The Effect of Implementing Mathematics Realistic Education (RME) into Mathematics Learning Outcomes Inspected from the Emotional Intelligence of Students at Krian 1 Highschool Sidoarjo

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ARTICLE INFO	ABSTRACT
Published Online: **25 May 2023**	This study was motivated by a perspective that mathematics is a difficult lesson, thus, affecting math learning outcomes of students. This study aimed to find out if implementing Realistic Mathematics Education (RME) affects mathematics learning outcomes inspected from students' emotional intelligence at Krian 1 Highschool Sidoarjo. This study used quantitative approach with experimental design method. Data were collected in the study through tests and questionnaires in which questionnaires were used to measure emotional intelligence while tests were functioned to collect students' learning outcomes. After the study was conducted, the hypothesis testing indicated that the RME majorly affected learning outcomes of students with high emotional intelligence which acquired from the 17.758 score of F_{count} with 0.002 of F_{sig}. Next, the second most affected was moderate emotional intelligence in which an F_{count} score of 0.917 with 0.449 of F_{sig} was acquired. Low emotional intelligence was not affected in which an F_{count} score of 0.917 with 0.449 of F_{sig} was obtained.
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KEYWORDS: Realistic Mathematics Education, Emotional Intelligence, Learning Outcomes

I. INTRODUCTION

Education is a primary need for every human being. Education also has a massive impact in improving the quality of nation and state. A proper education will give birth to a future generation that is smart can find solutions of various problems. Students perceive mathematics as a difficult and tedious lesson. This condition is supported by the average outcomes of mathematics learning of one of the XI classes at Krian 1 Highschool Sidoarjo which only amounted to 70.88 and based on the results of interviews with some students who expressed that math is not an easy subject and it takes a long time to understand a material, making it tedious during the teaching-learning activities. This thought will give an adverse impact for future development of mathematics education. In such a situation, teachers must be able to take an action to get around the learning process Click or tap here to enter text.. A fun math learning must be prioritized by teachers. The learning process also includes the interactions among students, between students and teachers, and between students and learning media. Such interactions will support students in the learning process, thus achieving the expected competencies.

Underperforming students were often found in the learning process at schools. One of the student's internal factors that determines learning outcomes is the aspect of emotional intelligence [3], [4]revealed that emotional intelligence greatly affects the process and success of student's learning. Without emotional intelligence, students will give up easily, not having motivations to learn, and not capable of focusing their attention on learning materials. A high emotional intelligence will produce students with achievements and might improve their learning outcomes [5], [6]

Based on the study of [7], [8], [13] entitled Profil Pemahaman Konseptual Mahasiswa dalam Memecahkan

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Masalah Matematika dengan KE Rendah, it was stated that educator in mathematics learning should invite students to control their emotions when solving an issue. A problem solving that drives students to be emotionally active, using and controlling their emotions to be happy in facing mathematical problems and supporting the students to be willing to solve mathematical problems [2], [9].

A non-optimal learning will turn students to be lack in learning motivation that results in low learning outcomes and unachieved learning goals. Therefore, implementing a non-monotonous, innovative, and creative learning with specific approaches is essential to improve student's learning motivation. Similar to methods, a learning method might be good for learning purposes. Each method has their strengths and weaknesses. A method can be considered good for a topic delivered by a specific teacher but can be unsuccessful if delivered by another teacher although they have the same purpose, i.e., achieving the expected competencies [9] expressed that learning success can be affected by both internal and external factors of students.

According to [10] stated that "realistic mathematics education is a learning approach that is based on using mathematical problems taken from real-life experiences to represent abstract concepts of mathematics". According to [11] expressed that "within realistic mathematic learnings, studying can be defined as doing math work by solving various daily problems as an important part". According to

[12] also stated that "if children learning math separately from their daily experiences, they will soon forget and unable to apply them in math". According to [12], the steps in implementing realistic mathematics education encompass 1) understanding contextual problems; 2) solving contextual problems; 3) comparing and discussing answers; 4) drawing conclusions.

