



The influence of creative thinking ability and interpersonal intelligence on students' cooperation skills in mathematics learning

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Abstract

Background: The study begins with the premise that mathematics education enhances logical, analytical, systematic, interpersonal, critical, and creative thinking, and fosters cooperation, essential in science, technology, and educational goals.

Aim: The research aims to assess how creative thinking abilities and interpersonal intelligence impact students' cooperation skills.

Method: This quantitative research employs multiple linear regression analysis. It includes selecting subjects, creating and validating instruments, distributing them, collecting, analyzing data, and drawing conclusions.

Result: The analysis, represented by the equation $Y = -5.588 + 0.694X_1 + 0.366X_2$, indicates that creative thinking and interpersonal intelligence significantly influence cooperation skills. Creative thinking is more influential (69.4%), and these factors together account for 55.5% of the variance in cooperation skills.

Conclusion: The study concludes that both creative thinking ability and interpersonal intelligence are significant predictors of students' cooperation skills, with creative thinking being the more dominant factor. The hypothesis that these variables affect cooperation skills is accepted.

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and state (Subandi et al., 2018; Dwiranata et al., 2019). With education, a person can explore the potential and talents possessed, so that someone can achieve success, included through the learning process at school, where all have a specific vision, mission, and goals (Purba & Andhany, 2018; Siburian et al., 2019). In learning mathematics, cooperation skills can accelerate learning goals, because basically learning communities always better results than individual learning alone and help students gain hands-on experience, such as discussing and simple experiments. A lesson is said to be effective if it produces something as expected or in other words, if the objectives are achieved (Mahsup & Anwar, 2018).

In the learning process, students must be more active and creative, but in reality, students are less in issuing ideas or ideas, less in terms of curiosity, less in terms of asking, and less in terms of developing problem-solving skills, so students are passive in the classroom (Wahyuni, 2016; Yuniar et al., 2020). Not only that, but students also lack

independences in learning and less looking for other references after being given an explanation from the teacher which is suspected to be the cause of students' lack of creative thinking skills (Elyani et al., 2019). Especially in learning mathematics, many students complain about mathematics lessons. Students think that maths is very difficult (Hobri et al., 2021). Thus, students should have creative thinking skills, interpersonal intelligence, and cooperation skills (Adiastuty et al., 2021). High interpersonal intelligence allows people to work with others and synergize to produce positive result, such as working together, thinking independently, having a great sense of empathy, and having other positive concepts (Antinah et al., 2018). So, when students have group assignments, students can contribute and work together, because interpersonal intelligence is closely related to students' cooperation skills.

According to Meika & Sujana (2017) and Kuncorowati et al (2018) in achieving the desired goals, students must have the ability to think creatively. The ability to think creatively is a competency that must be possessed by a student to face the future and needs to be developed, especially in the face of the information age and an increasingly fierce competitive atmosphere (Erdawati et al., 2019; Suherman et al., 2021; Wang et al., 2018). Creative thinking skills in the mathematics learning process are needed in the classroom to help students in releasing ideas or ideas to have a high-level mindset in solving problems (Andini & Rusmini, 2022; Irawan et al., 2021; Jawad et al., 2021; Rachmawati et al., 2020; Rahmawati et al., 2023).

In addition to creative thinking, students must also have interpersonal intelligence where this intelligence is more than one in the human mind, all students are not only verbally or mathematically intelligent, students may have expertise in other areas. The intelligence possessed by students is certainly very diverse (Kurniawati et al., 2017; Yerizon et al., 2018). Interpersonal intelligence shows students' ability to communicate effectively, be able to empathize well, and the ability to develop harmonious relationships with others (Masdalifah, 2017). Then, what students must have are cooperation skills. Cooperation in the learning process is an important part and cannot be separated from other abilities that must be mastered by students (Syifa et al., 2019). The importance of cooperation skills as some of one's soft skills (Karuk et al., 2022). For example, in learning mathematics in group assignments, good cooperation with group members is needed so that the goals of learning can be achieved. Mathematics is one of the lessons that students learn from the lowest level of education to college which plays an important role in education, because it is a compulsory subject, and learning mathematics must be correct in order to train students to think logically, analytically, systematically, critically, and creatively (Yayuk et al., 2020).

The ability to think creatively increases or has a significant influence after being given the learning model treatment cooperative learning (Maemunah et al., 2020; Koroh, 2019; Hasan et al., 2019; Khoer, 2019; Djuanda et al., 2019; Widyastuti et al., 2018; Cintia et al., 2018; Henra, 2018; Erdyna & Zuhrotul, 2018; Zubaidah et al., 2018). Khoer (2019) revealed that the mathematical creative thinking ability of seventh-grade students in junior high school gave maximum or significant results on student learning outcomes after the application of cooperative learning models and the results of research by Djuanda et al (2019) revealed that the increase in mathematical creative thinking ability of VIII grade students on the material of the system of linear equations by 0.58 which was interpreted as moderate. However, not all previous studies said that creative thinking skills increased after being given a cooperative

learning model, such as the research of Faelasofi (2017) shows that the level of students' mathematical creative thinking ability on the subject of opportunity is still low because the new score achieved is 59.26 and Sugiyanto et al (2018) state that the creative thinking ability of high school students is still low on every indicator and Ermayanti (2018) showed no significant difference in creative thinking skills given the cooperative learning model *Group Investigation* (GI) and *Student Team Achievement Division* (STAD).

Dien & Wustqa (2018) revealed that of grade VII students, 9.52% had interpersonal intelligence with the category "very high", 46.67% with the category "high", 40% with the category "medium", 1.90% with the category "low" and 1.90% with the category "very low". This shows that the average interpersonal intelligence of students in mathematics learning is in the high category. Setiawan & Prihatnani (2020) shows differences in learning outcomes from levels of interpersonal intelligence and interaction of learning models *Team Assisted Individualization* (TAI) and *Numbered Heads Together* (NHT) with interpersonal intelligence. The results showed that there were no significant differences in learning outcomes from different levels of interpersonal intelligence and there was no interaction between learning models and interpersonal intelligence on learning outcomes. Therefore, researchers want to further examine interpersonal intelligence, whether interpersonal intelligence increases or not after the application of the learning model, because researchers find differences from previous studies.

