

The Role-Playing Problem-Posing Learning to Improve Students' Emotional Intelligence and Mathematics Problem-Solving Skills

Diyanti Jati Pratiwi^{1*}, Tatag Yuli Eko Siswono², Neni Mariana³
^{1,2,3}Universitas Negeri Surabaya, Surabaya, Indonesia



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ABSTRACT

The research is aimed to observe the effect of role-playing problem-posing learning methods on emotional intelligence and mathematic problem-solving ability. This research was a quasi-experimental research with a non-equivalent pretest-posttest control group design. The sample was chosen by random sampling with Primary 4A 17 students as a control group class and Primary IV B 17 students as an experiment group class. The Data collection techniques was done through emotional intelligent questionnaire and mathematics problem-solving test. T-test was used as an analysis technique due to data collection before and after the research program. Based on T-test analysis for emotional intelligence and mathematic problem-solving ability, the data showed there was no difference before and after research in both control and experiment class with the value of sig. 2 tailed $0,303 > 0,05$ for emotional intelligence and mathematic problem-solving ability got sig. 2 tailed scores $0,908 > 0,05$. The differences shown in control and experiment classes after learning method in the research with the value of sig. 2 tailed $0,02 < 0,05$ for emotional intelligence and mathematic problem-solving ability got sig. 2 tailed scores $0,01 < 0,05$. In this research, the learning method was the only thing which caused differences, so the researcher concluded that there was an effect of role-playing problem posing learning method to students' emotional intelligence and mathematics problem-solving ability.

INTRODUCTION

Mathematic learning process should be meaning full for students, Kulm stated that in order to make the learning of mathematics meaningful, teacher are responsible for choosing and posing tasks that engaged students actively in building their understanding, mathematical thinking, and confidence (Rosli et al., 2013). Role playing is one of a good choice to engaged students in knowledge because it help the students involved, not only learning about material but learning also to integrate the knowledge in action, by addressing problem, exploring alternatives, posing the problem and seeking novel and creative solution. Role playing is the best way to develop skills of initiative, problem posing, communication and problem solving. Problem-solving skill is a complex acts that affected a wider scope including their intelligent aspects. During the learning process of developing emotional intelligence, students are also triggered to have their own problems handled by utilizing their problem-solving skills (Mercer & Gkonou, 2017).

Emotional intelligence has become one of the important thing an educator needs to consider. It is a huge deal to add the materials in the learning process by remembering how students are supposed to have emotional intelligence during the interaction process with their peers as well as facing the problem inside their society (Basumatary, 2021). A child psychologist stated that some children who got high exposure to emotional intelligence will most likely become happy, confident, popular, and more

successful in school (Brackett & Salovey, 2006). These children are the ones who will have a big opportunity to create a big achievement at school, have a big circle of friendships, and get a successful life.

There were some differences from the mathematics learning at elementary school 3 Ngantru, Trenggalek. It has shown a teacher-centered learning process. They directly introduce mathematics formulas and questions examples to the students, without dragging the students into their own thinking and finding. The main objective of the teacher is finish the lesson, and the main goal is student score. Within the teacher-centered learning process, students' interaction and mental activities were more often forgotten and did not become the main objectives during class (Lesh, 1981).

Instead, students' final result has become the main goal that teacher had paid attention to towards the mathematics exercise given (Akinmola, 2014; Phonapichat et al., 2014). The teacher has also explained that students' mathematics cognitive skills are at the mediocre level, whereas in reality math proficiency is so much needed. Moreover, the mathematics learning process during the pandemic has become more of a challenge. Students often tried so hard to understand and concentrate to answer a question given by the teacher. Once it gets wronged, the peers will think it was a fun moment to see their friends state the incorrect answer. Therefore the feelings of getting humiliated by others have created a loss of motivational learning towards mathematics (Khoerunisa et al., 2020). Based on the interview done, almost half of the students gave the same response towards math; they felt bored, the exercise was too complicated, and they did not feel to master the subjects due to the new asynchronous teaching process (Yayuk et al., 2020). By dent of most of the reasons, it was not a surprise at all that the students saw mathematics as a hard and dreadful subject.

