The experimentation of learning models viewed from interpersonal intelligence

M T C Gerhana, Mardiyana, and I Pramudya
Mathematics Department of Postgraduate Program Sebelas Maret University, Surakarta, Indonesia

E-mail: Tita.ppsmatematika@gmail.com

Abstract. This research aimed to know experimentation Project Based Learning (PjBL) and Problem Based Learning (PBL) with scientific approach viewed from interpersonal intelligence. The subjects of this research were grade X MIPA students in SMA N 1 Minggir. This research instruments used were test and questionnaire. The result of the research showed that: (1) Students subjected PjBL with scientific approach had a better learning achievement than PBL with scientific approach; (2) students with high interpersonal intelligence had a better learning achievement than low and medium interpersonal intelligence, students with low and medium interpersonal intelligence gave the same learning achievement; (3) In PjBL, students with high interpersonal intelligence had a better learning achievement than low and medium interpersonal intelligence, students with low and medium interpersonal intelligence gave the same learning achievement. In PBL, students with high and medium interpersonal intelligence had a better learning achievement than low interpersonal intelligence, students with high and medium interpersonal intelligence gave the same learning achievement; (4) In high interpersonal intelligence, students subjected PjBL had a better learning achievement than students subjected PBL. In medium and low interpersonal intelligence, students subjected PjBL gave same learning achievement than students subjected PBL.

1. Introduction
The development of education in the current era more rapidly. Students are increasingly required to master all field of learning to be able to ensure a better life. However, education in Indonesia is still low, especially in mathematics education. The low mathematics education in Indonesia were being demonstrated by the international comparison of PISA (Program for International Student Assessment) 2016 in Mathematics subjects that Indonesia is ranked 63 out of 70 countries with an average score of 386 [7]. The low achievement in the mathematics lesson is not only from students but comes from all aspects of education both from government and educators (teachers). Teachers should be more innovative in learning to improve student achievement in the field of mathematics. Innovative learning can be done in various ways, one of them is choosing the right learning model. Learning model is a plan used as a guide in planning the learning in the classroom or learning in the tutorial [10]. The choice of learning model should be by the material discussed and the learning objectives achieved. Learning model such as project-based learning model and problem-based learning model. Project-Based Learning (PjBL) is an innovative learning approach in the 21st century. Through inquiry, students encourage learning reviews, collaborate on research, and create knowledge-based projects that they have [8]. While the Problem-Based Learning (PBL) model is a set of teaching
models that use problems as a focus for developing problem-solving skills, materials, and self-organization [4]. The PBL model of teaching is more effective for teaching mathematics. By adopting PBL in teaching mathematics, teacher can create some creative thinkers, critical decision makers, problem solvers which is very much needed for the competitive world. And also problem-based learning instructional strategy had an effect on content knowledge which provides greater opportunities for the learners to learn a content with more involvement and increase the student’s active participation, motivation, and interest among the learners. This leads the learner to have a positive attitude towards mathematics and help them to increase their achievement to a large extent and which will lead to long-term memory. It gave a new and desirable kind of experience for the students [5].

Mathematics learning material in this research is trigonometry. Trigonometric material is widely applied in real life, such as counting the height of the building, the height of tower, the height of the aircraft, with a certain elevation angle. However, in fact in teaching trigonometry material, teacher less giving a contextual and realitical problem. With the PjBL model and PBL model, teachers can provide contextual and realistic problems. In the PjBL model students can be invited to find real problems, practice the planning, and solve the problem, such as calculating the height of the school flagpole with a clinometer. In the PBL model, teachers can provide contextual problems that can be solved with trigonometric material.

In Indonesia, the ongoing curriculum emphasizes the modern pedagogic dimension of learning, using a scientific approach. The scientific approach is a learning process designed in such a way that learners actively construct concepts or principles through observing stages to identify or find problems, formulate problems, formulate hypotheses, collect data with various techniques, analyze data, draw conclusions and communicate concepts or principles that are found [2]. Therefore, the learning model in this study uses a scientific approach.

