

An Experimental of Group Investigation With Scientific Approach Viewed From Emotional Intelligence

Dwi Indarti^{1,a)}, Mardiyana^{2,b)} dan Ikrar Pramudya^{2,c)}

^{1,2} Mathematics Education Department
Sebelas Maret University
Surakarta, Indonesia

^{a)}dwi_ymail52@yahoo.com

^{b)}mardiyana@staff.uns.ac.id

^{c)}ikrarpramudya@staff.uns.ac.id

Abstract. The purpose of this research is to determine the impact of mathematics learning using Group Investigation (GI) with scientific approach viewed from emotional intelligence of the VII class students. This research is quasi-experimental research. The population of research is all VII grade students of SMP N 3 Gondangrejo in the academic year of 2016/2017 which consists of three classes with the number of the students that are 96 students. The sample of this research was taken using cluster random sampling technique, it was obtained two classes, 32 students from VII B class is as the experimental group and 32 students from VII A class is as the control group. The data analysis technique used two-way ANOVA with different cells following the normality test with liliefors method and homogeneity test with Bartlett method. The results of this research are: (1) the mathematics learning using GI model with scientific approach produces the better mathematics learning achievement than learning with conventional model on material of rectangle and triangle (2) the students with high emotional intelligence have better mathematics learning achievement than the students with moderate and low emotional intelligence. While the students with moderate emotional intelligence have better mathematics learning achievement than students with low emotional intelligence (3) there is an interaction between learning model and emotional intelligence of the students on the mathematics learning achievement in material of rectangle and triangle. GI with scientific approach learning model can be used by the teachers in mathematics learning, especially in the material of rectangle and triangle, which is expected to improve the student achievement.

INTRODUCTION

Education is a very important factor in improving the quality of human resources. The function and purpose of national education is stated in Law No. 20 of 2003 about National Education System, Chapter II, Section 3 that is as follows:

National education has function to develop the ability, character and civilization of the nation's dignity in order to develop nation's intellectual life, the purpose is to develop the students' potentials in order to become a man of faith and fear of God Almighty, noble, healthy, knowledgeable, skilled, creative, independent and become democratic and accountable citizens [1].

Based on the function and purpose of education, the learning organization should be able to prepare, develop, and establish the students in mastering the knowledges, attitudes, values, and basic skills needed in society.

Various attempts have been made by the government to improve the quality of education including curriculum improvement, preparing professional educators, procurement of books supporting subjects, and various other improvement efforts. The curriculum prevailing in Indonesia at this time is the 2013 curriculum. At first in 2013 curriculum mandated the essence of the scientific approach in learning. This approach is implemented through activities to observe, ask, gather information, associate and communicate. The five stages are deemed capable of making learners achieve the skills to think, feel, and do. The scientific approach is intended to provide understanding of the learner in identifying, understanding the various

materials using scientific approach. Therefore, the learning condition is directed to encourage the students in finding out from various sources through observation, rather than just being notified.

A lot of sciences whose development relies on mathematics. Mathematics is not just for the purposes of the calculation, but mathematics has been widely used for the development of science. One indication of the importance of mathematics seems that mathematics is as one of the subjects given at every level of education. Mathematics is also one of the subjects tested in the national examination, thus becoming one of the subjects which contribute to the success or failure of the students. In the other hand, mathematics is abstract and hierarchical causing relatively high level of difficulty on the learner in studying it.

The difficulties appear on the indicators of achievement learning which are relatively low compared to other subjects. It can be seen from the results of National Examination in the academic year of 2015/2016 at SMP N 3 Gondangrejo which is 71.53 for the average score of Indonesian, 47.15 for the average score of English, 38.90 for the average score of mathematics, 49.45 for the average score of Science. From the four subjects tested, the average score of mathematics is the lowest compared to other subjects. Less satisfying results obtained mathematics achievement for the students to demonstrate that mathematics is a difficult subject. Difficulties in learning mathematics of the students are not complete for all the material in mathematics. Based on the results of National Examination in the academic year of 2015/2016 at SMP N 3 Gondangrejo, it is obtained that absorption ability to solve problems relating to the itinerant story in material of rectangle nationally is 50.55%, Central Java Province of 46.18%, Karanganyar regency of 49.55%, and SMP N 3 Gondangrejo of 39.73%. According to the data above, it can be concluded that the absorption ability in material of rectangle in SMP N 3 Gondangrejo is still under absorption ability in the district, provincial and national level.

