The effect of team assisted individualization in mathematics learning reviewed from interpersonal intelligence

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Abstract. The purpose of this research was to investigate the effect of Team Assisted Individualization (TAI) toward geometry learning achievement. This research was quasi experiment. The research sample was 113 students in junior high school in 1 Eromoko in academic years of 2016/2017 that was selected by using cluster random sampling. The participants responded to the questionnaire based on Gardner’s theory that were used to collected interpersonal intelligence data and achievement test to obtain students mathematics learning achievement data. Hypothesis testing used two ways analysis of variance (ANOVA) with unbalanced cells. The result of the research showed that learning method has p value 0.001, multiple intelligence categories has p value 0.004 and interaction has p value 0.567. It can be concluded that TAI gave a different effect on mathematics learning achievement, there was a different mathematics learning achievement in each category of interpersonal intelligence and there was no interaction between interpersonal intelligent and learning models toward student’s mathematics learning achievement. TAI learning model can be used by the teachers in mathematics learning, especially in the material of geometry, which can give better mathematics achievement.

1. Introduction

Learning process is very important in the course of education. One of the branches of science contained in the learning process is mathematics. Mathematics is a science that underlies the development of modern technology and has an important role in developing the human mind power, so that mathematics is given in every level of education from primary school to high school. The learning process in mathematics requires logical, systematic, critical and creative thinking to be honed in its skills and able to use reasoning in solving various problems in everyday life. In fact, many students in studying mathematics hold that math lessons are difficult lessons, boring subjects and believe that mathematics will not benefit them after graduation.

Learning difficulties faced by junior high school students in Wonogiri Regency about solving problems related to statistics were influenced by factors from within the inside and outside the students. One of the causal factors of student self is mathematics which must use logic or reasoning and systematic thinking. In learning mathematics in the classroom, many students work on easy problems so that when students working on difficult problems and require a deep reasoning ability, they will face difficulties. These difficulties will affect in low mathematics achievement in students. The teacher’s role as facilitators in learning process is needed to improve mathematics learning achievement.

Success in the process of learning mathematics in influence two factors there was learning models and multiple intelligences. Tran [1] suggested that mathematics learning will be effective if teachers apply cooperative learning models and use their creativity to create enjoyable learning. In
cooperative learning the students will be heavily involved in working with heterogeneous learning [2]. Research on multiple intelligences in learning mathematics has been conducted by Santoso [5] about four types of intelligence (linguistic, mathematical-logical, visual and interpersonal space) on the subject of triangle shows there is influence of multiple intelligences on mathematics learning achievement. Hariyati [6] examined the three types of intelligence (mathematical-logical, linguistic and interpersonal) on the subject of statistics. The results of research showed there was influence of multiple intelligences on mathematics learning achievement. Handayani [7] examined the three types of intelligence (mathematical-logical, interpersonal) on the subject of social arithmetic. Research showed there was the influence of multiple intelligences on mathematics learning achievement. From the previous related studies of multiple intelligences, generally the results of these studies show that there was influence toward intelligences on mathematics learning achievement. Therefore, researchers are interested to examine the multiple intelligences on geometry materials. Re-searchers limited this study by taking one type of multiple intelligences, namely interpersonal intelligence. Interpersonal intelligence type is very suitable in learning by using TAI model. Students with interpersonal intelligence tend to like group activities and adapt easily. With this type of students interpersonal intelligence differences must have to cooperate well in learning on mathematics with TAI model, so that this learning model really could to improve learning achievement.

2. Method
This research used a quasi-experimental research with 2x2 factorial design. The aim of this research was to investigate the influence of two independent variables toward dependent variable. The first independent variables in this research was model learning which TAI was use in experimental class and direct learning was use in control class. Then another independent variable was interpersonal intelligence, while the dependent variable was student’s mathematics learning achievement. The sample in this research was all students eight grade of Senior High School 1 EROMOKO in Wonogiri on the academic years of 2016/2017. The sample was taken by using cluster random sampling. This research used three methods in collecting data collection, those were documentation method used to obtain student’s profile data, the test method used to obtain students mathematics learning achievement data (containing the indicators of geometry materials in the form of multiple choice questions), and questionnaire used to categorize the level in interpersonal intelligences of students. Table 1 is a way to determine high, moderate and low interpersonal intelligence [9].

| Interval                      | Category     |
|-------------------------------|--------------|
| $x_i > \bar{x} + 0.5s$       | High         |
| $\bar{x} - 0.5s \leq x_i \leq \bar{x} + 0.5s$ | Moderate     |
| $x_i < \bar{x} - 0.5s$       | Low          |

Information:
- $x_i$: Score for each student
- $\bar{x}$: Average score of all sample students
- $s$: Standard deviation of the entire sample

In this research, start with testing the hypothesis by two ways analysis of variance (two-way anova) with unbalanced cells. Next the research data should qualified analysis includes a data distribution normality test, and homogeneity of variance test which was assisted with SPSS 17 application in Windows software.