Teacher’s task besides choosing the right learning model is to pay attention to students’ interpersonal intelligence. The chosen learning model must be by students’ interpersonal intelligence. Interpersonal intelligence according to Gardner & Checkley is the ability to understand the thoughts, attitudes, and behavior of others [3]. Interpersonal intelligence is the ability to understand and be sensitive to feelings, intentions, motivations, temperaments, temperament of others [9]. Interpersonal intelligence in this study is the ability of a person to understand the thoughts, feelings, attitudes, and motivation of others so that a person can establish good relations and communication with others. PjBL and PBL with a scientific approach is a model of learning that is applied in groups. Students perform tasks assigned by teachers in groups. In the group, students will interact with friends to find the right answer. The accuracy of the answers will affect the mathematics learning achievement. Therefore, interpersonal intelligence also needs to be considered by teachers because it will also affect student learning achievement in the application of mathematics learning model, as in a study conducted by David, et al. that interpersonal intelligence has a positive relationship with learning activities [6]. Some of the problems that will be examined in this research is: (1) Which gives better learning achievement between PjBL model with scientific approach and PBL model with scientific approach; (2) Which had a better mathematics learning achievement between students whose interpersonal intelligence high, medium, and low; (3) In each category learning model, which had a better mathematics learning achievement students whose had the level of interpersonal intelligence; (4) In each level of interpersonal intelligence, which had a better mathematics learning achievement, PjBL model with a scientific approach and PBL model with a scientific approach. Based on the above explanation, the author will conduct research the experimentation of learning models viewed from interpersonal intelligence.

2. Experimental Method
This research employed a quasi-experimental research. In this case to know the difference use of PjBL model with scientific approach and PBL model with scientific approach to students’ mathematics learning achievement viewed from student interpersonal intelligence. The method that is used in this
research is a quantitative method. Variables that will be observed are learning model as an independent variable, interpersonal intelligence as attribute variable, and student’s mathematics learning achievement as a dependent variable. The design used in this research is the $2 \times 3$ factorial design presented in Table 1.

**Table 1. Research design**

| Learning Model ($A$) | Interpersonal Intelligence ($B$) |
|---------------------|----------------------------------|
|                     | High ($B_1$) | Medium ($B_2$) | Low ($B_3$) |
| PjBL ($A_1$)        | $(AB)_{11}$ | $(AB)_{12}$ | $(AB)_{13}$ |
| PBL ($A_2$)         | $(AB)_{21}$ | $(AB)_{22}$ | $(AB)_{23}$ |

The population of this research was grade X MIPA students in SMA N 1 Minggir academic year 2016/2017. The used sampling technique is random sampling that is done by selecting 2 classes randomly that is class X MIPA 1 and X MIPA 2. Class X MIPA 1 as an experimental class with PBL model with a scientific approach and class X MIPA 2 as an experimental class with PjBL model with a scientific approach. The research instruments used were tests and questionnaire. Instrument test to get data of student’s mathematics learning achievement and instrument questionnaire to get data of student’s interpersonal intelligence. The test used in this study as many as 25 questions and problems that were tested as many as 35 questions. A measurement scale that is used for test result is interval scale. Questionnaires used in this study as many as 30 statements and questionnaires tested as many as 50 questions. The measurement scale for questionnaire data uses interval scale which has been converted into nominal scale by categorizing interpersonal intelligence into high, medium, and low categories using following calculation. Interpersonal intelligence questionnaire indicators can be seen in Table 2.

