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## THE EFFECT OF EMOTIONAL INTELLIGENCE ON MATHEMATICAL CONCEPTS UNDERSTANDING OF JUNIOR HIGH SCHOOL STUDENTS

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### Abstract:

This study aims to determine the effect of emotional intelligence on the understanding of the mathematical concepts of Junior High School students. This study is a correlational study conducted at SMPN 18 Kerinci with a population of eight grade students SMPN 18 Kerinci. The sample in this study was 59 students selected using a total sampling technique. Data collection instruments used were questionnaires on emotional intelligence and mathematical concepts test. Hypothesis testing used t-test. The findings showed that emotional intelligence influenced the understanding of the mathematical concepts with a determination coefficient of 27.30%.

**Keywords:** Emotional Intelligence, Mathematical Concepts Understanding, Correlational Study

## PENGARUH KECERDASAN EMOSIONAL TERHADAP PEMAHAMAN KONSEP MATEMATIS SISWA SMP

### Abstrak:

Penelitian ini bertujuan untuk mengetahui pengaruh kecerdasan emosional terhadap pemahaman konsep matematis siswa Sekolah Menengah Pertama. Penelitian ini merupakan penelitian korelasional dengan analisis regresi yang dilakukan di SMPN 18 Kerinci dengan populasi siswa kelas VIII SMPN 18 Kerinci. Sampel dalam penelitian ini berjumlah 59 siswa yang dipilih menggunakan teknik total sampling. Instrumen pengumpulan data yang digunakan adalah angket kecerdasan emosional dan tes pemahaman konsep matematis. Pengujian hipotesis dilakukan dengan menggunakan uji-t. Hasil penelitian menunjukkan bahwa terdapat pengaruh kecerdasan emosional terhadap pemahaman konsep matematis dengan koefisien determinasi 27,30%.

**Kata kunci:** Kecerdasan Emosional, Pemahaman Konsep Matematis, Penelitian Korelasional

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## INTRODUCTION

One of many subjects that have very important in the education world is mathematics. Mathematics is the basis of the other sciences' development (Sari, Habibi, & Putri, 2018). By mastering mathematics learning, students can easily learn other sciences such as physics, chemistry, economics, sociology, psychology, medicine, pharmacy, and many other sciences that use basic mathematics (Wulansari, Putra, Rusliah, & Habibi, 2019). Mathematics is the queen of all sciences (Eva & Kusrini, 2016).

There are some very important aspects of learning mathematics, one of them is mathematical concepts understanding. All concepts in mathematics have a strong and clear relationship between concepts, so a concept mastery greatly determines the understanding of the other concepts and can be used in problem solving (Ulandari, Putri, Ningsih, & Putra, 2019; Elita, Habibi, Putra, & Ulandari, 2019). The statement of the Ministry of National Education that one of the objectives of mathematics learning at the junior high school level is to carry out the students' ability to understand the concepts, explain the relationships between concepts and apply mathematical concepts in solving mathematical problems (Purwasih, 2015; Oktari, Putra, Putri, & Ningsih, 2018). The Regulation of Minister of Education and Culture No. 58/2014 concerning the junior high school curriculum also explained that one of the goals of mathematics lessons is to understand the mathematical concepts, explain the relationship between concepts and apply concepts or algorithms flexibly, accurately, efficiently, and precisely in solving the problem (Sari, 2018).

Therefore, developing the ability to understand students' concepts is one of the main goals of learning mathematics in schools (Betyka, Putra, & Erita, 2019). Through mathematics learning, students are expected to be able to understand mathematical concepts well and be able to explain the interrelationships between concepts and apply these concepts. The ability to understand concepts is the initial capital of students to master other more complex skills (Putra, Syarifuddin, & Zulfah, 2018; Yanti, Laswadi, Ningsih, Putra, & Ulandari, 2019).

According to Rosmawati in Putri (2012), revealed that conceptual understanding is the ability of students to master several subjects. Master is not only meant to know, but also to be able to express, understand, and apply. Mathematics learning not only transfers knowledge to students, but also helps students develop mathematical concepts properly (Ariyanto, Aditya, & Dwijayanti, 2019; Putra, Ulandari, & Sepnila, 2020). Mousley in Fatqurhohman (2016) said that The primary teaching activities aim to build mathematical understanding through student activity in the search for mathematical ideas. Therefore, the ability to understand mathematical concepts is one of the important mathematics learning goals as a building pillar for higher order thinking (Sari, Habibi, & Putri, 2018).

