Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

April 2024. Vol. 12, No. 2
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 354-363

The Effect of Intellectual Intelligence (IQ) and Emotional Intelligence (EQ) on Student Mathematics Learning Outcomes

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Received: March 2024; Revised: April 2024; Published: April 2024

Abstract

It will be possible to determine whether the learning objectives have been achieved by assessing the learning outcomes. In addition to intellectual intelligence, emotional intelligence is another factor that determines students' learning outcomes. This study aimed to determine how intellectual intelligence (IQ) and emotional intelligence (EQ) influence the mathematics learning outcomes of MAS TPI Sawit Seberang grade XI students. Based on the hypothesis proposed, intellectual intelligence (IQ) and emotional intelligence (EQ) influence the mathematics learning outcomes of MAS TPI Sawit Seberang grade XI students. The type of research used is quantitative research with an ex post facto method. The research instruments were an intellectual intelligence (IQ) questionnaire of 15 statements, an emotional intelligence (EQ) questionnaire of 22 valid statements, and odd semester student math report cards as data on student math learning outcomes. The data analysis techniques used were descriptive statistical analysis, prerequisite tests, and hypothesis testing. The research findings are that 62.5% of students have high-category intellectual intelligence, 72.73% have moderate-category emotional intelligence, and 98.86% have very high-category math learning outcomes. From the results of the research that has been done, the researchers draw several conclusions: (1) Intellectual intelligence (IQ) influences the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang. (2) emotional intelligence (EQ) influences the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang. (3) There is an effect of intellectual intelligence (IQ) and emotional intelligence (EQ) simultaneously on the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang. Furthermore, it is expected to conduct research with other variables to determine the effect of other variables on math learning outcomes. In addition, a more sustainable testing method, such as testing conducted periodically during the student's learning year, should be used. This method will help more comprehensively and accurately determine the relationship between IQ, EQ, and student math learning outcomes.

Keywords: Intellectual Intelligence (IQ); Emotional Intelligence (EQ); Math Learning Outcomes

How to Cite: Mulyani, R., & Lubis, R. (2024). The Effect of Intellectual Intelligence (IQ) and Emotional Intelligence (EQ) on Student Mathematics Learning Outcomes. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 12*(2), 354-363. doi:https://doi.org/10.33394/j-ps.v12i2.11225

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INTRODUCTION

Learning mathematics is an important aspect of education that affects students' academic development. In this process, intelligence is a key factor influencing how students understand and master mathematical concepts. Intelligence is not a concept limited to numeracy alone but also involves the ability to analyze, plan, and solve mathematical problems. Intelligence in this context refers not only to cognitive abilities measured through IQ tests but also includes emotional aspects such as motivation, perseverance, and adaptability to mathematical challenges. Understanding the role of intelligence in mathematics learning can help teachers and education policymakers develop more effective and inclusive learning strategies that consider the diversity of student intelligence (Wijaya, 2019). Therefore, research on the influence of intellectual and emotional intelligence in mathematics learning outcomes is

important to improve the quality of mathematics education and students' success in understanding and applying mathematical concepts in everyday life.

The importance of intellectual intelligence (IQ) and emotional intelligence (EQ) in education cannot be overstated. Intellectual intelligence (IQ), often measured through standardized tests, indicates a person's cognitive ability to understand information, solve problems, and learn from experience. In the context of mathematics education, a high IQ is often associated with the ability to learn and understand complex mathematical concepts (Grégoire, 2016).

However, IQ alone is not enough to guarantee success in education. Emotional intelligence (EQ) also plays an important role in shaping student learning outcomes, especially in the often frustrating and confusing subject of mathematics. EQ includes the ability to recognize and manage one's own emotions as well as empathy for the emotions of others. Students with high EQ tend to be better able to cope with mathematical challenges, maintain motivation to learn, and adapt to diverse learning environments (Tariq et al., 2013).

Whether or not the learning objectives are achieved will be seen from the learning outcomes. Mathematics learning outcomes reflect a deep understanding of mathematical concepts and students' ability to solve problems, learning independence, creativity, and a positive attitude toward learning (Grootenboer et al., 2015). Based on a field survey, the learning outcomes of grade XI students at MAS TPI show that most students can master the material taught by the math teacher. From the survey, it can be seen that as many as 85% of students achieved high learning outcomes. However, the math teacher revealed that around 40-50% of the students who attended the lesson did not fully enjoy the learning process, even though they had sufficient ability to solve mathematical problems. This shows that although academic learning outcomes show success, students' enjoyment and interest in mathematics are also important in improving learning effectiveness (Mazana et al., 2019).