The low of mastering materials of plane is caused by the difficulty of the material is so that the students is low in mastering material. Therefore, the mastery of plane needs to be improved. This is because the material of plane is as prerequisite material for understanding the further material and as base for mastering the concept related to plane. The low learning achievement, presumably because the learning process of mathematics at SMP N 3 Gondangrejo is less than the maximum. This is consistent with the results of interview with the teachers and students at SMP N 3 Gondangrejo, it is found that the learning of mathematics still use the lecture method. At first, the teacher introduces the material, gives one or two examples, then asks one or two questions, and then asks the student to complete the exercises from the book. When the students have trouble with such questions, the students begin to act negatively toward mathematics. Mathematics learning model that is widely applied by teachers during this time is classical learning model with the lecture method, and expository, where the teachers have high dominance in the learning process so that most of students feel bored with the learning of mathematics. The dominance of the teacher can lead the students less active and less able to think critically and creatively.

To improve the achievement of the students, it needs better effort from the teachers to create conducive learning for improving the students' abilities. Conducive learning can be realized with innovations in learning activities such as the use of innovative learning model, fun and varied. A variety of learning models can reduce the saturation of the students in lesson and can improve the ability of the students to interact socially and minimize the differences.

In this regard, the learning model that can be used in mathematics learning is cooperative learning model such as Group Investigation (GI). According to Slavin [2], the most extensive research with specialization in cooperative learning task is GI. The principle of investigation on measuring GI requires the students to be able to present the problems and find strategies to solve mathematical problems that they face. GI model also allows the students to build their own knowledge, because the students are required to solve problem or take the conclusion by collecting information firstly from various sources and then get conclusion about an issue. Thus, the mathematical problem solving ability is expected to develop through learning using the GI tso that it can increase the academic achievement.

The need to modify the type of GI cooperative model with scientific approach because in practice the GI learning the students are usually only given the problems in the form of a booklet to be done or complete the sentence incomplete. With a scientific approach, the students are given authentic and challenging problems so that rise curiosity and encourage the students to work together to find solutions. Material of rectangle and triangle is a material that can be presented in authentic problems and applied in daily life. Learning GI-PS is expected to facilitate students' knowledge effectively on the material of rectangle and triangle. This is because the GI-PS learning gives the students the opportunity to solve the real problems scientifically. The teachers are no longer dominate the class, but only direct and motivate the students to learn independently and develop a sense of responsibility so that they can be active in solving real problems of daily life in groups.

Based on the explanation above, the researcher is interested to implement cooperative learning model of GI with a scientific approach. By applying the model modification is expected that learning objectives can be

achieved better. This is supported by several studies that have been done before, among others, research conducted by the Gangga [3], it is concluded that the mathematics achievement of students with GI learning model is better than PBL and learning directly on the material solid geometry with the flat side.

Besides there are also other factors that affect the success of the learning process, namely the interest in learning, motivation in learning, learning activities, learning styles, emotional intelligence, creativity, etc. As one of the internal factors, emotional intelligence of students with each other is not the same. Goleman [4] states that the highest intellectual contribute approximately 20% of the factors that determine individual success in life, while 80% filled by other forces including emotional intelligence. The emotional intelligence is very influential in the process and learning success. This is because learning is not solely an intellectual problem, but also emotionally. Learning is not just the interaction with learning resources and environments, but also it is involving the human relationship among the students and between the students and the teachers. Emotional intelligence is able to train the ability of students to manage their feelings, the ability to motivate themselves, the ability to be strong in facing the frustration, the ability to control impulse and delay gratification, set the mood and able to empathize and cooperate with other people. These capabilities support the students in reaching goals and objectives.

This is consistent with the results of Rupande research [5] which states that:

”Emotional intelligence is very critical to student learning. Emotional intelligence allows the individual to communicate, lead and negotiate with others. A person with emotional intelligence is able to understand his or her own emotions and also the emotions of others. Emotional intelligence actually enables a person to gain more in an educational setting since the individual is able to integrate well both socially and academically. A person with emotional intelligence is a team player, and gains a lot from positive interaction with lecturers and other students”.