According to Wardani in Hidayat & Banjarnahor (2017), the indicators of mathematical concepts understanding included (a) restating a concept; (b) classifying objects according to the specific properties; (c) giving examples and non-examples for the concepts; (d) representing concepts in various forms of mathematical representation; (e) developing the necessary or sufficient conditions of a concept; (f) using, utilizing and selecting specific operating procedures; and (g) applying the concept or algorithm of solving the problem. Sanjaya also explained that the indicators of conceptual understanding included (a) being able to explain verbally about what had been achieved; (b) able to represent the mathematical situation in various ways and find out the differences; (c) able to classify objects according to the requirements that shape the concept; (d) able to apply the relationship between concepts and procedures; (e) able to provide examples and not examples; (f) able to apply concepts simply; (g) able to develop concepts that have been learned (Effendi, 2017).

Researchers take indicators of understanding the concept into five indicators which are slices of the indicators mentioned above, namely (a) students can reexpress the concepts they have learned; (b) students can give examples and not examples of the concepts; (c) students can represent concepts in a representative manner; (d) students can associate a concept with other concepts and (e) students can apply concepts in simple calculations. Even though students' mathematical concepts understanding is fundamental, when the observation conducted at SMP Negeri 18 Kerinci, the level of students' understanding of mathematical concepts was still low. 62% of students cannot answer four items well. Students can not give examples of which the functions and not functions and can not restate a concept that has

been learned. The students also have not been able to represent the concepts in various forms of mathematical representation. This shows a low understanding of the students' mathematical concepts. Based on the interview with mathematics teachers, students still had difficulty completing the questions given by the teacher if the questions were different from the examples given. When the learning held, just 27% of students pay attention to the teacher's explanation, and some other students are not focused. Students are reluctant to work on problems in earnest if teachers do not guide them. Even when they do not know how to solve the problem, they do not try to find an explanation in the book but tend to do it carelessly.

This fact indicates that students are still unable to motivate themselves in understanding and solving math problems. This condition can be caused by several things, including factors from within the student, such as curiosity and students' mood when working the questions. Several factors can affect student learning outcomes, namely, internal factors and external factors. Internal factors are factors that originate from within students, such as motivation, mathematical-logical intelligence, emotional intelligence, attitude, self-confidence, creative thinking, and others. In contrast, external factors are factors that originate from outside of the students', such as facilities and infrastructure, environment, teachers, teaching methods, and others (Khodijah, 2014).

Based on the results of these observations, researchers can analyze some factors that affect students' mathematical concepts understanding below. One factor is emotional intelligence. If this element is embedded in students well, then the subject matter provided by the teacher can be easily accepted by students. That is because concentration patience and precision are necessary to solve mathematics learning problems (Martin, 2011). In managing concentration, patience, and precision, it is necessary to have strong emotional management so that it is not easy to give up to solve the problems in mathematics learning. According to Solovey & Mayer (Eva & Kusriani, 2016), emotional intelligence is a person's ability to recognize, manage their own emotions, and can motivate themselves and be able to recognize the emotions of others and can build relationships with others. In other words, emotional intelligence is the ability of how someone can manage their emotions well, especially in dealing with others. Goleman also stated that emotional intelligence is the ability of how we can recognize our feelings and even the feelings of others, how we can motivate ourselves, how we can manage

emotions well in ourselves and the ability to build relationships with others (Gusniwati, 2015). This emotional intelligence is something that we cannot just have but requires a process of learning it, and the factor that significantly influences one's emotional intelligence is the environment (Allen, MacCann, Matthews, & Roberts, 2014). The environment strongly affects emotional intelligence, is not sedentary, and can change at any time for that role of the environment, especially parents in childhood and teachers in schools significantly affect the formation of emotional intelligence (Gusniwati, 2015).

From the explanation above, the researcher can conclude that emotional intelligence is the ability possessed by someone to recognize their emotions, manage emotions, motivate themselves, recognize the emotions of others, and can build relationships with others. Annurrahman (2009) explains that there are several characteristics of emotional intelligence found in a person in the form of (a) the ability to motivate oneself; (b) endurance to face frustration; (c) the ability to control impulse and not exaggerate pleasure; (d) the ability to maintain moods and to keep stress burdens from paralyzing the will to think, empathize and pray. According to Goleman in Rosida (2016) the indicators to measure emotional intelligence include; (a) recognizing one's emotions; (b) managing emotions; (c) self motivation; (d) empathy; (e) social skills. In this study, researchers used the five indicators above as a tool to measure students' emotional intelligence in learning mathematics.