Cooperation skills have also been widely researched such as (Mutia et al., 2020; Risma, 2019; Faisal et al., 2019). Faisal et al (2019) state that the application of the Team Game Tournament cooperative learning model can improve students' cooperation skills. Then, the research results from Mutia et al (2020) mentioned that there was an increase in cooperation skills where there was a significant increase in the second cycle to 90% from 53% of students' cooperation skills in the first cycle after applying the STAD-type cooperative learning model. From this explanation, it is known that cooperation skills are highly recommended during the learning process because they have a significant increase. Cooperation skills basically make a person form a learning community where working with a group will provide better results than working alone or individually, because it helps a person get direct experience, such as discussing, and by discussing a person can express his ideas or ideas. Especially in learning mathematics, students can freely express ideas and ideas to their friends when working together.

From the explanation above, it can be seen that the ability to think creatively, interpersonal intelligence, and cooperation skills have increased or there is an influence and has no influence after being given the treatment of various learning models or linking with various learning models, while no one has conducted research that does not associate it with learning models. It is also known that creative thinking skills are needed by students in the learning process because students can issue ideas or ideas in solving mathematical problems, besides that, students must have interpersonal intelligence so that students can communicate effectively because it can affect students' cooperation skills during group work or discussion. The purpose of the study was to determine the influence of creative thinking skills and interpersonal intelligence on students' cooperation skills in mathematics learning in junior high school grade VIII on straight-line equation material, because in this material students are able to provide ideas or ideas that vary when students collaborate by discussing together.

METHODS

This type of research was quantitative correlation with multiple linear regression data analysis techniques. Quantitative research is a research method based on the philosophy of positivism, used to examine certain populations or samples, data collection using research instruments, and quantitative or statistical data analysis with the aim of testing established hypotheses (Sugiyono, 2017). The purpose of this study is to determine the effect of creative thinking ability and interpersonal intelligence on student cooperation skills, where X_1 in this study is creative thinking ability, X_2 is interpersonal intelligence, and Y is cooperation skills. Multiple linear regression was a generalization of simple linear regression in which there is more than one predictor variable. The predictor variables in this study are creative thinking ability and interpersonal intelligence. The stages of implementation of this research are shown in Figure 1.

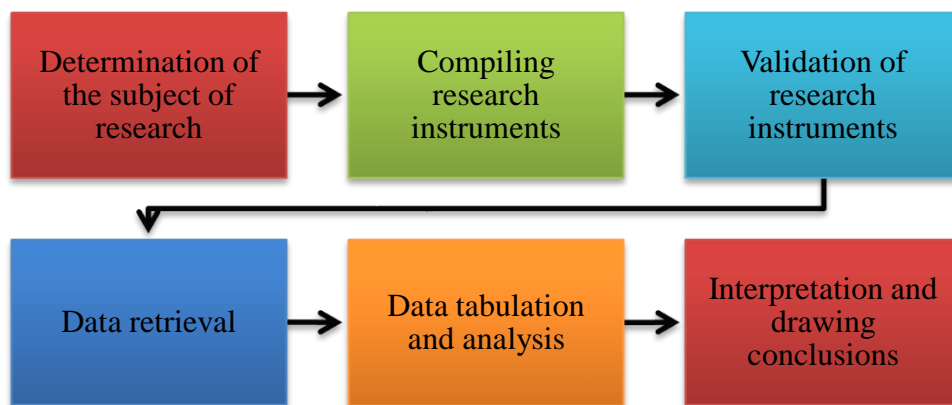


Figure 1. Research Procedure

The stages of research as presented in the picture above can be explained as follows:

1. Determination of the subject of research

The subject of research or respondent is the entirety of the object of research that has certain characteristics in the study (Sakban & Wahyudin, 2019). The subjects of this study were junior high school students in grade VIII. The sampling technique in this study was random sampling or non-probability sampling which amounted to 28 people.

2. Compiling research instruments

The instruments used in this study were tests and questionnaires. The instrument in this study is an essay test with 5 questions to determine the ability to think creatively in students because with the test in the form of an essay can be known variations in student answers, this corresponds to the number of indicators in Table 1. Instruments creative thinking ability questionnaires, interpersonal intelligence questionnaires, and cooperation skills questionnaires.

Assessment indicators are made in the form of research questionnaires through the development of indicators from each variable, then formed into several forms of statements. Indicators of creative thinking skills according to Munandar (2014), indicators of interpersonal intelligence according to Kurniasih (2021), and indicators of cooperation skills according to Huda (2015) in Table 1.

Table 1. Research Instrument Indicators

Variable	Indicators
Creative thinking skills	<ol style="list-style-type: none"> 1. Able to express opinions during math learning 2. Quickly understand the material math 3. Looking for answers alternatively when working on math problems 4. Provide varied and detailed answers 5. Able to provide new ideas 6. Give consideration to solving problems in math 7. Able to solve problems in one's way
Interpersonal intelligence	<ol style="list-style-type: none"> 1. Have sensitivity to the feelings and mentality of others 2. Likes to help others 3. Able to interact and communicate with others 4. Have the ability to mediate in solving problems 5. Have awareness of various things 6. Very confident in conveying things 7. Able to persist in completing tasks 8. Have a habit of tending to be interested and pursue a career field
Cooperation skills	<ol style="list-style-type: none"> 1. Have a sense of responsibility together 2. Contribute to each other 3. Have independence in solving problems 4. Exert each other's abilities to the maximum 5. Have a commitment to doing group tasks 6. Cooperate with others from different backgrounds

The calculation of scores on student questionnaires is a score of 4 for alternative answers always, a score of 3 for alternative answers often, a score of 2 for alternative answers sometimes, and a score of 1 for answers never.