When students are faced with a mathematics problem they are going through a process of understanding the issue that emerges based on the seen fact (problem-posing), and how to solve it (Allchin, 2013; Anwar et al., 2012). Therefore, for the fourth grade, the chapter on Plane within the sub-chapter of area and circumstance will require more discussion and time consumption, thus this material is considered to be suitable to be taught using an integrative thematic approach (Supriyanto, 2014). This way, the mathematics learning objectives cannot be achieved in the first place. Hence, under the role-playing problem-posing, students will be able to get deepen the life value lesson and are expected to solve their own problem later in the future (Freeman & Wash, 2013). As this learning process will lead the students to have a clear view of their own problem, have a role in it, and condition themselves into the problem, this will help them strengthen their problem-solving skills.

From the previous discussion, it can be concluded that role-playing problems-posing will level up the students' problem-solving skills in maths and emotional intelligence will influence their character development process throughout the learning process (Walkington & Bernacki, 2014; Allchin, 2013). Based on the conditional gap found during the observation, the researcher decided to create a study entitled "The role-playing problem-posing learning process to improve students' emotional intelligence and mathematics problem-solving skills". This research is aim to analyze whether there is a difference in problem solving ability and emotional intelligence in the control class and the experimental class after using the role-playing problem-posing method.

RESEARCH METHOD

General Background

Research has been done using a quantitative approach. The specific design used is a quasi-experimental design with a non-equivalent control group design. The objectives of this research are to compare the students' emotional intelligence and their mathematics problem-solving skills. The comparison was done between the control group and the experimental group. These two groups are conditioned to have almost the same characteristics to help execute the research. Treatments are given to the experimental group only so that the researcher can define the differences between both of the groups with and without the treatments.

Role-playing is the first treatment given to the experimental group. The students are asked to have a scenario that contains a problem. To trigger students' problem-solving skills, they are asked to exchange scenarios and share their thought about how to solve each other's problems to create a further discussion towards the treatment. On the other hand, the control group is having a more conventional model of learning. The independent variable in the experimental group is the role-playing problem posing method of teaching, while in the control group the researcher used a teacher-centered method of teaching. Within the experimental group, the dependent variables are emotional intelligence and problem-solving skills, while the control variables are learning materials, synchronous meeting durations, and teachers' roles

Participants

The researcher chooses the students from the fourth grade of elementary school 3 Ngantru, Trenggalek (Indonesia) as the subject of this research. The characteristics of the students have become the strongest reason to choose this level to become the sample of the research. Most of the students are having an asynchronous meeting during the pandemic. The length of their mathematics classes has also become a consideration. Since math is one of the most important subjects to learn at school, the researcher thought of finding the perfect level for problem-solving is important. Moreover, math subjects in the fourth-grade elementary school have been considered to be level up. In this grade, students are expected to have a bigger case of mathematics problems, also preparing themselves for further education such as junior high level. Based on several reasons, the researcher sure fourth-grade is the perfect level to have the test on.

Instrument and Procedures

The data was collected by using a questionnaire with a 1-5 Likert scale. This questionnaire is used to know the students' emotional intelligence. Moreover, to tell students' problem-solving skills in the Plane Chapter, they were given a test that consists of problem-solving questions within their level. The instrument used in this research has been tested and the results showed that the instruments are valid and reliable. There are five main aspects to test students' emotional intelligence. These aspects are; 1) Emotional identification, 2) Emotional management, 3) Self-motivation, 4) Communication development, and 5) Peers emotional analysis. The questions are developed based on these five aspects and expanded into 22 questions. The questionnaire later is filled out by the students by considering these scores of positive questions; very match(5), match(4), neutral(3), doubtful(2), very unlatch(1). Meanwhile, for negative questions, the scores are reversed. Other than that, the researcher also used

an instrument to test students' mathematics problem-solving skills. The data collection process was done by distributing 10 questions consisting of mathematics problems within the Plane chapter specifically to solve the surface and circumference questions. To score students' skills, the researcher prepared a scoring guide to help categorize the aspects. These aspects are; 1) Questions' understanding, 2) Solutions' planning, 3) Problem-solving, and 4) Crosscheck.