**Table 2. Intelligence questionnaire indicators**

| Interpersonal Intelligence Criteria | Indicators                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------|
| Feelings of relation in learning  | Feelings of learning in groups                                              |
| Feelings of relation beyond learning | Feelings of interaction on the internet social networking                  |
| Ability to empathize              | a. Have a sense of caring with others in need                               |
|                                   | b. Paying attention to the latest social issues                            |
| Ability to communicate            | a. Be able to talk effectively with others                                  |
|                                   | b. Pay attention and listen to others while talking                         |
| Ability to control emotions       | a. Avoiding conflict with others.                                           |
|                                   | b. Be able to resolve conflicts in accordance with shared wishes           |
| The breadth of the relation       | a. Be able to relate with anyone                                           |
|                                   | b. Active follow formal / non-formal organization                           |
|                                   | c. Actively use social media on the internet                               |

Questionnaires given to students are measured using a Likert scale. Questionnaire assessment criteria as presented in Table 3.

**Table 3. Questionnaire assessment criteria**

| Type of Statement | Score of Alternative Answers |
|-------------------|-----------------------------|
|                   | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| Positive statements | 5          | 4     | 3       | 2        | 1                 |
| Negative statements | 1          | 2     | 3       | 4        | 5                 |
Calculation of the category of interpersonal intelligence as follows: high interpersonal intelligence if \( x_i > \bar{x} + \frac{1}{2}s \); Medium interpersonal intelligence if \( \bar{x} - \frac{1}{2}s \leq x_i \leq \bar{x} + \frac{1}{2}s \); Low interpersonal intelligence if \( x_i < \bar{x} - \frac{1}{2}s \) [1].

Information:
\( \bar{x} \) : average questionnaire score 
\( s \) : standard deviation

The data analysis technique used two-way analysis of variance with a different cell. Before performing the hypothesis test, the prerequisite test is the normality test by Liliefors test and homogeneity test by Bartlet test should be performed. Furthermore, the double comparison test with Scheffe method is done after two-way analysis of variance with a different cell.

3. Result and Discussion
To know the result of experimentation of PjBL model and PBL model viewed from student’s interpersonal intelligence, the steps were taken by the author is performing equivalence tests on the student’s initial ability, hypothesis test, and double comparison test.

3.1. Equivalence test on the student’s initial ability
The equivalence test was performed to test the equality of the average population of student’s initial ability in experimental class one (a class that will be subject to PjBL model) and experimental class two (a class that will be subject to PBL model). The purpose of the equivalence test is to know that the experimentation result is obtained from the treatment are given, not from other influences. Before performing an equivalence test, the author performs a normality test and homogeneity test of initial ability.

3.1.1. Normality Test. Normality test using Liliefors test. The result of normality test can be seen in Table 4.

| Class            | \( n \) | \( L_{obs} \) | \( L_{0.05;33} \) | Decision | Conclusion |
|------------------|--------|--------------|----------------|----------|------------|
| Experimental class one | 33    | 0.1535       | 0.1542         | \( H_0 \) is accepted | Normal    |
| Experimental class two | 33    | 0.1526       | 0.1542         | \( H_0 \) is accepted | Normal    |

From Table 4, it appears that for two populations, \( H_0 \) is accepted. This suggests that populations for experimental class one and experimental class two come from normally distributed populations.

3.1.2. Homogeneity Test. Homogeneity test is used to determine whether the population comes from the same variances. Homogeneity test using Bartlett test with 5% significance level. Homogeneity test for initial ability showed that \( \chi^2_{obs} = 0.156 \) and \( DK = \{ \chi^2 | \chi^2 > 3.841 \} \), so that \( \chi^2_{obs} = 0.156 \in DK \). Thus, the homogeneity test decision is \( H_0 \) accepted. From the calculation of homogeneity test, it can be concluded that the population for experimental class one and experimental class two have the same variance.

Normality test and homogeneity test have been fulfilled. The next step is performed one-way analysis of variance with a different cell. Based on calculations obtained \( F_{obs} = 3.23 \) and \( F_{(0.05;1,65)} = 3.99 \) so \( F_{obs} = 3.23 \notin DK \). Thus, the decision of one way analysis of variance with different cell is \( H_0 \) accepted. From the calculation of one way analysis of variance with different cell, it can be concluded that two populations for experimental class one and experimental class two have the same initial ability.