3. Validation of research instruments

Validity is a measure that indicates the levels of validity or validity of an instrument. A valid instrument has high validity. The type of validity used is criterion validity. Instrument validation is performed on linguists and material experts. Likert score categories given by language and material experts are 5 scores with a score of 1 in the category of not good, score 2 in the category of less good, score 3 in the category of quite good, score 4 in the category of good, and a score 5 in the category of very good. The aspects assessed by linguists on test instruments and questionnaires are in Table 2. While the aspects assessed by material experts on test instruments are in Table 3.

Table 2. Aspects that Linguists Assess on Test Instruments, and Questionnaires

No	Assessed Aspects
1	Language use by the improved spelling
2	Language used commutative
3	Simplification of sentence structure
4	The sentences used are clear and easy to understand
5	Question sentences do not have double meanings
6	Question attributes such as commas, periods, question marks, etc. are complete and appropriate

Table 3. Aspects that Material Experts Assess on Test Instruments

No	Assessed Aspects
1	Questions according to indicators
2	Question limits and expected answers are appropriate
3	The material asked is by the measured competence
4	The content of the material asked is according to the school level or grade level
5	Clarity of the intent of the question
6	Possible problems can be solved

This validation aims to know whether the instrument is feasible or unfeasible, as can be seen in Table 4.

Tabel 4. Reability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.950	33

Before collecting data, the instrument must be tested for validity. Validity and reliability tests using SPSS software. Table 4 shows that the results of the reliability test by looking at Cronbach's Alpha value are 0.950 or 95%.

Table 5. Validity Criteria

Score Interval	Criterion
$81,25\% < x \leq 100\%$	Very valid
$62,50\% < x \leq 81,25\%$	Valid
$43,75\% < x \leq 62,50\%$	Less valid
$25\% < x \leq 43,75\%$	Invalid

After the experiment, the results show that the *Cronbach's Alpha* value is 0.950 or 95%. That means the instruments in the study are very valid.

4. Data retrieval

After the validity and reliability tests are carried out, the next step is students are given 5 description test questions with 90 minutes to find out students creative thinking skills. Next, dissemination and filling out questionnaires to determine creative thinking skills, interpersonal intelligence, and cooperation skills.

5. Data tabulation and analysis

The data analysis used in this study was multiple linear regression. Multiple linear regression serves to find the effect of two or more independent variables (independent variable or X) on the dependent variable (bound variable or Y). The formula of the multiple regression analysis equations is:

$$Y = a + b_1X_1 + b_2X_2 + \dots + b_nX_n \quad (1)$$

With Y is the dependent variable; a is a constant; b_1, b_2, \dots, b_n is the coefficient of determination; and X_1, X_2, \dots, X_n is the independent variable. A dependent variable is a variable that is affected or that becomes a result due to the presence of an independent

variable. An independent variable (independent variable) is a variable that affects or causes a change in the dependent variable (Arya et al., 2020). Karena penelitian ini menggunakan X_1 , X_2 , dan Y , maka diperoleh persamaan:

$$Y = a + b_1X_1 + b_2X_2 \quad (2)$$

with Y is the dependent variable; a is a constant; b_1, b_2 is the coefficient of determination; and X_1, X_2 is the independent variable.

6. Interpretation and drawing conclusions

This study used a quantitative research method. Data samples were taken from 2 classes, junior high school class VIII students in the first semester. Data analysis using JASP and SPSS Software, the data analysis techniques used are multiple linear regression analysis, descriptive tests, and data normality tests. Where this analysis is to find out whether there is an influence of creative thinking skills (X_1) and interpersonal intelligence (X_2) on cooperation skills (Y). 99% confidence level, $\alpha = 0.01$.

H_1 : There is an influence of creative thinking ability and interpersonal intelligence on students' cooperation skills in mathematics learning.

H_0 : There is no effect of creative thinking ability and interpersonal intelligence on students' cooperation skills in mathematics learning. With provisions, if the significance value $<$ probability 0.01 then there is an influence of the independent variable (X) on the dependent variable (Y), or the hypothesis is accepted. If the significance value $>$ probability 0.01 then there is no effect of the independent variable (X) on the dependent variable (Y) or the hypothesis is rejected.

RESULTS AND DISCUSSION

Results

In this study, data was taken from 28 junior high school students in grade VIII semester 1 (one) who had studied mathematics. In the learning process, students are formed into several groups by their teachers in order to find out the cooperation skills that exist in their own students. According to his research Tyaswati (2020) teachers are tasked with creating a pleasant learning atmosphere for students, one of which is by improving cooperation skills so that results can increase, creative thinking skills are increased and interpersonal intelligence can increase.

Data collection is carried out after students learn mathematics on straight-line equation material. Data were obtained from tests and questionnaires on the Likert 4 scale filled out by each student. Then the assessment results can prove creative thinking ability, interpersonal intelligence, and cooperation skills in Figure 2.