The research was conduct for fourth grade students. They were separated into two classes, experiment and control class. After confirming that the data was normally distributed and homogeneous, the researcher used test sheets and emotional intelligence questionnaires to take the data. The research procedure flowchart is in Figure 1.

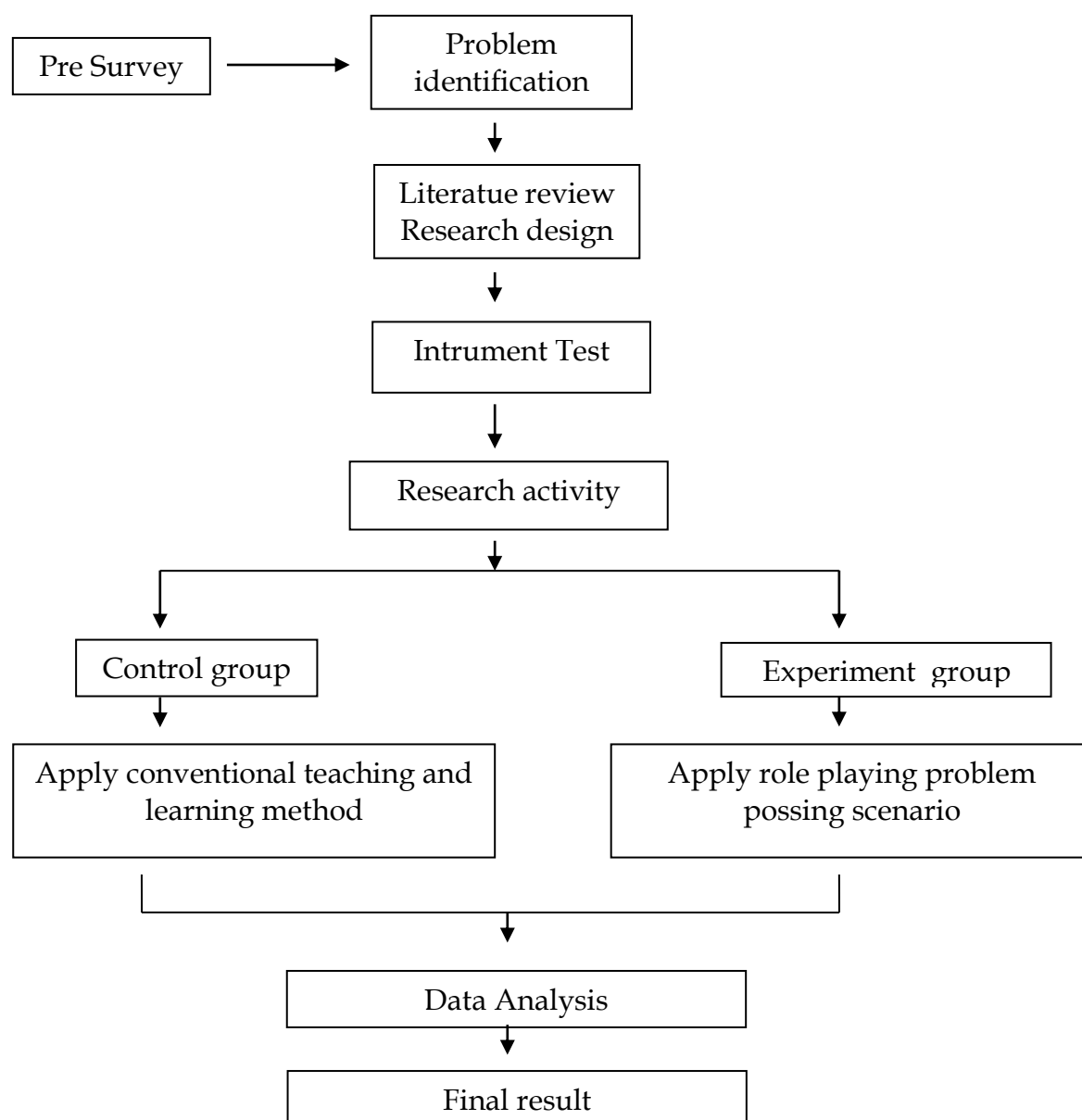


Figure 1. Research procedure.