3.2. Hypothesis Test
Mathematics learning on trigonometric material applies PjBL model and PBL model. In the PjBL model with a scientific approach, students are given project assignments in groups. The results of the
project report can be seen in Figure 1. While in the PBL model with a scientific approach, students are given the task of solving contextual problems related to trigonometry. The results of the student assignments on the model PBL can be seen in Figure 2. The groups in the PjBL model and PBL model are formed heterogeneously.

![Figure 1. Results of The Project Report](image1.png)

![Figure 2. Results of The Student Assignments on The Model PBL](image2.png)

After students complete assignments on PjBL model and PBL model, students are given a test of trigonometry material. In Table 5 presented the results of multiple choice tests.

**Table 5. Results of Multiple Choice Tests**

| Students with high interpersonal intelligence level in PjBL model | The highest value of multiple choice test | The lowest value of multiple choice test |
|---------------------------------------------------------------|----------------------------------------|----------------------------------------|
| Students with medium interpersonal intelligence level in PjBL model | 80                                      | 36                                      |
| Students with low interpersonal intelligence level in PjBL model | 76                                      | 36                                      |
| Students with high interpersonal intelligence level in PBL model | 80                                      | 68                                      |
| Students with medium interpersonal intelligence level in PBL model | 80                                      | 64                                      |
| Students with low interpersonal intelligence level in PBL model | 68                                      | 36                                      |
Based on the research result, mathematics learning achievement data based on interpersonal intelligence can be obtained as served in Table 6.

**Table 6. Student mathematics learning achievement data based on interpersonal intelligence**

| Learning Model | Interpersonal Intelligence |
|----------------|---------------------------|
|                | High  | Medium | Low   |
| N              | 9     | 15     | 9     |
| Mean           | 95.11 | 62.40  | 64.89 |
| PjBL Maximum Value | 100   | 80     | 76    |
| Minimum Value  | 80    | 36     | 36    |
| Standard Deviation | 6.86  | 11.69  | 11.62 |
| N              | 7     | 8      | 15    |
| Mean           | 76.00 | 71.00  | 51.47 |
| PBL Maximum Value | 100   | 80     | 68    |
| Minimum Value  | 68    | 64     | 36    |
| Standard Deviation | 11.31 | 5.55   | 13.26 |

3.2.1. **Normality Test.** Normality test using Liliefors test. The result of normality test based on learning model can be seen in Table 7.

**Table 7. Summary of normalities data student mathematics learning achievement**

| Population                   | n   | \( L_{obs} \) | \( L_{table} \) | Decision  | Conclusion |
|-----------------------------|-----|---------------|-----------------|-----------|------------|
| PjBL                        | 33  | 0.1364        | 0.15423         | \( H_0 \) is accepted | Normal    |
| PBL                         | 30  | 0.1579        | 0.16176         | \( H_0 \) is accepted | Normal    |
| Interpersonal Intelligence High | 16  | 0.1811        | 0.22150         | \( H_0 \) is accepted | Normal    |
| Interpersonal Intelligence Medium | 23  | 0.0937        | 0.18474         | \( H_0 \) is accepted | Normal    |
| Interpersonal Intelligence Low | 24  | 0.1045        | 0.18085         | \( H_0 \) is accepted | Normal    |

From Table 7, it appears that for four populations, \( H_0 \) is accepted. This suggests that populations for PjBL model, PBL model, interpersonal intelligence high, interpersonal intelligence medium, and interpersonal intelligence low come from normally distributed populations.