Emotional intelligence is one of the factors that influence students in learning. Based on Jannah, Susanti, & Benni (2016) explained that students who have high learning achievements at school have good grades because these students are always attentive and always present during class hours. The thing that causes these students is a reflection of good emotional intelligence in students.

Students who can manage emotional intelligence well in themselves will make these students succeed in learning and achieving high achievement (Erasmus, 2013). Likewise, with the results of previous studies that there is an influence between emotional intelligence on learning outcomes (Rosida, 2016) and student mathematics learning achievement (Eva & Kusriani, 2016). Not only that, but this emotional intelligence also influences critical thinking skills and mathematical communication skills (Sulistianingsih, 2017). Therefore, the researcher wants to examine further whether emotional intelligence also affects the ability of students to understand mathematical concepts.

## RESEARCH METHOD

This research was conducted on eighth grade students of SMPN 18 Kerinci, Kerinci Regency, Jambi Province. This research is a correlational study using data analysis techniques using regression. The population in this study was eighth grade students of SMPN 18 Kerinci, while the sampling technique in this study used total sampling. Therefore the population in this study is the same as a sample of 59 students.

The instruments used in this study were emotional intelligence questionnaires and mathematical concepts understanding tests. The emotional intelligence questionnaire consisted of 30 items of statements from five indicators of emotional intelligence, namely; (a) recognizing one's emotions; (b) managing emotions; (c) self motivation; (d) empathy; (e) social skills (Rosida, 2016). While the mathematical concept understanding test consists of 5 item items that represent five indicators of concept understanding namely; (a) students can reveal the concepts they have learned; (b) students can give examples and not examples of concepts; (c) students can present concepts in a representative manner; (d) students can associate a concept with other concepts and (e) students can apply concepts in simple calculations.

Theoretically, this instrument has been validated by two experts, and empirically this instrument has been tested on 26 students who are not included in the research sample. The object of the trial and sample of this study came from populations that were normally distributed, homogeneous, and had average similarities. Researchers categorize the sample based on the emotional intelligence level into three, i.e. low, medium and high, using the three-rank model (Respati & Ernawati, 2007).

Table 1. Range of Emotional Intelligence Criteria

Interval of Score	Category
$x \leq M_i - SD_i$	Low
$M_i - SD_i < x \leq M_i + SD_i$	Medium
$x > M_i + SD_i$	High

To calculate the ideal mean ( $M_i$ ) and the ideal standard deviation ( $SD_i$ ) the following formula is used.

$$M_i = \frac{\text{ideal mximum score} + \text{ideal minimum score}}{2}$$

$$(SDi) = \frac{\text{ideal mximum score} - \text{ideal minimum score}}{6}$$

The data analysis technique used in this study is regression analysis. Before conducting a regression test, the classical assumption test is performed, namely the normality, linearity, and heteroscedasticity tests. After this regression prerequisite test is fulfilled, testing the result using the t-test and evaluating the determination coefficient to see how much impact the independent variable has on the dependent variable.

## RESULTS AND DISCUSSION

The emotional intelligence data of eighth grade students of SMPN 18 Kerinci was obtained from an emotional intelligence questionnaire consisting of 30 statement items and consisting of 59 respondents. The scoring used with four choices has a vulnerable 1 to 4. Scores for positive statements are 4 for always, 3 for often, 2 for sometimes, and 1 for never. For negative statements which are 1 for always, 2 for often, 3 for sometimes and 4 for never.

From the emotional intelligence data that researchers have distributed, an average value of 94.41 is obtained with a minimum value is 72, a maximum value is 111, and a range is 39.

Table 2. The Emotional Intelligence Score Distribution

Interval	Frequency	Percentage
72 - 84	11	18,7%
85 - 97	25	42,3%
98 - 110	22	37,3%
111 - 123	1	1,7%

Table 2 shows the majority of students' answers at intervals of 85 - 97, with a percentage of 42.3%. The ideal mean of emotional intelligence is 75, and the standard deviation is 15.

Table 3. The Students' Emotional Intelligence Score

Interval Nilai	Frekuensi	Relative Frekuence	Category
$x \leq 60$	2	3,2%	Low
$60 < x \leq 90$	19	32,8%	Medium
$x > 90$	38	64%	High

From table 3, it can be seen that 19 respondents are in the medium category, 38 respondents are in the high category, and 2 respondents are in a low category. The concept of understanding data for eighth grade students of SMPN 18 Kerinci was obtained from test questions a concept of circle material consisting of five items with a research sample of 59 students. From the concepts understanding data that researchers have distributed, an average value of 12.90 is obtained with a minimum value is 7 and a maximum value is 19, and a range value is 12.