Data Analysis

The quantitative data that is about to be analyzed are differentiated based on the test results and the emotional intelligence questionnaire from the students. Before analyzing the data, the researcher has done several steps:

- a. Score student's test result within the answer key.
- b. Create a short summary of the answer from the control and experimental group in a form of a table.

The next step ladder will be analyzing students' average scores from both groups based on their problem-solving skills and emotional intelligence by conducting these steps: (1) Perform normality test. The normality test was implemented to see whether the test results data were normally distributed or not. Normality test was carried out on pre-test and post-test using the Kolmogorov-Smirnov normality test with the help of SPSS 25. (2) The homogeneity test used the one-way ANOVA test with the help of SPSS 25. The test was carried out to determine whether the data was homogeneous or not. The basis for making decisions to determine whether the sample variance is normal; (1) if the significance value >0.05 then H_0 is rejected or the variance of the data group is the same, and (2) if the significance value is <0.05 then H_0 is accepted or the variance data groups are not the same.

- c. If it is known that the data is normally distributed and homogeneous, then the t-test is executed to test the hypothesis and answer the problem formulation. The t-test is needed to see the significance level between each of the independent variables' influence on the dependent variable in a partial way. This test is performed by looking at the Sig from the Coefficient table on the SPSS output. The basic results of taking a t-test are obtained as follows: (1) If the arithmetic of the t-test has the result of less than ($<$) t table, it can be concluded that the results of the independent variable have no effect on the dependent variable or sig value greater than the significance value of 0.05 ($\alpha = 5\%$). (2) If the arithmetic of the t-test has the result of more than ($>$) t table, it can be concluded that the results of the independent variable have an effect on the dependent variable or sig value smaller than the significance value of 0.05 ($\alpha = 5\%$).

RESULTS AND DISCUSSION

The study was done in February 2021. The researcher found out that students are still having difficulties in understanding some of the materials in the Plane Chapter such as area and circumference. The biggest cases of students' slow learning are the pandemic and teacher centered method. Distance learning is harder to get done when it comes to mathematic learning (Akar & Erden, 2021). The concept for each introduced chapter was considered unclear as the whole teaching process was numeric oriented. During the teaching process, the researcher found differences between questions and exercises given. Research done by Darma et al., (2018) has stated that students' have a greater opinion that a shorter question is easier to solve compared to a longer question. Another consecutive reason found by the researcher is the number of synchronous meetings done within the whole semester. Many researchers such as Akar & Erden (2021) and Irfan et al., (2020) argued that teaching mathematics is supposed to be delivered face-to-face to get the students to understand each material and structure, the researcher agrees that it is such a big deal when students are having difficulties during their studies.

Taking the example in the control group, the teacher is not aware of students' understanding during the learning process. Most teachers will use easier methods to teach math during the pandemic (Tezer et al., 2021). Began with providing students with work exercises, the students are told to have them done at home. While in the experimental class, with the help of the parents, the students are making a small group within a district scope to have a learning-together experience to help each other studying. Based on Kellems et al., (2019) creating a smaller group discussion may function to help students overcome difficulties during the learning process. It is also seen that students were given a great response, as they can have interaction with their peers. Not only being able to explain directly but can also improve students' cognitive achievement (Myers et al., 2021; Yilmaz et al., 2021). It can as well monitor students' affectiveness. This is proven by statistical data obtained by the researcher.

Statistical analysis

To answer the research question about whether there is a difference in emotional intelligence in the control class and the experimental class after using the role-playing problem-posing method, an independent sample t-test was conducted. This Independent sample t-test was carried out first on the pretest data for the control class and the experimental class. Then continued the independent sample t-test on the experimental class posttest data with the control class posttest data. The level of significance used is 5% or 0.05. This aims to determine the difference in the effect between the experimental class and the control class after being given treatment. The results of the independent sample t-test of the students' emotional intelligence pretest data showed a sig. 2 tailed value, namely $0.303 > 0.05$. This shows that there is no difference between the experimental class and the control class before being given treatment. This is due to the coordination of learning methods and methodologies for teachers in both classes. The learning media is the same, the learning model is similar even though the teacher is different and of course, there are different ways of explaining.

