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Student's Problem-Solving Ability through the Realistic Mathematics Education with Fun Card

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Abstract

The purpose of this study is to test: (1) classical mastery of problem-solving abilities in Realistic Mathematics Education Learning assisted with fun cards, (2) whether problem-solving abilities in Realistic Mathematics Education Learning Approach is better than learning with PBL, (3) the influence of students' learning responsibility towards problem-solving skills with the Realistic Mathematics Education approach, and (4) describe students' problem-solving abilities in terms of learning responsibility. This study uses a mixed method of sequential explanatory design, the population in this study was the seventh-grade students of one of Junior High School 36 Semarang the academic year of 2018/2019. The results showed that (1) students' problem-solving abilities through the Realistic Mathematics Education Learning Approach assisted with fun cards met classical learning completeness criteria, (2) problem-solving abilities of students who obtained Realistic Mathematics Education Learning assisted with fun cards are better than students who learn with Problem-Based Models Learning, (3) learning responsibilities have a positive effect on students' problem-solving skills in Realistic Mathematics Education Learning assisted with fun cards, (4) students' problem-solving abilities in terms of responsibility through the RME learning approach assisted with fun cards.

1. Introduction

Mathematics is a scientific discipline that holds an important role in education and other fields of science. According to Permendikbud Number 21 of 2016 concerning Content Standards for one of Junior High School, the goal to be achieved in mathematics learning is to show a logical, critical, analytical, careful, and thorough attitude, responsible, responsive, and not easily giving up in solving problems and having a sense of curiosity, continuous learning enthusiasm, self-confidence, and interest in mathematics. Viewed from the purpose of mathematics learning, mathematics has an important role in helping students to be ready to face everyday life problems. The ability developed by students according to the Ministry of Education and Culture previously mentioned is problem-solving ability. According to Tambychik & Maerah (2010), problem-solving is one of the main aspects of the mathematics curriculum that students need to apply and integrate many mathematical concepts and skills and make decisions. The ability to solve mathematical problems is the students' ability to solve a mathematical problem by applying their knowledge, skills, and understanding (Santia, 2015). The ability to solve problems in mathematics is one of the abilities which students must have and develop in learning mathematics. In solving problems, students are expected to understand the process of solving these problems and become skilled in selecting and identifying relevant conditions and concepts, looking for generalizations, formulating a plan for solving and organizing skills they have previously had.

But in fact, the problem-solving ability in one of Junior High School in Semarang still needs to be improved. This is shown from the percentage of mathematics materials mastery for the National Examination for Junior High School Academic Year 2017/2018 for statistics and opportunities at the school level is 47.86, which means it is still less than mathematics subject minimum mastery criteria that is 65. Therefore there needs to be an

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increase in statistics subject. Based on the Field Experience Practices (internship) and an interview with one of the seventh-grade mathematics teachers of one of Junior High School in Semarang, it is stated that problem-solving skill still needs to be improved, this is shown in the learning process of students who do not yet have responsibility within their respective groups, are less active in working on assignments, and lack of discipline in collecting tasks. In other words, the sense of responsibility for students learning is not optimal. Then there needs to be an effort to improve the problem-solving ability of students at one of Junior High School in Semarang.

One of the learning approaches that can provide opportunities for students to develop and explore their abilities optimally is Realistic Mathematics Education (RME) learning, because learning using the RME approach is contextual, which means that mathematics learning is carried out using contextual problems or problems related to daily life that is understood by students as the first step in the learning process. This is in accordance with the opinion of Yuliani (2017) wherein the RME learning process two mathematical components are used which are horizontal mathematical which is a learning process so that students with the knowledge they have can organize and solve real problems in daily life and vertical mathematics which is a reorganizing process by using mathematics itself.

In addition to applying the RME learning approach, to create a pleasant and not boring learning atmosphere, one can use media in learning, one of which is fun cards. Fun card media was chosen because with this media students can work on various problem exercises through group discussions so that it is expected to trigger a growing sense of student learning responsibility, increase student activity because this allows students to work together in the sense of exchanging ideas. The activeness of students participating in learning is expected to be able to improve students' understanding of the problem.

The learning steps that will be carried out in this study are using the Realistic Mathematics Education-assisted fun card approach which is explained as follows: (1) opening, at this stage, the teacher conveys contextual problems to students. Then students are asked to understand the problem given. If there are students who have difficulty in solving problems, the teacher gives inducement questions so that students are guided in understanding the contextual problems, (2) student working, students work individually to solve contextual problems that are given. Then match the answers with the classmates, (3) discussion, the teacher gives a new contextual problem, students are asked to solve the problem with group members. After that, a class discussion is held with the teacher as the facilitator. Students are asked to make conclusions independently about what has been done. If students fail, the teacher leads to the conclusion they should. At this stage, the teacher distributes fun card questions as further discussion material and is done in groups, (4) closing, at this stage the teacher gives a quiz about the material just learned then discusses the answer with students.