It means that emotional intelligence is essential for student learning. Emotional intelligence allows individuals to communicate, lead and negotiate with others. A person with emotional intelligence is able to understand his own emotions and the emotions of others. Emotional intelligence actually allows people to get more in the educational regulation because an individual is capable in integrating both socially and academically. A person with emotional intelligence is a team player, and gain a lot of positive interactions with professors and other students.

Additionally, Kolachina [6] with the results of research ”when students are educated to be emotionally and socially/cultural intelligent, their general performance can be improved”. That is, when the students are educated to be smart, emotionally and socially, their general performance can be improved.

Selection of cooperative learning model of GI with scientific approach (GI-PS) in the mathematics learning is expected to improve the achievement of learners especially in the material of plane in every category of emotional intelligence. The purpose of this research is to determine: 1) Which has the better mathematics learning achievement, learners taught using cooperative learning model or GI with scientific approach or conventional model. 2) Which of the following have better mathematics learning achievement, the students with high emotional intelligence, moderate, or low. 3) On each type of learning models (GI-PS and conventional), which one has better mathematics learning achievement, the students with high emotional intelligence, moderate, or low. 4) In each of the categories of students’ emotional intelligence (high, moderate, and low), which one has better mathematics learning achievement, the students; taught using cooperative learning model or a GI with scientific approach or conventional model.

METHODOLOGY OF THE RESEARCH

Type of Research

The type of this research is quasi-experimental study (quasi-experimental research) because the researcher does not control or manipulate all relevant variables, except for several variables studied. Manipulation of variables in this research performed on one independent variable, it is the learning model.

Time and Place of Research

The research was conducted at SMP N 3 Gondangrejo in the second semester in the academic year of 2016/2017. The research was carried out on February 2017 until March 2017.

Population and Sample of Research

The population in this research is all students of VII class at SMP Negeri 3 Gondangrejo in the academic year of 2016/2017 consisting of three classes with the number of students that is 96 students. The research sample was taken using cluster random sampling, it is obtained two classes, namely, VII B class is as an experimental class consisting of 32 students and VII A class is as the control class consisting of 32 students.

Variable of Research

In this research, there are two independent variables and one dependent variable. Learning model and emotional intelligence are as the independent variable and mathematics achievement is as the dependent variable.

Technique of Collecting the Data

There are three techniques of collecting the data in this research, they are documentation, test, and questionnaire. Documentation used to collect the data is the UAS mathematics score at the first period in the academic year of 2016/2017. The test is used to collect the data about the students' mathematics achievement VII class at the second period in the academic year of 2016/2017. The questionnaire is used to obtain the data on the students' emotional intelligence.

Validity and Reliability of Instrument

Content validity of the students' mathematics achievement test and emotional intelligence questionnaire was conducted by 3 experts. To measure the reliability of the mathematics achievement test, it used Kuder-Richardson technique, while to measure the reliability of the emotional intelligence questionnaire, it used Alpha formula.

Technique of Analyzing the Data

Data analysis techniques used in this research is a two-way analysis of variance with different cells. Two factors used to determine the difference significance of the row effect, column effect and the combination of row effect and column effect on the students' mathematics achievement are learning model and students' emotional intelligence.

RESULT AND DISCUSSION

Based on test results in prerequisite test, all sample are derived from normal distributed population and the populations have the same variance (homogeneous). It can be concluded that the balance of the population has obtained early mathematical ability is balanced. The data of students' achievement test results and descriptions can be seen in table 1, 2,3 and table 4 below.

TABLE 1. Mean and Marginal Mean

Learning Model	Emotional Intelligence			Marginal Mean
	High (B ₁)	Moderate (B ₂)	Low (B ₃)	
GI Model (A ₁)	55.33333333	48.63158	44.57143	49.51211
Conventional Model (A ₂)	56.5	33.68421	24	38.0614
Marginal Mean	55.91666667	41.15789	34.28571	

From table 1, it can be seen that the marginal mean of the students' mathematics learning achievement taught using GI model is higher than the marginal mean of the students' mathematics learning achievement

taught using conventional model. In general, the mean of mathematics learning achievement of students with high emotional intelligence is better than the mean of students' achievement mathematics learning with middle and low emotional intelligence. The mean of mathematics learning achievement of students with emotional intelligence is better than the mean of achievement of students' mathematics learning with low emotional intelligence. Hypothesis test used were two way analysis of variance with unequal cell. The results of the analysis are presented in Table 2 below.