In this regression analysis, several prerequisite tests must be met, namely the normality, linearity, and heteroscedasticity tests. Data normality test is performed to determine whether each variable is normally distributed or not. This study uses the Kolgomorov-Smirnov statistical test with SPSS 22. The criteria used through the Asymp. Sig (2-Tailed) value by comparing with the alpha value specified is 0.05. The criteria are if the Asymp. Sig (2-Tailed) value > 0.05, it can be concluded that the data is normally distributed.

Table 4. Normality Test Result

<b>Variable</b>	<b><i>Asymp-sig. (2-tailed)</i></b>	<b>Degree of Significant</b>	<b>Decision</b>
<b>Understanding of Concepts</b>	0,200	0,05	Normally
<b>Emotional Intelligence</b>	0,200	0,05	Normally

From table 4, the concept understanding variable acquired a significance value of 0.200. Because the significance value is  $0.200 > 0.05$ , it can be concluded that the concept understanding variable is normally distributed. Then for the emotional intelligence variable obtained significance of 0.200. Because the significance value is  $0.200 > 0.05$ , it can be concluded that the emotional intelligence variable is normally distributed.

The next classical assumption test is the linearity test, and this test is performed to know whether emotional intelligence and concept understanding linear or not. A good regression model is a regression model if the independent variable and the dependent variable linear. This linearity test was carried out using SPSS version 22.



Table 5. Linearity Test Result

Variable	Sig.	Criteria
Emotional intelligence and understanding of concepts	0.425	Linear

From table 5, the linearity test of the emotional intelligence and concept understanding is obtained. The significance value of 0.425 is greater than 0.05 so that the independent variable and the dependent variable in this study linear.

The last classical assumption test is the heteroscedasticity test, and this test aims to test whether, in the regression model, there is an inequality of variance originating from the residuals of one observer to another. Heteroscedasticity can be seen through scatterplots, as in figure 1.

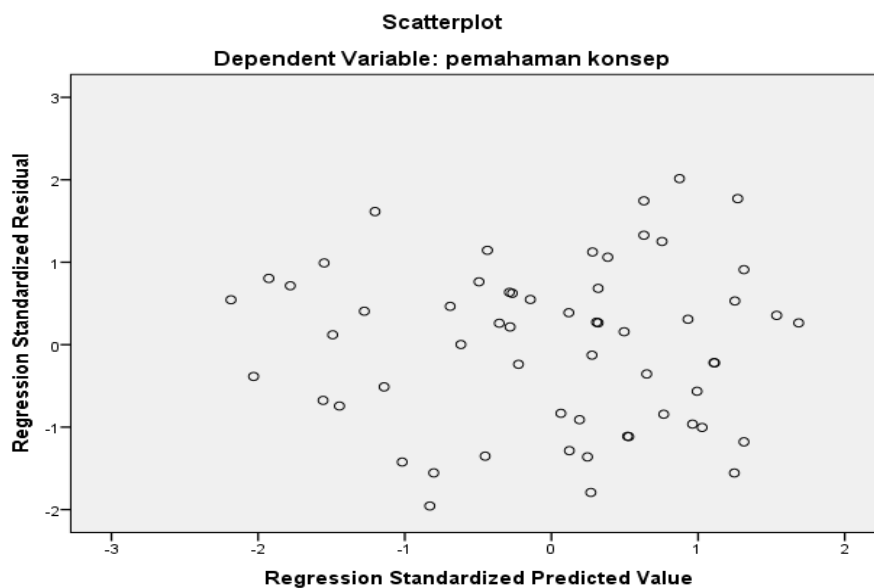


Figure 1. Scatterplot of Students' Mathematical Concepts Understanding

Figure 1 shows that there are no clear patterns and points that spread above and below the number 0 on the Y axis. So it can be concluded that there is no heteroscedasticity in the regression model.

After testing the classical assumptions, a hypothesis test will be conducted using regression analysis. Hypothesis testing in this study was to determine the effect of independent variables on the dependent variable,

namely the influence of emotional intelligence on understanding students' mathematical concepts.

Table 6. The Regression of Emotional Intelligence on Students' Mathematical Concepts Understanding

Independent Variable	Regression Coefisient
Constant	- 0,774
Emotional Intelligence	0,145

From table 6, it can be seen that the constant value for the emotional intelligence variable is -0.774, while the result of the regression coefficient of the emotional intelligence variable is 0.145. Therefore, a regression model can be made with the formula  $Y = a + b_1X_1$ .

$$Y = -0.774 + 0.145X_1$$

Where:

Y is concept understanding

X<sub>1</sub> is emotional intelligence

The significance of the regression equation can be implied as follows:

- Regression Coefficient of the emotional intelligence variable of 0.145 means that each addition of one point of the emotional intelligence variable increases the understanding of the concept by 0.145 times.
- The value of the constant of -0.774 means that if the value of X<sub>1</sub> = 0 or the emotional intelligence variable does not exist, the value of understanding the mathematical concepts is -0,774.