Implementing Realistic Mathematics Education (RME) is expected to provide impacts on improving student's learning outcomes in mathematics learnings. Learning outcomes mastered by students must be fully attached to them, and the knowledge owned should last long in their mind, not to be understood and remembered temporarily only. As described above, this paper was arranged with a reason to discover the effect of implementing Realistic Mathematics Education (RME) into mathematics learning outcomes inspected from high, moderate, and low emotional intelligence.

II. RESEARCH METHOD

This study fell into quantitative research because the study acquire data in the form of number and the data analysis was done through statistics. The research method used in the study was experimental design with quasi experiment as a study that does not fully control the studied variables. Pretest-Posttest Control Group Design was applied as the research design.

Group	Questionnaire	Approach	Test Result
Experiment	O_1	X	O_2
Control	O_1	Y	O_3

Note:

X: Learning by implementing Realistic Mathematics Education (RME)

Y: Learning by implementing Conventional Approaches

O_1: Questionnaires given to experiment and conventional classes.

O_2: Results of the test provided to the experiment class.

O_3: Results of the test provided to the control class.

The researchers have conducted a study and data collecting on November 1st, 2022, to December 1st 2022 at Krian 1 Highschool Sidoarjo. XI class students of Krian 1 Highschool Sidoarjo were the population in the study which amounted to 12 classes, and the sample used in the study was XI-8 and XI-7 class students as the experiment and control classes.

This study used test questions and questionnaires as the instrument of test method for learning outcome. Test questions mean the questions or exercises used to measure a skill of a student. Questionnaires are the instrument given to students that contained questions regarding students' emotional intelligence. The data were analysed through

ANOVA test with normality and homogeneity tests as the prerequisites. After the prerequisite tests were performed, the next step was testing the hypotheses as the last stage to draw conclusions using the ANOVA test equation.

III. RESEARCH RESULT

Dependent and independent variables were variables raised in the study. Independent variables in the study were Realistic Mathematic Education and Conventional Approaches with Emotional Intelligence as the control variable, while the dependent variable was mathematics learning outcomes. The data of mathematics learning outcomes of students were obtained through math test results about external common tangent to two circles.

Before conducting data collection, the researchers validated the research instruments which consisted of test questions and questionnaires. The purpose of this validation is to receive inputs regarding the downside of the questionnaires that will be used for data collection. The inputs were analysed and applied to revise the instrument so that it is suitable for use in

the study. The validation process was conducted on experts or lecturers who are able to validate the instrument.

After the data from the results of questionnaires and learning outcomes were obtained, the data processing was done to determine categories of emotional intelligence, which resulted in high, moderate, and low emotional intelligence categories. Mean scores of experiment and control classes were acquired, namely $\overline{X} = 63.02$ and $\overline{X} = 59.83$. The standard deviation scores of both experiment and control classes were $S = 4.46$ and $S = 5.08$ respectively. Then, the results of emotional intelligence questionnaires will be categorized in high, moderate, and low levels. The researchers categorized emotional intelligence based on the results of questionnaires with the following conditions.

- **High Category**

Experiment Class (XI-8)	Control Class (XI-7)
$X \geq M + 1 \cdot SD$ $X \geq 63.03 + 4.46$ $X \geq 67.49$	$X \geq M + 1 \cdot SD$ $X \geq 59.83 + 5.08$ $X \geq 64.91$

- **Moderate Category**

Experiment Class (XI-8)	Control Class (XI-7)
$M - ISD \leq X < M + 1 \cdot SD$ $63.03 - 4.46 \leq X < 63.03 + 4.46$ $58.57 \leq X < 67.49$	$M - ISD \leq X < M + 1. SD$ $59.83 - 5.08 \leq X < 59.83 + 5.08$ $54.75 \leq X < 64.91$

- **Low Category**

Experiment Class (XI-8)	Control Class (XI-7)
$X < M - 1. SD$ $X < 63.03 - 4.46$ $X < 58.57$	$X < M - 1. SD$ $X < 59.83 - 5.08$ $X < 54.75$

Based on the data processing of emotional intelligence questionnaires of students in XI-8 and XI-7 classes of Krian 1 Highschool Sidoarjo, a table on high, moderate, and low categories of emotional intelligence can be shown as follows.