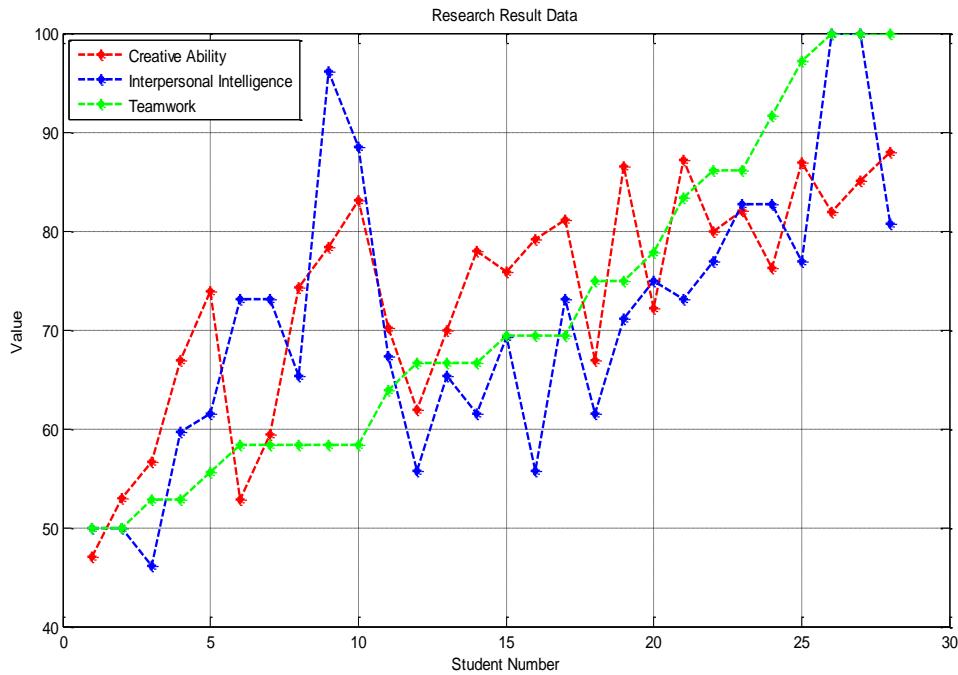


Figure 2. Research Data and Results

Figure 2 shows that the results of students' creative thinking skills with red lines show the average score of the 28 students with the lowest of 47, a medium score of 75.9, and a highest of 87.9. The average score on the interpersonal intelligence of students with the blue line showed the lowest was 46.15, the medium score was 71.15, and the highest was 100. Meanwhile, the green line shows the average score on students' cooperation skills, the lowest score is 50, the medium score is 66.66 and the highest is 100.

After collecting the data, the researchers then conducted descriptive statistical tests. The results of the descriptive statistical test are in Table 6.

Table 6. Descriptive Statistics Test Results

	X1	X2	Y
Valid	28	28	28
Missing	0	0	0
Mode	47.000	73.070	58.330
Median	76.085	72.110	68.050
Mean	73.370	71.149	71.326
Std. Deviation	11.509	14.316	16.128
Variance	132.465	204.940	260.124
Skewness	-0.772	0.364	0.544
Std. Error of Skewness	0.441	0.441	0.441
Kurtosis	-0.305	-0.212	-0.885
Std. Error of Kurtosis	0.858	0.858	0.858
Shapiro-Wilk	0.924	0.967	0.914
P-value of Shapiro-Wilk	0.043	0.509	0.024
Minimum	47.000	46.150	50.000
Maximum	87.900	100.000	100.000

Table 6 shows the results of data output in *JASP Software* from 28 students, that the value of the mode or value that often appears in creative thinking ability is 47.000, interpersonal intelligence is 73.070, and cooperation skills are 58.330. The value of the median on creative thinking ability is 76.085, the value of interpersonal intelligence is 72.110 and the value of cooperation skills is 68.050. The mean value of creative thinking ability is 73.370, interpersonal intelligence is 71.149, and cooperation skills are 71.326. The variance value of creative thinking ability is 132.465, the value of interpersonal intelligence is 204.940 and the cooperation skills are 260.124.

Based on Table 6, it can also be seen the highest and lowest values, where the highest value in creative thinking ability is 87.900, interpersonal intelligence is 100.000, and cooperation skills are 100.000. Meanwhile, the lowest value in creative thinking ability is 47.000, interpersonal intelligence is 46.150, and cooperation skills are 50.000.

After the researcher conducted a descriptive test, the next researcher conducted a normality test. The results of the normality test are in Table 7.

Table 7. Normality Test

Variable	Skewness	Kurtosis	P-Value of Shapiro	Description
X1	-0.772	-0.305	0.043	Normal
X2	0.364	-0.212	0.509	Normal
Y	0.544	-0.885	0.024	Normal

If the Skewness and Kurtosis values are $< \pm 1.96$ with a significance value of 0.05 and $< \pm 2.58$ with a significance value of 0.01, then it can be said that the data is normal. In addition, data normality can be known if the P-Value of Shapiro > 0.01 . It can be seen in Table 7 the P-Value of Shapiro on creative thinking ability is 0.043, the P-Value of Shapiro on interpersonal intelligence is 0.509 and the P-Value of Shapiro on cooperation skills is 0.024. Then the P-Value of Shapiro on X_1 ($0.043 > 0.01$), the P-Value of Shapiro X_2 ($0.509 > 0.01$), and the P-Value of Shapiro Y ($0.024 > 0.01$). It can be concluded that the values of X_1 , X_2 , and Y normal are normal, so all the data obtained can be said to be normal. After the researchers conducted a data normality test, the researchers then dilakukan uji heteroscedasticity and the results are in Table 8.

Table 8. Heteroscedasticity Test

Model		Coefficients ^a		Standardized Coefficients	t	Sig.
		Unstandardized Coefficients	Std. Error			
	B			Beta		
1	(Constant)	-12.515	7.323		-1.709	.100
	Creative Thinking Skills	.042	.126	.071	.333	.742
	Interpersonal Intelligence	.248	.101	.522	2.445	.022

a. Dependent Variable: RES2

Table 8 shows the results of the heteroscedasticity test using SPSS software with the significance of the creative thinking ability variable of $0.742 > 0.01$ and the value of the interpersonal intelligence variable of $0.022 > 0.01$. This means that heteroscedasticity does not occur. After conducting the heteroscedasticity test, the researcher conducted a linearity test and the results are in Table 9.

Table 9. Linearity Test
ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Cooperation Skills * Interpersonal Intelligence	Between Groups	(Combined)	6294.799	16	393.425	5.940	.002
		Linearity	2878.486	1	2878.486	43.460	.000
		Deviation from Linearity	3416.314	15	227.754	3.439	.022
	Within Groups		728.555	11	66.232		
	Total		7023.354	27			

Table 9 shows the results of the linearity test with a linearity significance value of 0.000, this value < 0.01 . So, conclude the linearity test is fulfilled. Also seen is the deviation from linearity value of $0.022 > 0.01$. This means that the linearity test is fulfilled. Furthermore, researchers conducted a linear regression test and the results are in Table 10.