Student success in learning is not solely due to one intellectual factor but also results from other factors, such as emotional intelligence (MacCann et al., 2020). Doug Lennick states that intellectual intelligence is needed for success and emotional abilities to fully function talent abilities (Leila et al., 2020). This understanding is supported by Goleman, who agrees that IQ only supports 20% of the factors determining success; the remaining 80% comes from other factors, including emotional intelligence. There must be a balance between intellectual and emotional intelligence to support successful learning outcomes (Leila et al., 2020).

Emotional intelligence is a factor that also determines students' learning outcomes (Salmawati, 2022). It is the potential possessed by a person to control feelings and emotions towards himself or others. It can distinguish between the two, which is then used to direct future thoughts and actions (Ratnasari et al., 2020).

Peter Salovey and John Mayer define emotional intelligence as the potential to control diverse emotions appropriately and use one's emotional abilities to regulate one's thoughts and behavior (Hidayatullaily et al., 2023). According to Goleman, emotional intelligence is the skill of carefully understanding and controlling emotions in oneself and others, using emotions as a reference for actions to be taken (Schukajlow et al., 2017).

Apart from emotional intelligence, there are other aspects of intellectual intelligence. According to Zohar and Marshall, intellectual intelligence has the potential to be a solution to problem-solving and a strategy for achieving goals (Mahmud, 2020). Intellectual intelligence is defined as the potential of individuals in terms of mastering, obtaining and applying knowledge that is obtained very well in order to find solutions in solving problems (Paulina & Janrosl, 2023). Intellectual intelligence (IQ) is thinking abstractly with the potential possessed. Adapting to life experiences passed in daily life using their learning potential to solve problems (Mishra et al., 2020).

Various researchers have used Intellectual and emotional intelligence several times as variables in previous studies. Research by Himmah (2021), Lestari et al. (2021), and Zein and Siregar (2022) show that intellectual and emotional intelligence impact student math learning

outcomes. This means that the higher the scientific insight and the ability to understand humans in-depth, the higher the learning outcomes achieved.

Another case is the research of Arifin et al. (2022), which focuses on the influence of intellectual and emotional intelligence on forming religious characters. Research from Nurdiansyah (2016), whose research focus is broader and includes psychological and social aspects that can affect mathematics learning, namely spiritual intelligence, emotional intelligence, the negative impact of social networks, and divergent thinking skills, and how these variables affect students' mathematics learning outcomes. There is also research from Sitorus et al. (2022) that emphasizes the importance of emotional intelligence in influencing academic achievement in mathematics subjects.

Much of the research on the influence of intelligence on mathematics learning outcomes has been conducted in contexts that may differ from specific school environments or cultures. Therefore, research is needed to explore the influence of intellectual and emotional intelligence on mathematics learning outcomes by considering local contexts, such as the culture and learning habits of students in a particular school.

The purpose of this research is to understand the extent to which intellectual intelligence (IQ) and emotional intelligence (EQ) affect the mathematics learning outcomes of grade XI students of MAS TPI Sawit Seberang. Thus, this study aims to identify the relationship between these two types of intelligence and academic achievement in mathematics subjects. This research will provide valuable insights into the factors that influence learning outcomes in mathematics, which is one of the key subjects in the education curriculum. Educators can develop more effective learning strategies with a better understanding of how intellectual and emotional intelligence affect learning outcomes.

METHOD

Researchers use quantitative research, using the ex post facto method. Quantitative methodology is a way to test certain hypotheses by examining the relationship between variables, where these variables are usually estimated using research instruments so that the numbers obtained from the information can be detailed (Amruddin, 2022). The ex post facto method is a study conducted to examine events that have occurred and then explore backwards to find out the causes of these events (Khaldi, 2017).

This research was conducted at MAS TPI Sawit Seberang, which is located in Sawit Seberang District, Kab. Langkat. The population that is the subject studied in this study is the XI grade students of MAS TPI Sawit Seberang in the 2023/2024 academic year. With a total of 112 students in class XI. The sample in this study was 88 students; the sampling method in this study was cluster random sampling. The procedure of this study is the planning stage; at this stage, the researcher prepares a research instrument in the form of a questionnaire and tests it on students to assess its validity and reliability. At the implementation stage, the researcher distributes questionnaires that have been tested for validity and reliability.

