

Students' problem solving ability in thinking aloud pair problem solving learning assisted by schoology viewed from mathematical disposition

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Abstract

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This research aimed to determine whether Thinking Aloud Pair Problem Solving learning assisted by Schoology was effective to problem solving ability. The method of this research was quantitative-assisted interviews. This research involved 63 selected students of 252 of 8th grade students in one of junior high schools in Kudus. The results showed that: (1) students' problem solving ability in Thinking Aloud Pair Problem Solving learning assisted by Schoology achieved the mastery learning; (2) students' problem solving ability who received Thinking Aloud Pair Problem Solving learning assisted by Schoology was better than students who received Problem Based Learning; and (3) mathematical disposition positively affected to the students' problem solving ability.

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1. Introduction

Learning mathematics is very important for students since there are so many activities that they do involve mathematics. Students can think logically, analytically, critically and creatively by researching mathematics. Unfortunately, most of the students are still having difficulties on problem solving. Therefore, they must still learn because it is extremely important in daily life and useful for the development of human competence (Tambychik & Meerah, 2010).

One of the education problems that is currently on focus is the lack of students problem solving ability (Rahayu & Kartono, 2014) because students are not accustomed to solve mathematics problems routinely. During this time, mathematics only emphasizes on providing formula, giving the example of the problems and exercises regularly (Marisa, 2011).

According to Woolfolk & Margarets (2012), problem solving is usually defined as formulating new answer, beyond the simple application of prior

learning process to achieve the goal. Problem solving is the most complex learning activities. A question becomes a problem if the student is not able to complete it on time and does not have the desire and the need to fix that (Masrukan, 2008).

In this research, the step of problem solving skills used are the steps revealed by Polya. Polya (1973) states that a solution contains about four-steps problem solving, namely understanding the problem, devising a plan, carrying out the plan, and looking back.

Akinsola and Olowojaiye as quoted by Wijayanto (2014) conclude that the way teachers deliver the learning in the classroom is very influential in changing the attitudes and habits of the students in learning mathematics. According to George (2010), one of learning model that has been proven to enhance the learning process is a cooperative learning model.

One of the cooperative learning models is Thinking Aloud Pair Problem Solving. It is a technique of thinking out loud in pairs to resolving the problem. According to Lochhead and

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Whimbey as quoted by Wardlow & Johnson (2004), Thinking Aloud Pair Problem Solving learning requires two students who act as a problem solver and listener to cooperate in solving the problem by following certain rules. Thinking Aloud Pair Problem Solving learning is effective to optimize problem-solving skills because when the problem solver reads the problem to the listener, students are able to optimize their problem-solving abilities on stage to understand the problem. Furthermore, when the problem solver starts explaining the troubleshooting steps, students can optimize their problem-solving abilities on the stage of devising and carrying out the plan. The looking back phase will be optimal when the listener is performing its duties, namely correcting measures undertaken by the settlement problem solver, so the students can optimize their problem-solving abilities.

Thinking Aloud Pair Problem Solving learning is considered to be able to ease the learning process. It contains several steps, as follows.

1. The teacher gives a different problem to problem solver and listener.
2. The problem solver and the listener learn each other's problems for 5 minutes.
3. The problem solver begins to solve the problem and then explain each step of completion to the listener.
4. The listener observes the process of resolving the problem. He or she may ask if there are things he or she cannot understand, or provide direction and guidance if a problem solver has difficulty.
5. Teachers observe and help the discussion.
6. After the first question is solved, problem solver and listener switch the roles and discussions run as the first time.
7. Performing the second discussion of issues that have been given together.
8. Giving awards to the best teams as the motivation.

Several previous researches with the similar topic have been conducted. They show the positive results. The results of Irham & Mulyono (2017) research show that (1) the students' problem solving with Thinking Aloud Pair Problem Solving learning that achieves the mastery learning are shown by the percentage of students who reached the minimum mastery criteria are more than 75%, and (2) the students' problem solving ability with Thinking Aloud Pair Problem Solving learning is better than students in conventional learning. Meanwhile, the research by Kani (2015) reveals

that Thinking Aloud Pair Problem Solving learning can help students in realizing the process of thinking and improving their problem solving abilities, particularly in understanding the troubleshooting questions prepared in the research.