Table 10. Model Summary Results
Model Summary – Y

Model	R	R ²	Adjusted R ²	RMSE	R ² Change	F Change	df1	df2	P	Durbin-Watson		
										Autocorrelation	Statistic	P
H ₀	0.000	0.000	0.000	16.128	0.000		0	27		0.274	1.270	0.043
H ₁	0.745	0.555	0.520	11.177	0.555	15.608	2	25	< .001	-0.229	2.379	0.381

Table 10 shows that the magnitude of the R² value is 0.555, meaning that the influence of cooperation skills or the dependent variable (Y) in this study is 55.5% with a moderate category or in other words quite influential. This proves that the hypothesis in this study is accepted because H₁ is accepted and H₀ is rejected. Judging from the value of H₁, it shows that students' cooperation skills have a significant influence that is quite good in the learning process, especially in learning mathematics. After that, researchers conducted ANOVA statistical tests and the results are in Table 11.

Table 11. ANOVA Statistical Test Results

Model		Sum of Squares	df	Mean Square	F	P
H ₁	Regression	3899.981	2	1949.991	15.608	<.001
	Residual	3123.373	25	124.935		
	Total	7023.354	27			

Table 9 shows the t-count value of 15.608, while the significance value (P-value) is < .001 with a probability value of 0.001, it can be said that creative thinking ability and interpersonal intelligence are not equal to zero or in other words, the independent variable (independent variable) affects the dependent variable (dependent variable). This can also be seen in the R² value which is not equal to 0 (zero) or has a significant effect. After conducting the ANOVA statistical test, the researcher conducted coefficients. The results of the coefficients test are in Table 10.

Table 12. Coefficients Test Results

Model		Unstandardized	Standard Error	Standardized	T	P
H ₀	(Intercept)	71.326	3.048		23.401	< .001
H ₁	(Intercept)	-5.588	14.103		-0.396	0.695
	X ₁	0.694	0.243	0.495	2.859	0.008
	X ₂	0.366	0.195	0.325	1.874	0.073

Based on Table 12, it can be concluded that the assumed hypothesis can be accepted, because there is an increase in creative thinking ability and interpersonal intelligence in cooperation skills. It can be seen from the two independent variables that the increase in creative thinking ability has a greater value of 69.4% compared to interpersonal intelligence with a value of 36.6%. This shows that cooperation skills must be possessed by a student because it affects the creative thinking ability and interpersonal intelligence of students. Because the value of the influence of creative thinking ability is greater in percentage than interpersonal intelligence ($X_1 > X_2$). So, the equation can be used:

$$Y = -5.588 + 0.694X_1 + 0.366X_2 \quad (3)$$

- The t-count value of the creative thinking ability variable (X_1) is 2.859. Because t-count 2.859 > t-table 2.787. Because the t-count value is $2.859 > t\text{-table } 2.7872$, it can be concluded that the first hypothesis is accepted. So, there is an influence of creative thinking ability (X_1) on cooperation skills (Y).
- The value of the creative thinking ability variable (X_1) is significant with a value of 0.694, because assuming the absence of other independent variables if the value of the creative thinking ability variable (X_1) increases, it can be concluded that the second hypothesis is accepted. So that there is an influence on creative thinking ability (X_1) on cooperation skills (Y).
- The value of the interpersonal intelligence variable (X_2) is significant with a value of 0.366, because assuming the absence of other independent variables if the value of the interpersonal intelligence variable (X_2) increases, it can be concluded that the third

hypothesis is accepted. Thus, there is an influence on interpersonal intelligence (X_2) on cooperation skills.

- d. The value of creative thinking ability (X_1) and interpersonal intelligence (X_2) on cooperation skills (Y) with a value of 0.555, meaning that there is an influence of creative thinking ability and interpersonal intelligence on cooperation skills.

Discussion

This research was conducted on 8th-grade students in Mataram with a total of 28 students. This study was conducted to determine the effect of creative thinking ability and interpersonal intelligence on students' cooperation skills in learning grade VIII junior high school mathematics on the material of straight-line equations.

After the researchers took the data to the school, the researchers conducted a normality test by looking at the Skewness, Kurtosis and P-Value of Shapiro so that it could be seen that all data were normal. Then multiple linear regression tests were carried out and the equation was obtained: $Y = -5.588 + 0.694X_1 + 0.366X_2$. From the results of the study, it was found that creative thinking ability and interpersonal intelligence have an influence on students' cooperation skills. The results obtained also show that the most influential variable is creative thinking ability with a value of 69.4% and seen from the determination value (R^2) which is 0.555, it means that 55.5% of the increase in creative thinking ability and interpersonal intelligence is influenced by cooperation skills. It can also be seen from the anova test that all independent variables affect the dependent variable and through hypothesis testing that H_0 is rejected and H_1 is accepted.

Based on the research results obtained, there is an influence of creative thinking ability and interpersonal intelligence on students' cooperation skills in mathematics learning. This is by what is stated by Lutfiah et al (2021) which states that there is an increase in creative thinking skills after applying the learning model. Dien & Wustqa (2018) shows that students' interpersonal intelligence in mathematics learning is in the high category in class VII students with 9.52% having interpersonal intelligence in the "very high" category and Sohrabi (2021) stated that group games can improve cooperation skills.

Therefore, in the learning process, students must have the ability to think creatively because with this ability students can provide new ideas or ideas in solving math problems. In addition, students must have interpersonal intelligence, where students can communicate effectively because it affects students' cooperation skills. However, cooperation skills have increased due to other factors, such as students having a basic understanding of mathematical concepts and another factor is the application of the learning model (Nawangsih et al., 2020; Setiawan & Jayanti, 2019; Murniati et al., 2019). Murniati et al (2019) show that students' cooperation skills have increased in cycle II after being given the *search, solve, create, and share* (SSCS) learning model and students themselves already have a basic understanding of mathematics with a percentage of 84.38% in the high category.