3.2.2. **Homogeneity Test.** Homogeneity test using Bartlett test with 5% significance level. Homogeneity test for students mathematics learning achievement based on learning model showed that \( \chi^2_{obs} = 0.756 \) and \( DK = \{ \chi^2 | \chi^2 > 3.841 \} \) so that \( \chi^2_{obs} = 0.756 \notin DK \). Thus, decision is \( H_0 \) accepted. From the calculation of homogeneity test, it can be concluded that the population for PjBL model and PBL model have the same variance. Homogeneity test for students mathematics learning achievement based on interpersonal intelligence showed that \( \chi^2_{obs} = 1.716 \) and \( DK = \{ \chi^2 | \chi^2 > 5.991 \} \) so that \( \chi^2_{obs} = 1.716 \notin DK \). Thus, decision is \( H_0 \) accepted. From the calculation of homogeneity test, it can be concluded that the population for interpersonal intelligence high, interpersonal intelligence medium, and interpersonal intelligence low have the same variance.

3.2.3. **Two-Way Analysis of Variance (ANOVA) with Different Cell.** The result of two-way ANOVA with the different cell can be seen in Table 8.

**Table 8. Summary of two-way analysis of variance with the different cell**

| Source                        | SS     | DF | MS   | \( F_{obs} \) | \( F_{R} \) | Decision       |
|-------------------------------|--------|----|------|---------------|-------------|----------------|
| Learning Model (A)            | 917.71 | 1  | 917.71 | 7.68         | 4.01        | \( H_{0A} \) is rejected |
| Interpersonal Intelligence (B)| 7552.43| 2  | 3776.21 | 31.58       | 3.16        | \( H_{0B} \) is rejected |
| Interaction(AB)               | 2077.3 | 2  | 1038.65 | 8.69         | 3.16        | \( H_{0AB} \) is rejected |
| Galat                         | 6815.11| 57 | 119.56 |              |             |                |
| Total                         | 17362.56| 62 |       |              |             |                |
Based on the calculation of two way ANOVA with a different cell for inter row effects (learning model) is obtained $F_{ obs } = 7.68$ and $F(0.05;1,57) = 4.01$ so $F_{ obs } = 7.68 \in DK$. Thus, the decision of two-way ANOVA with a different cell for inter row effects (learning model) is $H_0$ rejected. Based on the calculation of two-way ANOVA with a different cell for inter line effects (learning model) is obtained $F_{ obs } = 31.58$ and $F(0.05;2,57) = 3.16$ so $F_{ obs } = 31.58 \in DK$. Thus, the decision of two-way ANOVA with a different cell for inter line effects (learning model) is $H_0$ rejected. Based on the calculation of two-way ANOVA with a different cell for interaction effects of rows and columns (interaction of learning models and interpersonal intelligence) is obtained $F_{ obs } = 8.69$ and $F(0.05;2,57) = 3.16$ so $F_{ obs } = 8.69 \in DK$. Thus, the decision of two way ANOVA with different cell for interaction effects of rows and columns (interaction of learning models and interpersonal intelligence) is $H_0$ rejected.

According to the result of two-way analysis of variance with different cell, it can be concluded that (a) learning model gives influences toward mathematics learning achievement of students, (b) students’ interpersonal intelligence affects to mathematics learning achievement of students, (c) there is an interaction between learning model and students’ interpersonal intelligence which influences mathematics learning model of students.

3.2.4. Double Comparison Test. The result of two-way ANOVA with a different cell proves that $H_{0A}$, $H_{0B}$, $H_{0AB}$ are rejected, so that double comparison test must be conducted. Double comparison test can be seen below

| Learning Model | Interpersonal Intelligence | Marginal Mean |
|----------------|---------------------------|---------------|
|                | High  | Medium | Low  |          |
| PjBL           | 95.11 | 62.40  | 64.89| 72.00    |
| PBL            | 76.00 | 71.00  | 51.47| 62.40    |
| Marginal Mean  | 86.75 | 65.39  | 56.50|          |