Learning mathematics is not only learning about the concepts, procedures, and applications, but also includes developing a mathematical disposition. Mathematical disposition is also known as a productive disposition that is growth of positive attitudes and habits to see mathematics as something logical, useful and utilitarian (Kilpatrick et al., 2001). According to the NCTM (2000), the disposition includes some indicators, namely: (1) being confidence in using mathematics to solve problems, communicate mathematical ideas and give arguments, (2) being flexible thinking in exploring mathematical ideas and trying alternative methods to resolve problem, (3) being persistent in doing the math, (4) being interested, curious and creative in math activities, (5) monitoring and reflecting thought and performance, (6) appreciating the application of mathematics in real life, and (7) appreciating mathematics as tools and language.

Government Regulation of The Republic Of Indonesia Number 17 Year 2010 Article 48 and 59 have led to the development of information technology-based education and information to provide access the learning resources for educators, staff, and students. One media that uses information technology is e-learning. The main concept of the use of e-learning is to facilitate the distribution of learning materials, exams, practice quizzes, and assessments. An e-learning that can be used is schoology. According to Amiroh (2013), schoology provides many options resources (learning resources). Schoology can also accommodate the type of question (question bank) which will be used during the quiz. Research by Nurhasanah et al. (2017) shows that the average value of students communication skills with Problem Based Learning and Think Talk Write learning assisted by *Schoology* is better than students in the control group.

Regarding to preliminary description, the purpose of this research are (1) to test whether students' problem solving ability in class that received Thinking Aloud Pair Problem Solving learning assisted by *Schoology* is able to achieve mastery learning, (2) to test whether the problem solving ability of students who received Thinking Aloud Pair Problem Solving learning assisted by *Schoology* is better than students who received

Problem Based Learning, and (3) to test whether a mathematical disposition effects on students' problem-solving abilities.

2. Methods

The method of this research was a quantitative research with experimental research. This type was supported by interviews. The quantitative method used to examine the population or a particular sample, data collection using research instruments and quantitative data analysis or statistics, with the aim of testing the hypothesis that has been set. However, the quantitative method that was used in this research was to obtain data of the students' learning outcomes on their problem solving abilities, while the interview method was to determine the description of the problem solving ability of students. This research design was the posttest-only control design. In this design, there were two groups that were chosen randomly.

This research involved 63 selected students of 252 students of 8th grade students in one of junior high schools in Kudus. This research used two sample groups. The first was the control group who received Problem Based Learning and the second was the experimental group who received Thinking Aloud Pair Problem Solving learning assisted by schoology. Then, the selection interview subject was conducted to support the results of this research. The subject interview was consisted of 6 students; two students with high mathematical disposition classification, two students with medium mathematical disposition classification, and 2 students with low mathematical disposition. The independent variable in this research was a mathematical disposition, while the dependent variable was problem-solving abilities.

To collect the data, this research used several data collection method, namely: 1) test, 2) questionnaire, and 3) interview. The instruments in this research were 1) problem solving ability test, 2) mathematical disposition questionnaire, and 3) interview guidelines. Mechanical analysis of problem-solving ability test instruments included validity, reliability, questions difficulty level test, and distinguishing matter test. Further, for mathematical disposition questionnaire had covered the validity and reliability test.

The analysis data of this research included data sampling analysis and problem solving abilities test. The sampling data analysis using mathematics final exams score odd semester academic year

2017/2018 covering normality test, homogeneity and equality test two averages. The analysis of the test data using the problem-solving ability test score problem solving capabilities included the classical assumption of normality test and homogeneity test, then continued by the proportion completeness test, two different average test, the difference in two proportions test and regression analysis test. Analysis of interview data was to determine students problem solving ability of in terms of mathematical disposition of each category.