CONCLUSIONS

The results of the research conducted, it is obtained that the data normality test with the Skewness, Kurtosis, and P-Value of Shapiro values, so that it can be seen that all the data obtained is normal. After that, multiple linear regression tests were carried out as well as hypothesis testing to determine the effect of creative thinking ability and interpersonal intelligence on student cooperation skills in mathematics learning. Based on multiple linear regression analysis, the equation is obtained: $Y = -5.588 + 0.694X_1 + 0.366X_2$ with a coefficient value of -5.588 , the regression coefficient of the creative thinking ability variable is 0.694 and the interpersonal intelligence coefficient is 0.366 , and seen from the magnitude of the R^2 value of 0.555 , this shows that the magnitude of the influence of the cooperation skills or the dependent variable (Y) in this study is 55.5% and seen from the ANOVA test shows that H_0 is rejected and H_1 is accepted. This means that creative thinking ability and interpersonal intelligence have a significant influence on students' cooperation skills.

The suggestion that can be given is that if there is further research, it is more detailed and broader in scope to create more relevant research results. In addition, researchers suggest adding the type of research instrument used and adding the number of samples in taking data so that more data is obtained later.

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AUTHOR CONTRIBUTIONS STATEMENT

AS is the first researcher or first author to go directly to the field, the main drafter and maker of research instruments. MS as a supervisor who provides input or revises drafts that have been compiled. The Army as a supervisor also reviews research instruments, reviews research instruments and provides input in drafts that have been compiled. SH is a research class coach who provides initial research ideas, monitors and provides input during the process, and revises the final research results.

REFERENCES

- Adiastuty, N., Sumarni, Riyadi, M., Nisa, A., & Waluya. (2021). Neuroscience study: Analysis of mathematical creative thinking ability levels in terms of gender differences in vocational high school students. *Journal of Physics: Conference Series*, 1933(1), 0–7. <https://doi.org/10.1088/1742-6596/1933/1/012072>
- Andini, S., & Rusmini, R. (2022). Project-based learning model to promote students critical and creative thinking skills. *Jurnal Pijar Mipa*, 17(4), 525–532. <https://doi.org/10.29303/jpm.v17i4.3717>
- Antinah, Kusmayadi, T. A., & Husodo, B. (2018). The experimentation of LC7E learning model on the linear program material in terms of interpersonal intelligence on Wonogiri Vocational School students. *Journal of Physics: Conference Series*, 983(1), 012119.

<https://doi.org/10.1088/1742-6596/983/1/012104>

- Arya, D., Rochmawati, L., & Sonhaji, I. (2020). Koefisien korelasi (r) dan koefisien determinasi (r^2). *Jurnal Penelitian Politeknik Penerbanyan Surabaya*, 5(4), 289-296.
- Cintia, N. I., Kristin, F., & Anugraheni, I. (2018). Penerapan model pembelajaran discovery learning untuk meningkatkan kemampuan berpikir kreatif dan hasil belajar siswa. *Perspektif Ilmu Pendidikan*, 32(1), 67–75. <https://doi.org/10.21009/PIP.321.8>
- Dien, C. A., & Wustqa, D. U. (2018). The Interpersonal Intelligence Profile of Seventh-Grade Students in Mathematics Learning. *Journal of Physics: Conference Series*, 1108(1), 012080. <https://doi.org/10.1088/1742-6596/1108/1/012080>
- Djuanda, M., Hairun, Y., & Suharna, H. (2019). Peningkatan kemampuan berpikir kreatif siswa melalui model pembelajaran kooperatif tipe numbered heads together (NHT) pada materi lingkaran. *Delta-Pi: Jurnal Matematika dan Pendidikan Matematika*, 8(1), 51-63. <https://doi.org/10.33387/dpi.v8i1.1365>
- Dwiranata, D., Pramita, D., & Syaharuddin, S. (2019). Pengembangan media pembelajaran matematika interaktif berbasis android pada materi dimensi tiga kelas X SMA. *Jurnal Varian*, 3(1), 1–5. <https://doi.org/10.30812/varian.v3i1.487>
- Elyani, E., Sumpono, S., & Amir, H. (2019). Perbandingan pembelajaran kooperatif tipe structured numbered heads (SNH) dan numbered head together (NHT) terhadap kemampuan berpikir kreatif siswa kelas X MIPA SMAN 6 Kota Bengkulu. *Alotrop*, 3(1). <https://doi.org/10.33369/atp.v3i1.9046>
- Erdawati, N., Ridha, H., Risnawati, & Granita. (2019). Pengembangan lembar kerja siswa berbasis pendekatan open-ended untuk memfasilitasi kemampuan berpikir kreatif matematis siswa Madrasah Tsanawiyah. *Jurnal Mercumatika: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, 4(1), 21-31.
- Erdyna, E. D., & Zuhrotul, 'Aini Addin. (2018). Modul pembelajaran berbasis multi representative pada mata kuliah geometri untuk meningkatkan kemampuan berpikir kreatif mahasiswa program studi pendidikan matematika STKIP PGRI NGANJUK. *Jurnal Dharma Pendidikan*, 13(2), 31–44.
- Ermayanti. (2018). Perbedaan kemampuan problem solving dan berpikir kreatif matematis siswa antara siswa yang diberi model pembelajaran kooperatif tipe GI dengan tipe STAD DI SDN 112292 Kualaberingin. *Jurnal Tematik*, 7(1), 131-140.
- Faelasofi, R. (2017). Identifikasi kemampuan berpikir kreatif matematika pokok bahasan peluang. *Jurnal E-DuMath*, 3(2), 155-163. <https://doi.org/10.26638/je.460.2064>
- Faisal, F. S., Tatang, S., & Ruswandi, H. (2019). Peningkatan keterampilan kerjasama melalui pembelajaran tipe kooperatif tipe teams games tournament pada siswa kelas V Sekolah Dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, 4, 127–133.
- Hasan, R., Lukitasari, M., Darmayani, O., & Santoso, S. (2019). The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation. *Journal of Physics: Conference Series*, 1157(2), 022075. <https://doi.org/10.1088/1742-6596/1157/2/022075>
- Henra, T. S. (2018). Perbedaan kemampuan berpikir kritis dan kemampuan berpikir kreatif matematika siswa dengan menggunakan model pembelajaran kontekstual dan pembelajaran kooperatif learning tipe numbered heads together. *MAJU*, 5(2), 119–129.