The results of two way ANOVA with different cell showing that $H_{0A}$ is rejected. It means that there is an influence of learning model to mathematics learning achievement. The compared learning models provide different learning achievement, so the inter row comparison test needs to be done to find out which learning model provides better learning achievement. The result of average comparison of inter rows can be seen in the following Table 10.

| Decision | $H_0$ | $F_{obs}$ | $F_{table}$ |
|----------|-------|-----------|-------------|
| $\mu_1 = \mu_2$ | 5.35  | 4.01      | $H_0$ is rejected |

Based on Table 10, $F_{ obs } = 5.35 > F_{ table } = 4.01$ so $H_0$ is rejected. This indicates that there is a difference in mathematics learning achievement of students who are subjected PjBL model and students who are subjected PBL model. Based on Table 9, average marginal achievement of students with PjBL model is 72.00 and average marginal achievement of students with PBL model is 62.40. Therefore, it can be concluded that the PjBL model gives better mathematics learning achievement than the PBL model.

The results of two way ANOVA with different cell showing that $H_{0B}$ is rejected. It means that there is an influence of interpersonal intelligence to mathematics learning achievement. The compared learning models provide different learning achievement, so the inter columns comparison test needs to be done to find out which interpersonal intelligence provides better learning achievement. The result of average comparison of inter columns is seen in the following table.
Based on Table 11, for $H_0: \mu_1 = \mu_2$ obtained $F_{\text{obs}} = 28.82 > F_{\text{table}} = 6.32$ so $H_0$ is rejected. So, there is a difference in mathematics learning achievement of students with high and medium interpersonal intelligence. Based on Table 9, average marginal achievement of students with high interpersonal intelligence is 86.75 and average marginal achievement of students with medium interpersonal intelligence is 65.39. Therefore, it can be concluded that students with high interpersonal intelligence give better mathematics learning achievement than students with medium interpersonal intelligence. $H_0: \mu_2 = \mu_3$ obtained $F_{\text{obs}} = 3.80 < F_{\text{table}} = 6.32$ so $H_0$ is accepted. This indicates that there is not a difference in mathematics learning achievement of students with medium interpersonal intelligence and low interpersonal intelligence. Therefore, it can be concluded that students who have medium interpersonal intelligence give the same mathematics learning achievement with students who have low interpersonal intelligence. $H_0: \mu_1 = \mu_3$ obtained $F_{\text{obs}} = 29.32 > F_{\text{table}} = 6.32$ so $H_0$ is rejected. This indicates that there is a difference in mathematics learning achievement of students with high interpersonal intelligence and low interpersonal intelligence. Based on Table 9, average marginal achievement of students with high interpersonal intelligence is 86.75 and average marginal achievement of students with low interpersonal intelligence is 56.50. Therefore, it can be concluded that students with high interpersonal intelligence give better mathematics learning achievement than students with low interpersonal intelligence.

The results of two way ANOVA with different cell showing that $H_{0AB}$ is rejected. It means that there is an interaction between learning model and students’ interpersonal intelligence which influences mathematics learning model of students. So, double comparative test between cells is required.

Based on Table 12, for $H_0: \mu_{11} = \mu_{12}$ obtained $F_{\text{obs}} = 50.31 > F_{\text{table}} = 11.88$ so $H_0$ is rejected. This indicates in PjBL model; there is a difference in mathematics learning achievement of students with high interpersonal intelligence and students with medium interpersonal intelligence. Based on Table 9, average marginal achievement of students with high interpersonal intelligence in PjBL model is 95.11 and average marginal achievement of students with medium interpersonal intelligence in PjBL model is 62.40. Therefore, it can be concluded in PjBL model with high interpersonal intelligence give better...
Mathematics learning achievement than students with medium interpersonal intelligence in PjBL model. $H_0; \mu_{12} = \mu_{13}$ obtained $F_{obs} = 0.29 < F_{table} = 11.88$ so $H_0$ is accepted. This indicates in PjBL model there is not a difference in mathematics learning achievement of students with medium interpersonal intelligence and students with low interpersonal intelligence. Therefore, it can be concluded in PjBL model, students who have medium interpersonal intelligence gives the same mathematics learning achievement with students who have low interpersonal intelligence. $H_0; \mu_{11} = \mu_{13}$ obtained $F_{obs} = 34.35 > F_{table} = 11.88$ so $H_0$ is rejected. This indicates in PjBL model, there is a difference in mathematics learning achievement of students with high interpersonal intelligence and students with low interpersonal intelligence. Based on the Table 9, average marginal achievement of students with high interpersonal intelligence in PjBL model is 95.11 and average marginal achievement of students with low interpersonal intelligence in PjBL model is 64.89. Therefore, it can be concluded in PjBL model, students with high interpersonal intelligence give better mathematics learning achievement than students with low interpersonal intelligence.