Validity and reliability tests were conducted before the test instruments were distributed to the sample classes. As a valid instrument, the validity test was carried out based on the consideration of mathematics education experts and calculations with the Product Moment Person correlation coefficient formula. This was done using the SPSS program. The questions were considered valid since the r-calculated and r-table comparison results were the same. Furthermore, reliability calculations were required to determine whether the data could be considered as reliable and whether the Cronbach's Alpha value > r-table (0.70). The calculation result of 0.84 shows that the test instrument is reliable because the value is greater than the r-table. Based on the analysis of the test results, it can be concluded that each test question can be used to measure students' intellectual abilities and emotional abilities.

The assessment of questions is standardized based on indicators, namely: a) Capture ability, b) Memory ability, c) Verbal ability, d) Numerical ability, e) Space abstraction ability, and f) Analytical and synthetic ability (Lina & Suwatno, 2018). Researchers used a

questionnaire for the variables of intellectual intelligence (IQ) and emotional intelligence (EQ). Researchers took data in the form of odd-semester student report cards and research reporting for the variable of mathematics learning outcomes. The data analysis stage manages the data obtained from the implementation results. Data analysis uses descriptive statistical analysis and prerequisite tests, whereas the prerequisite tests used are normality, multicollinearity, and heteroscedasticity tests. If the prerequisite test has been met, it is continued with the hypothesis test, namely the t-test, F test, and the coefficient of determination.

RESULTS AND DISCUSSION

Data Analysis

Descriptive analysis is the initial stage of testing this study's results. The following table presents the descriptive statistical results of the intellectual intelligence (IQ) variable from a sample of 88 students in class XI MAS TPI Sawit Seberang.

Table 1. Descriptive Statistics of Intellectual Intelligence (IQ)

Statistic	Statistical Value
N	88
Mean	54.26
Median	54.00
Modus	60
Range	38
Minimum	33
Maximum	71
Standard Deviasi	7.444

Descriptive statistical data from 88 respondents presented in Table 1 above resulted in a median score of 54.00, which shows that about 50% of students get low scores, namely below 54, and 50% get high scores, namely above 54. The average score of students' intellectual intelligence is 54.26. The mode value is 60. The difference in value between the largest and smallest values is 38. The minimum score is 33, and the maximum score is 71. The standard deviation is 7.444, where the standard deviation proves how far the average is. Therefore, standard deviation is used to determine the distribution of data.

Table 2. Intellectual Intelligence (IQ) Frequency

Score interval	**Frequency**	**Percentage (%)**	**Category**
75-63	10	11.36	Very High
62-51	55	62.5	High
50-39	20	22.73	Medium
38-27	3	3.41	Low
26-15	0	0	Very Low
Total	88	100	

Based on Table 2, the intellectual intelligence of 88 students as a sample shows that 10 students (11.36%) are in the very high category, 55 students (62.5%) in the high category, 20 students (22.73%) in the medium category, and 3 students (3.41%) in the low category. Thus, it can be concluded that the intellectual intelligence of class XI students of MAS TPI Sawit Seberang is in the very good category.

Table 3. Descriptive Statistics of Emotional Intelligence (EQ)

Statistic	**Statistical Value**
N	88
Mean	82.26

Statistic	Statistical Value
Median	83.00
Modus	80
Range	43
Minimum	57
Maximum	100
Standard Deviasi	9.202

Descriptive statistical data from 88 respondents presented in the Table 3 above results in a median score of 83.00, indicating that about 50% of students get low scores, namely below 83, and 50% get high scores, namely above 83. With an average student emotional intelligence score of 82.26. The mode value is 80. The difference in value between the largest and smallest values is 43. The minimum score is 57, and the maximum score is 100. The standard deviation is 9.202, where the standard deviation proves how far the average is. Therefore, standard deviation is used to determine the distribution of data.

Table 4. Frequency of Emotional Intelligence (EQ)

Score interval	Frequency	Percentage (%)	Category
126-150	0	0	Very High
102-125	0	0	High
78-101	64	72.73	Medium
54-77	24	27.27	Low
30-53	0	0	Very Low
Total	88	100	

Table 4 shows the emotional intelligence of 88 students as a sample: 64 students (72.73%) are moderate, and 24 students (27.27%) are in the low category. Thus, it can be concluded that the emotional intelligence of class XI students of MAS TPI Sawit Seberang is in a good category.