Table 1. The Recapitulation of Students' Emotional Intelligence Categorization

Category	Total	
	Experiment Class (XI-8)	Control Class (XI-7)
High Emotional Intelligence	5 students	6 students
Moderate Emotional Intelligence	27 students	23 students
Low Emotional Intelligence	3 students	7 students

After the categorization of emotional intelligence has been acquired, data analysis was conducted with prerequisite tests, namely normality and homogeneity tests. A significance level of 0.05 was applied in these tests. After measured using SPSS version 16 for Windows, Kolmogorov-Smirnov score result was obtained. If > 0.05 is applied, it can be determined that the data normally distributed. The scores obtained from the normality test on emotional intelligence questionnaires for experiment and control classes were 0.200 and 0.085. While the scores of normality test on learning outcomes of experiment and control classes were 0.200 and 0.106. These four acquired scores were > 0.05, therefore, the data used were normally distributed.

After the normality test was implemented and the data were determined as normally distributed, then homogeneity test was performed to find out if the acquired data were homogenous or not. SPSS version 16 for Windows was used for this measurement. If > 0.05 is applied, the data can be determined as homogenous. The scores obtained from implementing homogeneity test were 0.695 for emotional

intelligence questionnaires and 0.725 for learning outcomes. Of these two homogeneity test results, both homogeneity test result scores were greater than 0.05, therefore, the data used can be determined as homogenous. For the next data analysis, the ANOVA test was performed to test the hypotheses. This test was applied to discover the extent to which independent variables affect dependent variable. The testing criteria was if the significance value < 0.05, then H_o is rejected, and H_a is accepted at the significance level of $\alpha = 0,05$.

Table 2. The Hypothesis Test on Students' Learning Outcomes Based on High Emotional Intelligence

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	322.115	2	161.057	17.758	.002[a]
Residual	63.485	7	9.069		
Total	385.600	9			

a. Predictors: (Constant), Class, Emotional Intelligence

b. Dependent Variable: Learning Outcomes

According to Table 2, an F_{count} score of 17.758 is obtained with 0.02 significance score of F's, which means that the score is lower than 0.05, thus H_0 is rejected. It can be interpreted that Realistic Mathematics Education affects mathematics learning outcomes inspected from high emotional intelligence.

Table 3. The Hypothesis Test on Students' Learning Outcomes Based on Moderate Emotional Intelligence

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1605.978	2	802.989	52.549	.000[a]
Residual	718.202	47	15.281		
Total	2324.180	49			

a. Predictors: (Constant), Class, Emotional Intelligence

b. Dependent Variable: Learning Outcome

According to Table 3, an F_{count} score of 52.549 is obtained with 0.000 significance score of F, which means that the score is lower than 0.05, thus H_0 is rejected. It can be interpreted that Realistic Mathematics Education affects mathematics learning outcomes inspected from moderate emotional intelligence.

Table 4. The Hypothesis Test on Students' Learning Outcomes Based on Low Emotional Intelligence

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	80.739	2	40.369	.917	.449[a]
Residual	264.150	6	44.025		
Total	344.889	8			

a. Predictors: (Constant), Class, Emotional Intelligence

b. Dependent Variable: Learning Outcomes

According to Table 4, an F_{count} score of 0.917 is obtained with 0.449 significance score of F, which means that the score is greater than 0.05, thus H_0 is accepted. It can be interpreted that Realistic Mathematics Education does not affect mathematics learning outcomes inspected from low emotional intelligence.

IV. DISCUSSION

Analysis results of the study indicated that implementing realistic mathematics education significantly affected mathematics learning outcomes inspected from students' emotional intelligence.