TABLE 2. The Summary of Two way ANOVA

Sources	JK	dk	RK	F_{obs}	F_{α}	p
Model (A)	1595.1469	1	1595.1469	9.9061	4.008	< 0.05
Emotional Intelligence (B)	3963.0128	2	1981.5064	12.3054	3.158	< 0.05
Interaction (AB)	1032.5094	2	516.2547	3.2060	3.158	< 0.05
Galat	9339.5739	58	161.0271	-	-	-
Total	15930.2430	63	1595.1469	-	-	-

Based on Table 2 above, indicate that 1) the learning model influence on students' mathematics achievement in material rectangle and triangle. 2) emotional intelligence of students influence on mathematics achievement in material rectangle and triangle. 3) there was an interaction between emotional intelligence model of learning and student to student achievement on the material rectangle and triangle. Dual comparison test between columns results are contained in Table 3 below.

TABLE 3. The Summary of Dual Comparison between Columns

H_0	F_{obs}	$2F_{0.05,2,58}$	p
$\mu_1 = \mu_2$	9.209249122	6.276	< 0.05
$\mu_1 = \mu_3$	14.12865879	6.276	< 0.05
$\mu_2 = \mu_3$	2.561274151	6.276	> 0.05

Based on the summary of the results obtained from Table 3, we can conclude that: 1) there is a difference between mathematics achievement of students who have high emotional intelligence and academic achievement of mathematics in students who have emotional intelligence was. 2) there is a difference between mathematics achievement of students who have high emotional intelligence and academic achievement of mathematics in students who have low emotional intelligence. 3) there is no significant difference between mathematics achievement of students who have emotional intelligence was with mathematics achievement in students who have low emotional intelligence. The result of dual comparison between cells test is presented in Table 4 below.

TABLE 4. The Summary of Dual Comparison between Cell

H_0	F_{obs}	$5F_{0.05,2,58}$	p
$\mu_{11} = \mu_{12}$	1.27187	11.89	> 0.05
$\mu_{12} = \mu_{13}$	0.523677	11.89	> 0.05
$\mu_{11} = \mu_{13}$	2.323727	11.89	> 0.05
$\mu_{21} = \mu_{22}$	18.19918	11.89	< 0.05
$\mu_{22} = \mu_{23}$	2.305376	11.89	> 0.05
$\mu_{21} = \mu_{23}$	20.18293	11.89	< 0.05
$\mu_{11} = \mu_{21}$	0.028981	11.89	> 0.05
$\mu_{12} = \mu_{22}$	13.18117	11.89	< 0.05
$\mu_{13} = \mu_{23}$	7.665079	11.89	> 0.05

Based on the summary of the results obtained from Table 4, we can conclude that 1) the student is subjected to the learning model of GI-PS was not a significant difference between mathematics achievement of students who have high emotional intelligence, mathematics achievement in students who have emotional intelligence being and mathematics achievement in students who have low emotional intelligence. 2) the student is subjected to conventional models there are differences in achievement between students who have high emotional intelligence, emotional intelligence of students who have moderate and students who have low emotional intelligence. 3) on students who have emotional intelligence were there differences in achievement between students who are subject to the model of GI-PS and the conventional model.

Description

Based on the calculation of two-way ANOVA with different cells, it can be concluded that learning model influences on the students' mathematics achievement in material rectangle and triangle. To determine which learning producing better learning achievement can be viewed directly on the marginal mean for each class. Based on table 1, the marginal mean of class with GI-PS model is 49.5121 and the marginal mean of class with conventional model is 38.0614. It can be concluded that learning with GI-PS model produces better mathematics learning achievement than conventional model in material of rectangle and triangle.

The results of this study are in accordance with Ikawati's research [8] that mathematics learning with GI-PS model provides mathematics learning achievement better than learning with conventional model. The difference of learning achievement is significant because in learning using GI-PS model the students are grouped in heterogeneous consisting of 5-6 students. Learning using GI-PS can make students active in learning. The division of tasks in groups is adjusted to the students' ability so as to encourage the growth of positive interdepends between group members.