Problem-solving ability requires special skill and ability possessed by each student, between one student and the other students can have differences in solving a problem. In addition to students' cognitive abilities namely problem solving, there are other abilities that can be seen during learning that are affective ability. Based on the results of interviews with mathematics teachers at one of Junior High School in Semarang, which have been explained previously, it seems that the attitude of student responsibility still needs to be improved. Furthermore, the problem-solving ability has a strong relationship with student learning responsibilities. The indicators used in this study refer to the indicators developed by Aisyah et al (2014), namely (1) discipline; (2) sportsmanship; (3) obedience to the code of conduct; and (4) commitment to the task.

Indicators of problem-solving ability used in this study refer to the indicators of problem-solving ability according to Fuadi (2017), (1) ability to identify the elements requested and complete the required elements; (2) the ability to formulate mathematical problems or develop mathematical models; (3) the ability to choose and implement strategies to solve mathematical problems; (4) the ability to explain and interpret problem-solving.

Based on this background, the purpose of this study is to test: (1) classical mastery of problem-solving skills in Realistic Mathematics Education Learning assisted with fun cards, (2) whether problem-solving abilities in learning with Realistic Mathematics Education approach is better than learning with PBL, (3) the effect of students' learning responsibilities on problem-solving skills with the Realistic Mathematics Education approach, and (4) describing students' problem-solving abilities in terms of learning responsibility.

2. Research Method

The research method carried out was a mixed methods research with the explanatory sequential mixed methods. According to Creswell (2016: 19), mixed research involves the merging or pooling of quantitative and qualitative data research into research. The quantitative research design used in this study is Quasi-Experimental.

The design used is Posttest-Only Control Design. According to Creswell (2012: 310) the design can be illustrated as in Table 1 below.

Table 1. Posttest-Only Control Design

Group	Treatment	Test
Control	-	Posttest
Experimental	X	Posttest

Based on the table above there are two sample groups selected. The first group, the control group, was not given treatment (X) and was given PBL learning that is usually applied by teachers in research school, while the experimental group was given treatment in the form of learning using the Realistic Mathematics Education approach assisted with fun cards. Then the two groups were given a posttest which was a test of problem-solving ability for the first and second learning groups. Qualitative methods used as a complement to primary data qualitative methods in this study were interviews and questionnaires to get a description of students' mathematical problem-solving abilities in terms of students' responsibility.

This research was conducted at one of Junior High School in Semarang. The population in this study was the seventh-grade students of one of Junior High School in Semarang the academic year of 2018/2019. The sampling technique using random sampling obtained two classes, 32 students as the control group and 32 students as the experimental group. The variable in this study was the problem-solving ability. While the treatment in this study was the Realistic Mathematics Education approach assisted by fun cards.

Data collection methods in this study were tests, questionnaires, and interviews. The research instrument used in the study was a test to get data on students' problem-solving abilities, a questionnaire to get data on students' attitudes of responsibility, and interviews that would be used to describe students' problem-solving abilities in terms of learning responsibility. The tests and questionnaires used have met the criteria for tests and questionnaires that are in accordance with the validity, reliability, difficulty and different power.

Quantitative data analysis in this study used three tests, which are (1) classical mastery test with one-party proportion test and one-party average test to test the classical mastery of students in Realistic Mathematics Education Learning assisted with fun cards, (2) Average similarity test and the two proportions similarity test to test the difference in problem-solving abilities in RME learning with fun cards and PBL learning, (3) regression test to test the effect of attitude of responsibility on problem-solving ability. Qualitative data analysis was performed by the stages of data reduction, data presentation, and conclusions.

3. Results and Discussion

This section explains the results of quantitative and qualitative research. Learning in the experimental and control groups was done by four meetings and one meeting to test the problem-solving ability. The analysis of the problem-solving ability test data was carried out the normality test to meet the normality assumption of data coming from a normally distributed population and the homogeneity test to obtain the assumption that the variant of the sample data is homogeneous.

The first test is the classical mastery test which aims to test the classical mastery of the problem-solving ability through the RME fun card approach. Based on the test results the proportion of one right hand side $z_{count}(3{,}27) \geq (1{,}64)z_{0{,}5-a}$, was obtained, so H_0 is rejected. It means that the problem-solving ability of students with the RME learning assisted with fun cards approach reaches the classical minimum mastery criteria. Based on the one-party average test results $t_{count}(10{,}067) \geq (2{,}040)t_{(1-\alpha)(n-1)}$, was obtained, so H_0 is rejected. It means that the average test results of students' problem-solving abilities with the RME approach assisted with fun cards reached more than 68. Based on the test of the proportion of one right party and the average test of one right party it can be concluded that the students' problem-solving ability through the RME approach assisted with the fun card reached classical mastery.