Interpretation of the regression equation can be seen that the regression coefficient for the emotional intelligence variable has a positive sign of 0.145, which means emotional intelligence is in line with the variable understanding of the concept. Therefore, this emotional intelligence variable has a positive effect on understanding mathematical concepts. For more details, the hypothesis test uses the t-test.

From the data processing, it was obtained a t-test of 4.625 with a significance value of 0.000. Therefore the t-test value of 4.625 at the level of probability (confidence) 0.05 obtained t-table of 2.002. The value of t-count is  $4.625 > t \text{ table } 2.002$  and  $\text{sig} < 0.05$  ( $0.000 < 0.05$ ). It shows that the hypothesis is

accepted, so there is the influence of emotional intelligence on understanding mathematical concepts.

To see how much the influence of emotional intelligence on understanding concepts, used the Coefficient of Determination formula. Testing the coefficient of determination using SPSS 22 and the value of R is 0.522, while the value of R<sup>2</sup> is 0.273. Therefore, the coefficient of determination test is obtained from the calculation of the regression, then the coefficient of determination is 0.273 or R<sup>2</sup> x 100%; the result is 27.30%. Based on these results, it can be concluded that emotional intelligence affects the understanding of concepts with a large effect of 27.30%, and other variables outside this study influence 72.70%.

From the results of the analysis, emotional intelligence is very influential in understanding the mathematical concepts of students. This means, the higher a person's emotional intelligence, the higher the understanding of individual concepts. Since we know that emotions are the basic aspects of the human self in creating behavior and indicate that their emotions are good, their behavior will be good in the teaching and learning process. This will support his learning achievement to increase his understanding of the concept and his achievement.

In school, mathematics is a subject most students consider difficult. This is because mathematics issues require systematic resolution. Mathematics requires students to use logic to solve it because mathematics concepts are abstract (Sari, Habibi, & Putri, 2018). Comprehending and solving mathematical problems requires good concentration, patience, and accuracy.

The results show that in solving problems in mathematics need concentration, patience, and good accuracy. Motivation and strong emotional management are required in managing concentration, patience, and accuracy, so students do not easily give up and give up when they cannot find the right answer. Emotional intelligence can make a useful contribution to managing emotional self to focus attention on understanding mathematics and remain optimistic and motivate themselves to achieve high mathematics learning achievement. This is in line with the opinion of Khodijah (2014) that factors influencing student learning outcomes are not only external factors but also internal factors such as emotional intelligence affect student learning outcomes positively. Not only that, recent psychology research results indicate that emotional intelligence also affects learning and learning success (Marhaeni, 2016). Besides, the opinion of (Efendi, 2005; Sirate, 2012), which says that

students require emotional intelligence to be outstanding. Goleman in (Rosida, 2016; Sirate, 2012) also believes that good intelligence will affect learning outcomes.

The descriptive analysis shows that 64.4% of 59 students are in the high category. Students with a high level of emotional intelligence will be able to focus on knowing the subject matter, encourage themselves to progress ahead, are positive in the face of difficulties, have successful relationships and friendships with others, be able to understand people, and have good learning achievements.

Likewise, students with a high understanding of concepts also have a high level of emotional intelligence. This is evidenced when analyzing these students' total scores, and it points out that students with high emotional intelligence need a high understanding of concepts and vice versa. While emotional intelligence data analyst findings only impact 27.30% of understanding the concept, this implies that the contribution made is not too significant. Following research Sulistianingsih (2017), where the influence of emotional intelligence is not too significant on the ability to think critically, only accounted for 15.6%. The remaining is influenced by other factors, as Khodijah (2014) suggests that there are other influences such as attitudes, interests, students, climate, and others. Thus, in the teaching and learning process, emotional intelligence must be applied to the success of student learning for the present and future.

## CONCLUSION

Based on data analysis and discussion results, it can be concluded that emotional intelligence affects students' understanding of mathematical concepts. The coefficient of determination is 27.30%, meaning emotional intelligence influences 27.30% understanding of mathematical concepts of students. Therefore, the teacher must make an innovation in mathematics learning that can move students to be able to improve emotional intelligence in order to enhance students' understanding of mathematical concepts.

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