3. Result and Discussion

3.1 Student score in model type TAI and Direct learning
Table 2 show the measurement data of students’ final achievement. Data were obtained from post-test result in experimental class (TAI) and control class (direct learning).

| Statistics       | TAI     | Direct Learning |
|------------------|---------|-----------------|
| Size of Sample   | 56      | 57              |
| Lowest Value     | 74.076  | 63.803          |
| Highest Value    | 81.966  | 71.984          |
| Average Value    | 77.63   | 68.39           |
| Standard Deviation | 15.196  | 14.472         |

3.2 Categorization of student multiple intelligence in each model learning
The instrument was to categorize the levels (low, moderate, high) in interpersonal intelligences of students is by using questionnaire. The number of questionnaire to be used is 15 items. Student categorization into certain types of intelligence is seen from Table 3.

| Learning Method | Interpersonal Intelligence Level | N   |
|-----------------|----------------------------------|-----|
| TAI             | Low                              | 16  |
|                 | Moderate                          | 24  |
|                 | High                              | 16  |
| Direct Learning | Low                              | 12  |
|                 | Moderate                          | 27  |
|                 | High                              | 18  |

3.3 Section headings
Before the two-way anova test, normality and homogeneity were performed at significance level 5% by using SPSS 17. The normality test result of student’s learning achievement showed that the p value from experimental and control class more than 0.05 Experimental class is 0.991>0.05, and control class is 0.110> 0.05. The result indicated that the sample of students’ mathematics achievement test came from a normality distribution population. The result of homogeneity test of students’ mathematics learning achievement between experiment class and control class showed the p value more than 0.05, that was 0.059>0.05. This indicated that the population has homogeneous variance.

3.4 Figures and tables
After the prerequisite test had been done of normality and homogeneity then the data was analyzed using two ways analysis of variance.

| Test of Between-Subjects Effects | Source         | F    | P    |
|----------------------------------|----------------|------|------|
| Corrected Model                  | 3.986          | .004 |
| Intercept                        | 2591.342       | .000 |
| Learning Method                  | 12.484         | .001 |
| Interpersonal Intelligence       | 3.229          | .004 |
| Learning Method * Interpersonal Intelligence | .571 | .567 |
3.5 Estimated Marginal Means

Table 5. Method of Learning

| Method       | Mean  | Std. Error |
|--------------|-------|------------|
| TAI          | 78.021| 1.990      |
| Direct Learning | 67.893| 2.063      |

Table 6. Interpersonal Intelligence Level

| Interpersonal Level | Mean  | Std. Error |
|---------------------|-------|------------|
| Low                 | 69.240| 2.792      |
| Moderate            | 71.477| 2.051      |
| High                | 78.154| 2.547      |

3.6 Post Hoc Test with Scheffe on Interpersonal Intelligence

Table 7. Post Hoc Test with Scheffe on Interpersonal Intelligence

| Intelligence | Intelligence | P  |
|--------------|--------------|----|
| Low          | Moderate     | .961|
| Moderate     | High         | .221|
| High         | Low          | .225|

Based on the calculation in Table 4 showed the effect of learning model on mathematics learning has a value of \( F = 12.484 \) with \( p = 0.001 < 0.05 \). So, \( H_0 \) was rejected and \( H_a \) was accepted. It can be concluded that there was difference effect using TAI learning model in mathematics learning achievement. Experimental class based on Table 5 experimental class had mean score at 78.021 and in control class had mean score at 67.893. It can be concluded that TAI give greater than direct learning in student’s mathematics achievement. This result was related with Slavin[10] stated effect of TAI were equally positive for high, average, and low achievers, and for academically handicapped as well as nonhandicapped student.

The effect of interpersonal intelligence on mathematics learning achievement has a value of \( F = 3.229 \) with \( p = 0.044 < 0.05 \). So, \( H_0 \) was rejected and \( H_a \) was accepted. It can be concluded that there was any difference between high, moderate, and low level in interpersonal intelligence. Based on Table 7 (result using post hoc test with Scheffe), the result of low interpersonal intelligence different significantly with moderate interpersonal intelligence. In Table 6, low had mean score at 68.240 and moderate intelligence score at 71.477. So it can be concluded learning method effective-ly in moderate interpersonal intelligence than low interpersonal intelligence. Then, the result of moderate interpersonal intelligence differed significantly with high interpersonal intelligence. In Table 6, high had mean score at 78.154 and moderate intelligence score at 71.477. So it can be concluded learning method effective-ly in high interpersonal intelligence than moderate interpersonal intelligence. The result of high interpersonal intelligence differed significantly with moderate interpersonal intelligence. In Table 6, high interpersonal intelligence had mean score at 78.154 and low intelligence score at 69.240. So it can be concluded learning method effectively in high interpersonal intelligence than low interpersonal intelligence. This result was related with Advani[11] stated that students with higher level of interpersonal intelligence performed better when taught throught teaching strategy.

4 Conclusion

Based on the result and discussion, it can be concluded that TAI gave positive effect towards mathematics learning achievement. TAI gave better mathematics learning achievement than direct learning. There was different mathematics learning achievement between levels on interpersonal intelligence. There was no interaction between interpersonal intelligence and learning models toward student’s mathematics learning achievement. TAI could be an alternative learning model to improve students’ learning achievement in geometry.
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