Table 5. Descriptive Statistics of Mathematics Learning Outcomes

Statistic	Statistical Value
N	88
Mean	84.77
Median	85.00
Modus	84
Range	12
Minimum	79
Maximum	91
Standard Deviasi	2.753

Descriptive statistical data from 88 respondents presented in the Table 5 results in a median score of 85.00, indicating that about 50% of students get low scores, namely below 85, and 50% get high scores, namely above 85. The average score of student math learning outcomes is 84.77. The mode value is 84. The value difference between the largest value and the smallest value is 12. The minimum score is 79, and the maximum score is 91. The standard deviation is 2.753, where the standard deviation proves how far the average is. Therefore, standard deviation is used to determine the distribution of data.

Table 6. Frequency of Mathematics Learning Outcomes

Score Interval	Frequency	Percentage (%)	Category
80-100	87	98.86	Very High

Score Interval	Frequency	Percentage (%)	Category
60-79	1	1.14	High
40-59	0	0	Medium
20-39	0	0	Low
0-19	0	0	Very Low
Total	88	100	

Table 6 shows the math learning outcomes of 88 students as a sample: 87 students (98.86%) are very high, and 1 student (1.14%) is high. Thus, it can be concluded that the mathematics learning outcomes of XI-grade students of MAS TPI Sawit Seberang are very good. The normality test is carried out to see whether the data obtained is normally distributed, and then multiple regression is carried out.

Table 7. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		88
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.23037335
Most Extreme Differences	Absolute	.053
	Positive	.047
	Negative	-.053
Test Statistic		.053
Asymp. Sig. (2-tailed)		.200[c,d]

Based on Table 7, the sig value is≥ 0.05 (0.200> 0.05). So, it can be concluded that the data is normally distributed.

Table 8. Multicollinearity Test Results

Model	Collinearity Statistic	
	Tolerance	VIF
Intellectual Intelligence (IQ)	0.925	1.082
Emotional Intelligence (EQ)	0.925	1.082

Based on the Table 8, it is obtained, the VIF value for intellectual intelligence is 1.082 < 10.00 and the Tolerance value is 0.925> 0.10. The VIF value for emotional intelligence is 1.082 < 10.00, and the Tolerance value is 0.925> 0.10. Because the tolerance value of each independent variable is greater than 0.10 and the VIF (Variance Inflation Factor) value of each independent variable is less than 10, it can be concluded that the two independent variables are free from multicollinearity symptoms.

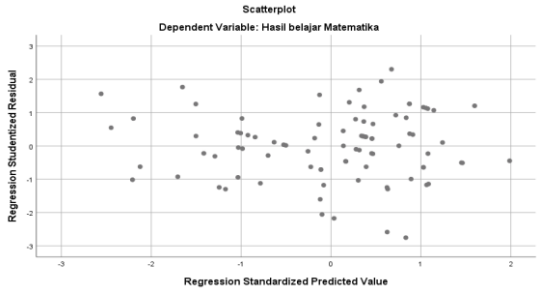

Figure 1. Heteroscedasticity test of Intellectual Intelligence and Emotional Intelligence on Learning Outcomes Emotional Intelligence on Learning Outcomes

Based on Figure 1, because there is no clear pattern and the data points spread, it can be concluded that there is no heteroscedasticity until the ideal regression model can be fulfilled. Multiple linear regression tests were conducted to see the effect of intellectual intelligence (IQ) and emotional intelligence (EQ) on the mathematics learning outcomes of grade XI students of MAS TPI Sawit Seberang.

Table 9. Recapitulation of Multiple Linear Regression Results

Independent Variable	Dependent variable	Regression coefficient b	t count	t table	Sig	Decision
Intellectual Intelligence (IQ)	Math learning outcomes	0.224	2.446	1.988	0.016	Accepted
Emotional Intelligence (EQ)	Math learning outcomes	0.607	6.641	1.988	0.000	Accepted
Constanta= 74.343; F count= 22.259; F table= 3.10; Sig F= 0.000; R Square= 0.344; ∝= 0.05						

The results of Table 9 obtained the tcount value of intellectual intelligence is 2.446 and the significant value of intellectual intelligence is 0.016. Since the value of tcount> ttable (2.446> 1.988) and the sig value is smaller than the significant level (0.016 <0.05), it can be concluded that there is an influence between intellectual intelligence and math learning outcomes of XI grade students of MAS TPI Sawit Seberang. Thus, Ha1 is accepted, and the first problem formulation is answered.

The recapitulation of the table above also answers Ha2. The emotional intelligence variable obtained a tcount of 6.641 and a significant value of 0.000 Since the value of tcount> ttable (6.641> 1.988) and the sig value is smaller than the significant level (0.000 <0.05), it can be concluded that there is an influence between emotional intelligence and the mathematics learning outcomes of students in grade XI MAS TPI Sawit Seberang. Thus, Ha2 is accepted, and the second problem formulation is answered.