As it was proven that the two classes had the same initial conditions, treatment was given to the experimental class. To answer the research questions, the researcher conducted an independent simple t-test. The results shows that the students' emotional intelligence show the value of sig. 2 tailed was $0.02 < 0.05$. It can be concluded that there is a significant difference between the control class and the experimental class after being given treatment. The difference is also shown from the results of the average scores in the experimental class and control class. The control class has an average score of 79.41 which is lower than the experimental class with an average score of 89.88 on the emotional intelligence test results.

Table 1. Emotional intelligence table result.

	Class	N	Mean	Std. Deviation	Std. Error Mean
Emotional Intelligence	Experimental class post test	17	89.88	10.487	2.544
	Control class post test	17	79.41	7.159	1.736

As emotional intelligence is further discussed in this section, its definition still needs to be understood. Emotional intelligence is required for the performance of decision-making in risk related tasks (Vaughan et al., 2018). These might also have a relation with what so-called 'street-smart' or 'common-sense' (Jalaluddin et al., 2020; Khoerunisa et al., 2020). Seen from the research result, the experimental group has shown a great difference after getting the treatment. As their emotional intelligence skill was drilled during the teaching process students' are required to create new symptoms of learning. This is in line with Cartwright et al., (2018) that argued emotional intelligence has taken a big part in academic success by reason of it can trigger students' cognitive skills.

An independent sample t-test was also conducted to test the differences in students' mathematical problem-solving abilities. The results show that the students' problem solving abilities intelligence pretest data showed a sig. 2 tailed value, namely $0.908 > 0.05$. This indicates that there is no difference between the experimental class and the control class before being given treatment. After it was known that there was no significant difference between the experimental and control classes, an independent sample t-test was conducted to prove the hypothesis in this study. The results also show with the help of SPSS 25 for mathematical problem-solving ability showed a sig. 2 tailed value of $0.01 < 0.05$. Based on these data, it can be concluded that there is a significant difference in the average problem-solving ability between the results of the post-test in the control class and the post-test in the experimental class. The data was strengthened by testing the average post-test scores for the control class and the experimental class. The results of processing the mean of the research data show that the mean post-test data for the experimental class is 106.88, which is greater than the control class, which gets an average score of 95.24 with a maximum score of 200 points.

Table 2. Problem solving table result.

	Class	N	Mean	Std. Deviation	Std. Error Mean
Problem Solving Abilities	Experimental class post test	17	106,88	9,280	2,251
	Control class post test	17	95,24	9,621	2,333

Mathematics is seen as a difficult subject that students need to acquire. In line with Yayuk et al., (2020) who stated that math's will teach students to have logical, analytical, systemic, critical, and creative ways of thinking to solve problems. By learning mathematics, students are introduced to a better way of solving each question. This term could visualize how students may have the same conditions within a real-life problem (Surya et al., 2017). Learning math's will develop students' logical and analytical thinking. Therefore significant differences were found during the test conducted between the experimental and control groups. Other than that, an analysis done by Phonapichat et al., (2014) discusses how mathematics always required a certain form of numerical or quantitative answer for each different answer. Therefore, learning math may result in an easier understanding of solving math-based problems.

This is in line with Amalia et al., (2017) and Vrinda & Joshith (2018) who explain that problem-solving for students who receive learning with a problem-posing approach has a better improvement compare to students who have conventional learning. Observing the learning process with the problem-posing approach, students are invited to create a

problem that will be solved later. This term will encourage students to understand more about the subjects given (Divrik et al., 2020). In this study, students are also invited to take questions from a role related to the area and circumference of a flat surface in the Plane chapter. Within this learning process students are allowed to not only make problems into question but also to understand other aspects in the form of emotions. These emotions arise from a role and the process of playing different characters (Taub & Azevedo, 2018). Problem-solving to a conflict is also taught in learning with role playing-problem posing. These have functioned so that students are able to improve their own problem-solving skills and emotional intelligence as a provision to enter the real world later. In line with Bosch & Winsløw (2016), there is a significant effect of the use of the role method on students' social skills in Social Sciences. So it can be proven that the role-playing-problem-posing learning method has affected students' emotional intelligence and mathematical problem-solving abilities.