- Hobri, Adeliyanti, S., Fatekurrahman, M., Wijaya, H. T., Oktavianingtyas, E., Putri, I. W. S., & Ridlo, Z. R. (2021). E-Comic mathematics based on STEAM-CC and its effect on students creative thinking ability. *Journal of Physics: Conference Series*, 1839(1). <https://doi.org/10.1088/1742-6596/1839/1/012036>
- Huda, M. (2015). *Model-model pengajaran dan pembelajaran*. Yogyakarta: Pustaka Pelajar.
- Irawan, F., Zubaidah, S., Sulisetijono, & Astriani, M. (2021). Does Remap-STAD have the potential to promote students' creative thinking skills. *AIP Conference Proceedings*, 2330(March). <https://doi.org/10.1063/5.0043179>
- Jawad, L. F., Majeed, B. H., & Alrikabi, H. T. S. (2021). The impact of teaching by using STEM approach in the development of creative thinking and mathematical achievement among the students of the fourth scientific class. *International Journal of Interactive Mobile Technologies*, 15(13), 172–188. <https://doi.org/10.3991/ijim.v15i13.24185>
- Karuk, I., Kolesnik, K., Prysiazniuk, L., Kryvosheya, T., Shykyrynska, O., Vyshkivska, V., & Komarivska, N. (2022). The development of cooperation skills of senior preschoolers in the experimentation process. *SOCIETY. Integration. Education*, 1, 404–414. <https://doi.org/10.17770/sie2022vol1.6838>
- Khoer, M. (2019). Pengaruh penerapan model pembelajaran kooperatif tipe numbered head together (NHT) terhadap peningkatan kemampuan berpikir kreatif siswa. *Equilibrium: Jurnal Penelitian Pendidikan dan Ekonomi*, 16(02), 113–122. <https://doi.org/10.25134/equi.v16i02.2172>
- Koroh, T. R. (2019). A development module to teach creative thinking ability based on creative problem solving and design thinking models. *International Journal of Innovation, Creativity and Change*, 5(3), 904–916.
- Kuncorowati, R. H., Mardiyana, & Saputro, D. R. S. (2018). Mathematics creative thinking levels based on interpersonal intelligence. *Journal of Physics: Conference Series*, 943(1), 012005. <https://doi.org/10.1088/1742-6596/943/1/012005>
- Kurniasih, S. (2021). *Kecerdasan interpersonal anak usia dini*. Geupedia.
- Kurniawati, K. R. A., Budiyono, B., & Saputro, D. R. S. (2017). Penerapan model pembelajaran kooperatif tipe jigsaw dan numbered heads together ditinjau dari kecerdasan interpersonal siswa pada pokok bahasan bangun ruang sisi datar. *Jurnal Pendidikan Matematika*, 11(1), 150-28. <https://doi.org/10.22342/jpm.11.1.3948.15-28>
- Lutfiah, I., Suharti, P., & Asy'ari, A. (2021). Improving students' creative thinking skills through the IBSC (Investigation Based Scientific Collaborative) learning model based on e-learning. *SEJ (Science Education Journal)*, 5(2), 85–97. <https://doi.org/10.21070/sej.v5i2.1572>
- Maemunah, M., Sakban, A., & Rejeki, S. (2020). Implementasi PDS di perkuliahan untuk meningkatkan berpikir kreatif mahasiswa civic education di Universitas Muhammadiyah Mataram. *CIVICUS: Pendidikan-Penelitian-Pengabdian Pendidikan Pancasila dan Kewarganegaraan*, 8(1), 1-13. <https://doi.org/10.31764/civicus.v8i1.1676>
- Mahsup, M., & Anwar, Y. S. (2018). Pengaruh metode stad terhadap hasil belajar matematika mahasiswa. *Jurnal Ulul Albab*, 22(2), 36-41. <https://doi.org/10.31764/jua.v22i1.584>
- Masdalihah, N. (2017). Pengaruh model pembelajaran kooperatif dan kecerdasan interpersonal terhadap hasil belajar matematika. *Jurnal Teknologi Pendidikan (JTP)*, 10(1), 22-32. <https://doi.org/10.24114/jtp.v10i1.8717>