Based on the inspection on high emotional intelligence, an F_{count} score of 17.758 with 0.002 F sig was acquired. If $F_{count} <$ sig (0.05) then H_{01} is rejected and H_{a1} is accepted. Therefore, with a score of 0.002 < sig (0.05), high emotional intelligence significantly affected the implementation of realistic mathematics education into mathematics learning outcomes.

Based on the inspection on moderate emotional intelligence, an F_{count} score of 52.549 with 0.000 F sig was acquired. If $F_{count} <$ sig (0.05) then H_{02} is rejected and H_{a2} is accepted. Therefore, with a score of 0.000 < sig (0.05), moderate emotional intelligence significantly affected the implementation of realistic mathematics education into mathematics learning outcomes.

Based on the inspection on low emotional intelligence, an F_{count} score of 0.917 with 0.449 F sig was acquired. If $F_{count} <$ sig (0.05) then H_{03} is accepted and H_{a3} is rejected. Therefore, with a score of 0.449 < sig (0.05), low emotional intelligence did not affect the implementation of realistic mathematics education into mathematics learning outcomes.

According to the results of hypothesis testing, high emotional intelligence was found to be the most influential in implementing realistic mathematics education into mathematics learning outcomes in terms of high, moderate, and low emotional intelligence in which an F_{count} score of 17.758 with 0.002 F sig was acquired and the highest mean scores of learning outcomes obtained from experiment and control classes were 92.8 and 83.2 respectively. Then, moderate emotional intelligence was the second most influential factor in which F_{count} score of 52.549 with 0.000 F sig was acquired and the mean scores of learning outcomes obtained from experiment and control classes were 86.7 and 77.7 respectively. Low emotional intelligence has no effects in which F_{count} score of 0.917 with 0.449 F sig was acquired and the mean scores of learning outcomes obtained from experiment and control classes were 78.3 and 70.6 respectively.

V. CONCLUSION AND RECOMMENDATION

As a result of discussing research results regarding the implementation of Realistic Mathematics Education into mathematics learning outcomes inspected from students' emotional intelligence, it can be concluded that:

a. Of the 35 experimental class samples and 36 control class samples, there were 11 students consisting of 5 experimental class students and 6 students from the control class who had high emotional intelligence. On statistical tests conducted, high emotional intelligence generated an F_{count} score of 17.758 with 0.002 F sig was obtained in which 0.002 < 0.05, so H_{01} was rejected. This result indicated that implementing Realistic Mathematics Education affected mathematics learning outcomes inspected from high emotional intelligence at Krian 1 Highschool Sidoarjo.

b. Of the 35 experimental class samples and 36 control class samples, there were 50 students consisting of 27 experimental class students and 23 students from the control class who had moderate emotional intelligence. On statistical tests conducted, moderate emotional intelligence generated an F_{count} score of 52.549 with 0.000 F sig was obtained in which 0.000 < 0.05, so H_{02} was rejected. This result indicated that implementing Realistic Mathematics Education affected mathematics learning outcomes inspected from moderate emotional intelligence at Krian 1 Highschool Sidoarjo.

c. Of the 35 experimental class samples and 36 control class samples, there were 10 students consisting of 3 experimental class students and 7 students from the control class who had low emotional intelligence. On statistical tests conducted, low emotional intelligence generated an F_{count} score of 0.917 with 0.449 F sig was obtained in which 0.449 > 0.05, so H_{03} was accepted. This result indicated that implementing Realistic Mathematics Education did not affect mathematics learning outcomes inspected from low emotional intelligence at Krian 1 Highschool Sidoarjo.

Based on the results of the conducted study, the researchers provide the following suggestions:

a. With the availability of RME learning model, teachers can use this learning model and be more innovative with various learning models to avoid students being tedious.

b. Students are expected to exercise their emotional intelligence because high emotional intelligence equals high learning outcomes. [14]

c. This study can be made as a reference for future researchers to conduct further studies as knowledge on different materials and classes.

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