. Based on their result of the interview season high average category students can answer all of the question correcly; average category students also can answer the question correctly but

not at all; and low average category students can not answer the question correcly. Based on the total number of indicators that can be fulfilled by the gender of male and female students in this study, it can be said that female's math problem solving ability is better than that of male's gender.

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