The second test is the two similarities average test aimed at testing whether the average problem-solving ability with the RME approach better than the average problem-solving ability through the PBL learning model. Based on the results of the calculation of the similarity test two averages

$t_{count}(3{,}73) > (1{,}99)t_{table}$ are obtained, so H_0 is rejected. It means that the average test results of students' problem-solving ability in classes using RME learning assisted with fun cards are more than the average results of tests of the problem-solving ability of students in classes using PBL models. Based on the results of the calculation of the two proportions similarity test $z_{count}\ (1{,}772) \geq (1{,}64)z_{table}$ were obtained, so H_0 is rejected. It means that the proportion of students who have finished learning in class using RME learning assisted with fun cards is more than the proportion of students who have finished learning in class using PBL models. From the results of the two average similarity test and the similarity of two proportions, it can be concluded that the problem-solving ability of 7th-grade students in presenting data in RME learning with fun cards is better than the problem-solving ability of students who obtained learning with PBL models.

The third test used a series of regression tests using PASW Statistics software to find out whether there is a positive influence of curiosity on students' mathematical critical thinking abilities. Based on the regression equation formula the regression equation was obtained as follows.

$$\hat{Y} = 39{,}480 + 0{,}878X$$

The regression equation shows that the average value of mathematical problem-solving abilities increased by 0.878 for an increase in one score of students' responsible attitudes. Because b is positive, responsibility has a positive effect on students' mathematical problem-solving abilities through RME learning assisted with fun card.

In linearity test of linear regression. Based on the calculation results, $F_{count}(0{,}501) < (0{,}910)F_{(1-a)(k-2,n-k)}$ is obtained, so H_0 is accepted as linear regression. So there is a linear relationship between student responsibility and students' problem-solving abilities. In the significance test of linear regression, based on the calculation, $F_{count}(20{,}853) \geq (4{,}17)F_{(0{,}95)(1{,}30)}$ is obtained so H_0 is rejected. Therefore, linear regression is significant.

Based on the calculation $r = 0{,}640$ is obtained which means that there is a strong relationship between students' responsibility and students' problem-solving ability in RME learning assisted with fun cards. Based on the calculation $t_{count}(4{,}567) > (1{,}69)t_{table}$ is obtained so H_0 is rejected. Therefore, corelation coefficient is significant.

Based on analysis, $R^2 = 0{,}410$ is obtained. These values indicate that the test scores of students' problem-solving abilities are influenced by 41% responsibility through the regression equation $\hat{Y} = 39{,}480 + 0{,}878X$. The remaining 59% is influenced by other factors such as student social, student personality, student motivation and so on.

Based on a series of analyses conducted, it was concluded that student responsibility had a positive effect on students' problem-solving abilities through the RME learning approach assisted with fun card.

The results showed that the problem-solving ability of students presenting data through RME learning assisted with fun cards achieved mastery learning more than 75%, ie 100% of test-takers who reached minimum mastery criteria, and the problem-solving ability of students who received RME learning assisted with fun cards was better than problem-solving skills of students who obtain PBL learning. That is because students get RME learning with fun cards that can improve students' problem-solving abilities.

This is in line with Noviana's research results (2013). The results of the study show that through learning Realistic Mathematics Education students can develop their communication and problem-solving ability because in Realistic Mathematics Education learning students are required to be able to play an active role in group discussions and creatively find solutions from the problems raised, interact with friends and teachers and exchange ideas so that their insights and thinking develop. This opinion is reinforced by the research conducted by Tandililing (2012) which states that learning using the RME approach can improve students' mathematical problem-solving abilities.

The factor that influences the success of learning with Realistic Mathematics Education is because it creates contextual and realistic learning. This is because in learning students are required to solve problems with the stages of problem-solving, write down what information is known and asked, determine the strategy and write the solution, then recheck the strategy and solution, then write a conclusion of the problem. Other things that cannot be ignored are giving student worksheet, fun cards, and quiz materials for presenting data, teacher assistance in providing stimulus so that students can find solutions to problems and other things that are not observed by researchers that can improve students' problem-solving..

In addition, problem exercises are proven to improve problem-solving abilities with a note that the quantity and quality of questions must be sufficient. The exercises are done in groups and individually. Group practice exercises are done when working on fun cards, with groups allowing students to exchange ideas and help one another. Individual problem exercises are done when working on quizzes, individual problem exercises allow students to improve their problem-solving abilities.