CONCLUSION

From the average value of students' emotional intelligence and Independent sample t-test, it is known that there is an effect of the role playing-problem posing learning model on the emotional intelligence of fourth-grade elementary school students. There is a significant difference between the control class and the experimental class. It is visible from the results that the role playing-problem posing model can be seen towards students' mathematical learning processes in the fourth grade of elementary school. Role-playing-problem-posing is a teaching methods to trigger students' emotional intelligence and mathematical-problem solving ability. This method will give students a chance to be confident compare to traditional learning method. This method also teach the students in making their own best decision by solving the problems, in order in the future they can solve their own life problem. Future studies should be exploring the complex link between problem posing and role playing learning method toward problem solving abilities. Also a complex link between emotional intelligent and problem solving abilities.

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***Diyanti Jati Pratiwi (Corresponding Author)**

Universitas Negeri Surabaya
Jl.Unesa Lidah Wetan, Surabaya, Indonesia
Email: diyantijatipratiwi@gmail.com

Prof. Dr. Tatag Yuli Eko Siswono, M.Pd.

Universitas Negeri Surabaya
Jl.Unesa Lidah Wetan, Surabaya, Indonesia
Email: tatagyes@gmail.com

Neni Mariana, S.Pd., M.Sc., Ph.D.

Universitas Negeri Surabaya
Jl.Unesa Lidah Wetan, Surabaya, Indonesia
Email: nenimariana@unesa.ac.id

Attachment

EMOTIONAL INTELLIGENCE QUESTIONNAIRE

Questionnaire instruction

1. Write your name and attendance number in the space provided.
2. Read the question carefully
3. Answer the question by choosing one of five alternative answer
 VM : very match
 M : match
 N : neutral
 D : doubtful
 VU :very unmatch
4. Answer by giving a checklist (√) in the selected column.

Name :

Attendance number :

EMOTIONAL INTELLIGENCE QUESTIONNAIRE

No	Question	Alternative answer				
		VM	M	N	D	VU
1	I can feel sad, angry and happy					
2	I know why I am sad					
3	I make wrong decision when I am mad oftenly					
4	I can manage my self when I am disappointed					
5	I feel sad when my friend					
6	I feel sad and down because I have a lot of task from school					
7	I study hard because I want to get a good score					
8	If I find a difficult question I will not give up and find the answer					
9	I am able to do the task independently either at school or at home					
10	I play while other friend doing group work					
11	I have many friends either at school or at home					
12	Many friends are hate me					
13	I want to forgive the guilty friend					
14	I fight with friend					
15	I want to make friend with anyone					
16	I am happy to be involved in school community service					
17	I want to hear other opinion					
18	I carry out class picket assignment					
19	I value group opinion					
20	Discussion is important					
21	I help family member to do house work					
22	I make a donation					

MATHEMATICAL PROBLEM SOLVING ABILITY RUBRIC

Name :
Class :

Test number	Aspect				Skor	Description
	Understand the problem	Planning a solution	Solve the problem	Crosscheck		

Class Teacher

.....

RUBRIC SCORING GUIDELINE FOR PROBLEM SOLVING ABILITY

Rated Aspect	Reaction to questions	Score
Understand the problem	Unable to understand the question / no answer	0
	Able to understand the problem well	1
Planning a solution	No solutions steps	0
	Planned the wrong solution step with no result	1
	Planned the solution with unfinished steps	2
	Using a certain completion step but leading to the wrong final answer	3
	Use the correct solution steps and find the right answer	4
Solve the problem	No answer	0
	Solve the problem with unclear solution steps	1
	There is a solution, unfinished solution step	2
	Solve the problem with the certain wrong step and wrong counting	3
	Solve the problem with the right steps but get the wrong final answer	4
	Solve the problem with the correct steps and find the correct answer	5
Crosscheck	No crosscheck	0
	Checking process only for the answer	1
	Checking process for the steps	2
	Perfect checking process, check the answer and the steps	3