- Meika, I., & Sujana, A. (2017). Kemampuan berpikir kreatif dan pemecahan masalah matematis siswa SMA. *Jurnal Penelitian dan Pembelajaran Matematika*, 10(2), 8-13. <https://doi.org/10.30870/jppm.v10i2.2025>
- Munandar, U. (2014). *Pengembangan kreativitas anak berbakat*. Jakarta: Rineka Cipta.
- Murniati, S., Winarti, E. R., & Irawanti. (2019). Meningkatkan kemampuan pemecahan masalah dan kerjasama siswa SMPN 24 Semarang melalui model pembelajaran SSCS. *Prisma, Prosiding Seminar Nasional Matematika*, 2, 99–102.
- Mutia, S. R., Tatang, S., & Ani, H. (2020). Penerapan model pembelajaran kooperatif tipe stad untuk meningkatkan keterampilan kerjasama siswa kelas IV SD. *Jurnal Pendidikan Guru Sekolah Dasar*, 5(2), 120–130. <https://doi.org/10.47178/elementary.v2i1.608>
- Nawangsih, R., Rusmawan, & Kurniastuti, D. (2020). Penerapan model problem based learning untuk meningkatkan kerjasama dan hasil belajar matematika kelas II SDN Gedongtengen. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, 09(7), 1–23. <https://doi.org/10.36989/didaktik.v1i2>
- Purba, D. L., & Andhany, E. (2018). Perbedaan kemampuan berpikir kreatif matematis siswa yang diajar dengan pembelajaran kooperatif think pair share (TPS) dan student teams achievement division (STAD) pada pembelajaran matematika di MTs Swasta Umar Bin Khattab. *AXIOM: Jurnal Pendidikan dan Matematika*, 7(1), 31-45. <https://doi.org/10.30821/axiom.v7i1.1768>
- Rachmawati, A. D., Baiduri, B., & Effendi, M. M. (2020). Developing web-assisted interactive media to improve mathematical creative-thinking ability. *Al-Jabar : Jurnal Pendidikan Matematika*, 11(2), 211–226. <https://doi.org/10.24042/ajpm.v11i2.6505>
- Rahmawati, L., Juandi, D., & Nurlaelah, E. (2023). A meta-analysis on the effectiveness of the stem approach on students ' mathematical creative thinking ability. *14(1)*, 109–120. <https://doi.org/10.24042/ajpm.v14i1.16637>
- Risma, K. N. (2019). Peningkatan kemampuan kerjasama melalui model pembelajaran kooperatif tipe NHT. *Jurnal Pendidikan Guru Sekolah Dasar*. 8(7), 695-705.
- Sakban, A., & Wahyudin, W. (2019). Penerapan Model Cooperative Learning Tipe Numbered Head Together (NHT) Terhadap Hasil Belajar Pendidikan Pancasila dan Kewarganegaraan Sekolah Menengah Pertama. *CIVICUS: Pendidikan-Penelitian-Pengabdian Pendidikan Pancasila dan Kewarganegaraan*, 2(1) 18-24. <https://doi.org/10.31764/civicus.v0i0.924>
- Setiawan, & Jayanti, S. (2019). Peningkatan hasil belajar dan kerjasama peserta didik melalui metode team game tournament berbantuan domino aljabar pada materi operasi aljabar kelas 7D SMP Negeri 5 Semarang. *PRISMA: Prosiding Seminar Nasional Matematika*, 2, 444–451.
- Setiawan, Y., & Prihatnani, E. (2020). Perbandingan TAI dan NHT terhadap hasil belajar trigonometri ditinjau dari kecerdasan interpersonal. *Mosharafa: Jurnal Pendidikan Matematika*, 9(2), 299–310. <https://doi.org/10.31980/mosharafa.v9i2.646>
- Siburian, J., Corebima, A. D., Ibrohim, & Saptasari, M. (2019). The correlation between critical and creative thinking skills on cognitive learning results. *Eurasian Journal of Educational Research*, 2019(81), 99–114. <https://doi.org/10.14689/ejer.2019.81.6>
- Sohrabi, T. (2021). Power of Play: How playing affects cooperation skills. *Brock Education Journal*, 31, 70–90. <https://doi.org/10.26522/brocked.v31i1.889>

- Subandi, A., Wiyanarti, E., & Ratmaningsih, N. (2018). Use of learning model cooperative learning type team games tournament (TGT) to improve interpersonal intelligence of students in social studies learning. *International Journal Pedagogy of Social Studies*, 3(1), 21–27.
- Sugiyanto, F. N., Masykuri, M., & Muzzazinah, M. (2018). Analysis of senior high school students' creative thinking skills profile in Klaten regency. *Journal of Physics: Conference Series*, 1006(1), 012038. <https://doi.org/10.1088/1742-6596/1006/1/012038>
- Sugiyono. (2017). *Metode penelitian kuantitatif, kualitatif dan R&D*. Bandung Alfabeta.
- Suherman, Vidákovich, T., & Komarudin. (2021). STEM-E: Fostering mathematical creative thinking ability in the 21st Century. *Journal of Physics: Conference Series*, 1882(1), 012164. <https://doi.org/10.1088/1742-6596/1882/1/012164>
- Syifa, F., Hendriani, A., & Kurniasih. (2019). Peningkatan keterampilan kerjasama melalui model pembelajaran kooperatif teams games tournament kelas III Sekolah Dasar. *Jurnal Pendidikan Guru Sekolah Dasar*, 4, 196–210.
- Tyaswati, N. (2020). Meningkatkan Keterampilan kerjasama siswa pada tema pengalamanku menggunakan model pembelajaran number head together (NHT). *Jurnal Ilmiah Wahana Pendidikan*, 6(2), 123-132.
- Wahyuni, D. (2016). Pengembangan tes berpikir kreatif kelas VIII SMP Rantauprapat melalui pembelajaran kooperatif tipe STAD. *Jurnal Warta Edisi* : 50, 1-10.
- Wang, Y., Lavonen, J., & Tirri, K. (2018). Aims for learning 21st century competencies in national primary science Curricula in China and Finland. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(6), 2081–2095. <https://doi.org/10.29333/ejmste/86363>
- Widyastuti, A. C., Permana, D., & Sari, I. P. (2018). Analisis kemampuan berpikir kreatif matematis siswa dalam menyelesaikan masalah matematika pada materi bangun ruang sisi datar dilihat dari gender. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 1(2), 145. <https://doi.org/10.22460/jpmi.v1i2.p145-148>
- Yayuk, E., Purwanto, As'Ari, A. R., & Subanji. (2020). Primary school students' creative thinking skills in mathematics problem solving. *European Journal of Educational Research*, 9(3), 1281–1295. <https://doi.org/10.12973/eu-jer.9.3.1281>
- Yerizon, Y., Putra, A. A., & Subhan, M. (2018). Mathematics learning instructional development based on discovery learning for students with intrapersonal and interpersonal intelligence (preliminary research stage). *International Electronic Journal of Mathematics Education*, 13(3), 97-101. <https://doi.org/10.12973/iejme/2701>
- Yuniar, D., Hobri, Prihandoko, A. C., Aini, K., & Faozi, A. K. A. (2020). The analyze of students' creative thinking skills on Lesson Study for Learning Community (LSLC) based on Science, Technology, Engineering, and Mathematics (STEM) approach. *Journal of Physics: Conference Series*, 1538(1). <https://doi.org/10.1088/1742-6596/1538/1/012072>
- Zubaidah, S., Mahanal, S., Ramadhan, F., Tendrita, M., & Ismirawati, N. (2018). Empowering critical and creative thinking skills through remap STAD learning model. *ACM International Conference Proceeding Series*, 75–79. <https://doi.org/10.1145/3206129.3239435>