Based on the calculation of two-way ANOVA with different cells, it can be concluded that emotional intelligence influences on the students' mathematics achievement in material of rectangle and triangle. To determine which category that producing better mathematics learning achievement, it is performed using multiple comparison test. Based on the mean of comparison test between the categories of high emotional intelligence and low emotional intelligence, it is found that there are differences in mathematics achievement between the students with high emotional intelligence and the students with moderate emotional intelligence in material of rectangle and triangle. Based on table 1, the marginal mean of the students with high emotional intelligence is 55.9167 and the marginal mean of the students with moderate emotional intelligence is 41.1578. It can be concluded that the mathematics achievement of the students with high emotional intelligence is better than the students with moderate emotional intelligence in material of rectangle and triangle.

Based on comparison mean test of the students with high and low emotional intelligence, it show that there is difference in mathematics achievement between the students with high emotional intelligence and those with low emotional intelligence in material of rectangle and triangle. Based on table 1, the marginal mean of the students with high emotional intelligence is 55.9167 and the marginal mean of the students with low emotional intelligence is 34.2857. It can be concluded that the mathematics achievement of the students with high emotional intelligence is better than the students with low emotional intelligence in the material of rectangle and triangle. The results of this study are in accordance with [7] that the learning achievement of student with high emotional intelligence is better than students with moderate and low emotional intelligence. Differences in mathematics learning achievement because students with high emotional intelligence category are able to recognize the emotions themselves, manage emotions, motivate yourself, recognize the emotions of others and foster cooperation with others, so as to be able to rise quickly from failure in solving math problems.

While based on the comparison mean test of the students with moderate and low mathematics learning activities, it is found that there is no significant difference between the mean of mathematics achievement of the students with moderate and low emotional intelligence in material of rectangle and triangle. This is not in accordance with the research hypothesis. Unfulfilled hypothesis is possible because In terms of self-motivating and fostering cooperation with others, students with moderate emotional intelligence is not yet able to motivate himself to solve problems or tasks presented, the effect is students with moderate emotional intelligence is having mathematics learning achievement equal with students with low emotional intelligence.

Based on the mean of comparison test between cells in the same rows, it can be concluded that the students taught using GI-PS model have the same performance as good for all categories of emotional intelligence, while the students taught using conventional model there is significant difference between the learning achievement of the students with high emotional intelligence and the students with moderate emotional intelligence, as well as the achievements of the students with high emotional intelligence and those with low emotional intelligence. According to the table 1, for the students taught using conventional model, it is obtained mean of students' achievement with high emotional intelligence of 56.5, the mean of students' achievement with moderate emotional intelligence of 33.68421 and the mean of students' achievement [with low emotional intelligence of 24. It can be concluded that the students taught using conventional model, the students' mathematics achievement with high emotional intelligence is better than students' mathematics achievement with moderate and low emotional intelligence. The students with moderate emotional intelligence have the same performance as good as the students with low emotional intelligence.

Based on the mean of comparison test between cells in the same columns, it shows that there is difference of achievement in the students with moderate emotional intelligence between the students taught using GI-PS model and conventional model. According to the table 1, the students taught using GI-PS model obtain the average of students' achievement with moderate emotional intelligence is 48.63158 and the students taught using conventional model obtain the average of students' achievement with moderate emotional intelligence is 33.68421. It can be concluded that the students with moderate emotional intelligence taught using GI-PS model have better achievement than the students taught using conventional model.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that in general, the students taught using GI-PS model have better learning achievement than the students taught using conventional model. However, if viewed in particular, the students with high emotional intelligence have the same achievement either taught using GI-PS model or conventional model. It same with the students with low emotional intelligence. In general, the students' emotional intelligence influences the student achievement. It means that the students with high intelligence have better achievement than the students with moderate and low emotional intelligence, the students with moderate emotional intelligence have better achievement than the students with low emotional intelligence. However, if viewed in the students taught using GI-PS, the students with high emotional intelligence have the same achievement with the students with moderate and low emotional intelligence, the students with emotional intelligence have same achievement with the students with low emotional intelligence. On the students taught using conventional model, the students with moderate emotional intelligence have same achievement with the student' with low emotional intelligence.

Based on the conclusions, some suggestions for teachers, students and other researchers are as follows:

1. Model group investigation with scientific approach can be used by teachers for the learning of mathematics in particular on material rectangle and triangle, which is expected to improve student achievement.
2. For teacher is to always motivate the students to improve emotional intelligence.
3. For further research is recommended to use a scientific approach combined with more cooperative learning models so that the learning activity will not be bored.

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