3. Results & Discussion

Learning activities in the experimental group was conducted over four sessions and one session to test problem-solving ability. While the learning in the experimental group was conducted from April 30, 2018 until May 9, 2018 and the implementation of group problem-solving ability test experiments were carried out on May 14, 2018 and the control group on May 15, 2018 with a time of 70 minutes each. Furthermore, the experimental class students were asked to complete a questionnaire to determine their mathematical disposition score.

The test results of students problem solving abilities were normality and homogeneity test. The normality test was conducted by using Kolmogorof-Smirnov test, while the homogeneity test was using Levene test with SPSS 16. The results showed that the data were normally distributed and homogeneous. Furthermore, the hypothesis I was to determine that students' problem solving ability in Thinking Aloud Pair Problem Solving learning assisted by Schoology had achieved the mastery learning. In this case, the mastery learning was if the results of students' mathematics learning was more than 75% of the number of students in a class using Thinking Aloud Pair Problem Solving learning assisted Schoology, so the value of mathematical problem solving ability test was more than or equal to 70. the test hypothesis I was conducted by using a test which tested the proportion of one party against the left. Apparently, the result showed that the problem solving ability of students in classe using Thinking Aloud Pair Problem Solving learning assisted by schoology successfully achieved the mastery learning.

The next test was hypothesis II. It used the difference of two average and two proportions. This second hypothesis test was performed to find

out the problem solving ability of students in class using Thinking Aloud Pair Problem Solving learning assisted by Schoology was better than students in the class using Problem Based Learning. Afterwards, the results of proportion difference test concluded that the problem solving ability of students in Thinking Aloud Pair Problem Solving learning assisted Schoology class was better than Problem Based Learning class.

The last, the hypothesis III test was conducted to determine whether the mathematical disposition affected students' problem solving ability in Thinking Aloud Pair Problem Solving learning assisted by Schoology class or not. The data used in this test were the students' mathematical disposition scores as independent variables represented by X and students' problem solving ability test scores as the dependent variable represented by Y . By using SPSS 16, the output of regression was $\hat{Y} = 33,446 + 0,575X$ and 44,5% of problem-solving ability affected by mathematical disposition.

Above all, schoology still can not be predicted whether it can help to maximize the students' problem-solving ability or not because until the end of the meeting, only 9 students who joined schoology group that had been prepared for this research. The researchers only asked students to download the problems that existed in schoology group. It went without saying that it was not interested for them to join the class though.

However, the factors affecting the success of this schoology assisted learning because Thinking Aloud Pair Problem Solving made learning became more challenging. This was supported by the learning path that required students to be able to explain to his/her partner about solutions they chose to solve the problem. Other things that can not be overlooked was the provision of students' worksheet, students' assignment sheet, and homework on the material surface area and volume cubes and beams, and also the support from teachers in providing the inducement so that students can find a solution of the problem as well as other matters which can enhance students' problem-solving abilities.

Exercises were proven being able to enhance the problem solving but on condition that questions should be in a good quality and quantity. Exercises in pairs enabled students to exchange ideas and provide assistance, while the individual exercises allowed students to hone their problem-solving abilities of each.

The results showed that mathematical disposition had positive effect on students' problem-solving abilities. So if students' mathematical disposition was higher, so was their problem-solving ability, and vice versa.

4. Conclusion

Based on the results of research and discussion of students' problem solving ability in Thinking Aloud Pair Problem Solving learning assisted by schoology, there are several conclusion that can be drawn. Firstly, students' problem-solving abilities in Thinking Aloud Pair Problem Solving learning assisted by schoology successfully achieved the mastery learning that is equal to 90.32% of students who passed minimum mastery learning criteria. Secondly, the problem solving ability of students who received Thinking Aloud Pair Problem Solving learning assisted by schoology is better than Problem Based Learning class. Thirdly, mathematical disposition positively affected to students' problem solving ability.

In the end, the researchers suggest to teachers of mathematics grade 8th that Thinking Aloud Pair Problem Solving learning can be used as the alternatives learning model to optimize students' problem-solving ability on the material surface area and volume of cubes and beams.

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