The results showed that both intellectual and emotional intelligence significantly influence students' mathematics learning outcomes. This confirms that not only academic ability but also emotional abilities such as motivation, perseverance, and adaptability are instrumental in improving student learning achievement.

Based on the analysis of Table 9, it can be seen that F_count>F_table (22.259>3.10) at the level (0.05). Or the sig value of F <sig ∝ (0.000 <0.05). With these results, Ha3 is answered: "There is a significant influence of intellectual intelligence and emotional intelligence on the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang".

The results of the calculation of the coefficient of determination, looking at the R Square value in Table 9, show that the value of the coefficient of determination or explanatory power is R2 = 0.344, so the magnitude of the influence of intellectual intelligence variables and emotional intelligence on student math learning outcomes is 34.4%.

Based on the regression equation Y = 74.343 + 0.083X_1 + 0.182X_2, it can be seen that the value a of 74.343 is a constant (not yet influenced by other variables), b1 (X1 regression coefficient value) of 0.083 shows that the intellectual intelligence variable has a positive influence on student math learning outcomes, which means that every 1 unit increase in the intellectual intelligence variable will affect learning outcomes by 0.083, b2 (X2 regression coefficient value) of 0.182, indicating that the emotional intelligence variable has a positive influence on the student math learning outcomes variable. This means that every 1 unit increase in the student mathematics learning outcomes variable will affect learning outcomes by 0.182.

Intellectual and emotional intelligence have been used several times as variables by various researchers in previous studies. Research by Himmah (2021), Lestari et al. (2021), and

Zein and Siregar (2022) show that intellectual and emotional intelligence impact student math learning outcomes. This means that the higher the scientific insight and the ability to understand humans in-depth, the higher the learning outcomes.

Another case is the research of Arifin et al. (2022), which focuses on the influence of intellectual intelligence and emotional intelligence on the formation of religious character. Research from Nurdiansyah (2016), whose research focus is broader and includes psychological and social aspects that can affect mathematics learning, namely spiritual intelligence, emotional intelligence, the negative impact of social networks, and divergent thinking skills, and how these variables affect student math learning outcomes. There is also research from Sitorus et al. (2022) that emphasizes the importance of emotional intelligence in influencing academic achievement in mathematics.

The finding that some students do not enjoy learning mathematics despite having sufficient ability emphasizes the importance of learning approaches that are interesting and relevant to students' needs (Acharya, 2017). Teachers need to pay attention to students' psychological and emotional aspects in designing and implementing learning. By considering the influence of intellectual and emotional intelligence, teachers can develop more inclusive learning strategies (Shafait et al., 2021). This includes using various methods and approaches that enable every student, including those with different levels of intelligence and learning styles, to achieve their optimal learning potential.

Emotional intelligence has a significant influence on mathematics learning outcomes, which shows the importance of establishing emotional intelligence coaching programs in schools (Chen & Guo, 2020). These programs can assist students in developing skills such as emotion management, problem-solving, and interpersonal communication needed to succeed in mathematics learning and everyday life.

From the description above, it can be said that students' intellectual and emotional intelligence needs to be considered because, from the results of this study, it is concluded that intellectual and emotional intelligence influence students' mathematics learning outcomes. Students with high intellectual and emotional intelligence will also have high learning outcomes, and vice versa.

CONCLUSION

The result has achieved the objectives and concluded that (1) There is an influence of intellectual intelligence (IQ) on the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang with a regression coefficient of 0.083 (8.3%); (2) Emotional intelligence (EQ) influences the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang, with a regression coefficient of 0.182 (18.2%); (3) There is an effect of intellectual intelligence (IQ) and emotional intelligence (EQ) simultaneously on the mathematics learning outcomes of XI grade students of MAS TPI Sawit Seberang. The coefficient of determination (R2) = 0.344, so it can be stated that intellectual intelligence and emotional intelligence affect about 34.4%.

RECOMMENDATION

Based on the results of the study, some suggestions in mathematics learning activities should teachers pay more attention to intellectual intelligence (IQ) and emotional intelligence (EQ) to create student personalities and achieve learning objectives. In addition to intellectual intelligence (IQ) and emotional intelligence (EQ), other factors still affect math learning outcomes. Therefore, future researchers are expected to conduct research with other variables to determine the effect of other variables on math learning outcomes. In addition, a more sustainable testing method, such as testing conducted periodically during the student's learning year, should be used. This method will help more comprehensively and accurately determine the relationship between IQ, EQ, and student math learning outcomes.

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