In addition to learning with the Realistic Mathematics Education approach, fun cards are also used in learning that contributes to the success of students' problem-solving abilities, the use of fun cards has a positive impact on students' problem-solving abilities. This is in accordance with the opinion of Hudojo (2005) which states that the use of card media for learning media has several advantages, namely: (1) students will like to solve problems based on their own experiences, this is because students are required to do it according to their abilities ; (2) psychological principles are fulfilled namely the concept or generalization from concrete to abstract things; (3) students can find concepts so that students can transfer to other relevant problems; (4) can increase student activity, this is because it allows students to work together in the sense of exchanging ideas.

The results showed that learning responsibility had a positive effect on students' problem-solving abilities. So the higher the level of student learning responsibility, the higher the student's problem-solving ability and so do the contrary. In this study, the influence of learning responsibilities is because the researcher applies RME learning with fun cards, although this does not rule out the possibility of other factors.

Determination of research subjects used purposive sampling techniques. After obtaining the results of students grouping based on responsibility categories, written test results in mathematical problem-solving abilities, student activeness during mathematics learning, and suggestions from class teachers, then two subjects were chosen to represent each category of responsible attitude. Based on the results of the grouping of the learning responsibility of the experimental group students, six research subjects were chosen.

3.1. Analysis of Problem-Solving Ability with High Responsibility

Subjects with high-responsibility can meet each indicator of problem-solving ability. The selected subjects were 2 students. Indicator analysis of students with a high responsibility attitude is able to write what is known and asked of the problem in their own sentences, able to write a solution chosen in solving problems coherently and completely, able to carry out calculations in accordance with the strategy/steps of problem-solving that has been made, able to re-examine the results obtained and write the conclusion of the problem properly.

This is in line with the results of the series of regressions tests in this study which concluded that learning responsibility has a positive effect on students' problem-solving abilities. In learning, students from high learning responsibility group are very active in small and classical group discussions, are more confident both in asking and responding without being appointed first, are disciplined in collecting assignments, and can participate in all learning activities very well. The attitude possessed by students with high learning responsibilities is thought to be one of the factors that result in students having good problem-solving abilities with information on achieving indicators of students' problem-solving abilities that have been described previously.

3.2. Analysis of Problem-Solving Ability with Medium Responsibility

Subjects with medium learning responsibility, both of them can meet the four indicators of problem-solving ability but with deficiencies, namely being able to write what is known and asked of the problem in their own sentences, unable to write a chosen solution to solving problems coherently and completely, less able carry out calculations in accordance with the strategy/steps in solving problems that have been made, able to re-examine the results obtained and write the conclusion of the problem properly.

This is in line with the results of the series of regressions tests in this study which concluded that learning responsibility has a positive effect on students' problem-solving abilities. In learning, students from medium learning responsibility groups are only active in small group discussions and there is no initiative to be active classically or respond to teachers without being appointed, occasionally late in collecting assignments, and overall being able to participate in all learning

activities properly. The attitude of students with moderate learning responsibilities is thought to be one of the factors that result in students having good problem-solving abilities with information on achieving the indicators of students' problem-solving abilities described earlier.

3.3. Analysis of Problem-Solving Ability with Low Responsibility

Subjects with low learning responsibility, both of them have not been able to meet the four indicators of problem-solving skills because there are still many shortcomings, namely not able to write what is known and asked of the problem with the sentence itself, less able to write the chosen solution to solving problems coherently and complete, less able to carry out calculations in accordance with the strategy/steps in solving the problem that has been made, less able to check the results obtained and write the conclusion of the problem properly.

This is in line with the results of the series of regressions tests in this study which concluded that learning responsibility has a positive effect on students' problem-solving abilities. In learning, students from low learning responsibility groups are less active in both small and classical group discussions, are often late in collecting assignments, and as a whole have not been able to follow all learning activities properly. Students in the learning responsibility group are low, often left behind in each learning activity. The attitude possessed by students with low learning responsibilities is thought to be one of the factors that result in students having poor problem-solving abilities with information on achieving the indicators of students' problem-solving abilities that have been described previously.

4. Conclusion

Based on the formulation of the problem and the results and discussion, it can be concluded that: (1) students' problem-solving abilities through the Realistic Mathematics Education learning approach assisted with fun cards meet classical learning mastery criteria, (2) the problem-solving abilities of students who obtain Realistic Mathematics Education Learning assisted with fun card is better than the students who obtain Problem Based Learning, (3) learning responsibilities have a positive effect on students ' problem-solving abilities in learning Realistic Mathematics Education assisted with fun cards, (4) students' problem-solving abilities in terms of responsibility through the RME learning approach assisted with fun cards as follows (a) Subjects with lower learning responsibilities group are less able to solve problems with the completion steps that have been made, students still have difficulty in writing what is known and asked in the problem, and are less able to solve problem carefully; (b) Subjects with the middle learning responsibility group are able to solve problems with the steps of completion that have been made, less able to solve problems carefully; (c) Subjects with high learning responsibility group are able to solve problems with the completion steps that have been made, able to solve problems correctly and smoothly.

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