Based on Table 12 for $H_0; \mu_{21} = \mu_{22}$ obtained $F_{obs} = 0.78 < F_{table} = 11.88$ so $H_0$ is accepted. This indicates in PBL model there is not difference in mathematics learning achievement of students with high interpersonal intelligence and students with medium interpersonal intelligence. Therefore, it can be concluded in PBL model, students who have high interpersonal intelligence gives the same mathematics learning achievement with students who have medium interpersonal intelligence. $H_0; \mu_{22} = \mu_{23}$ obtained $F_{obs} = 16.64 > F_{table} = 11.88$ so $H_0$ is rejected. This indicates in PBL model, there is a difference in mathematics learning achievement of students with medium interpersonal intelligence and students with low interpersonal intelligence. Based on the Table 9, average marginal achievement of students with medium interpersonal intelligence in PBL model is 71.00 and average marginal achievement of students with low interpersonal intelligence in PBL model is 51.47. Therefore, it can be concluded in PBL model, students with medium interpersonal intelligence gives better mathematics learning achievement than students with low interpersonal intelligence. $H_0; \mu_{21} = \mu_{23}$ obtained $F_{obs} = 24.02 > F_{table} = 11.88$ so $H_0$ is rejected. This indicates in PBL model, there is a difference in mathematics learning achievement of students with high interpersonal intelligence and students with low interpersonal intelligence. Based on Table 9, average marginal achievement of students with high interpersonal intelligence in PBL model is 76.00 and average marginal achievement of students with low interpersonal intelligence in PBL model is 51.47. Therefore, it can be concluded in PBL model, students with high interpersonal intelligence give better mathematics learning achievement than students with low interpersonal intelligence.

Based on Table 13, for $H_0; \mu_{11} = \mu_{21}$ obtained $F_{obs} = 12.01 > F_{table} = 11.88$ so $H_0$ is accepted. This indicates in high interpersonal intelligence, there is a difference in mathematics learning achievement of students subjected PjBL model and students subjected PBL model. Therefore, it can be concluded in high interpersonal intelligence, students subjected PjBL model give better mathematics learning achievement than students subjected PBL model. $H_0; \mu_{12} = \mu_{22}$ obtained $F_{obs} = 3.23 < F_{table} = 11.88$ so $H_0$ is accepted. This indicates in medium interpersonal intelligence, there is not a difference in mathematics learning achievement of students subjected PjBL model and students subjected PBL model. Therefore, it can be concluded in medium interpersonal intelligence, students subjected PjBL model give the same mathematics learning achievement with students subjected PBL model. $H_0; \mu_{13} = \mu_{23}$ obtained $F_{obs} = 8.47 < F_{table} = 11.88$ so $H_0$ is accepted. This indicates in low interpersonal intelligence, there is not a difference in mathematics learning achievement of students subjected PjBL model and students subjected PBL model. Therefore, it can be concluded in low interpersonal intelligence, students subjected PjBL model give the same mathematics learning achievement with students subjected PBL model.

From the calculation, obtained that students subjected PjBL with a scientific approach had a better learning achievement than PBL with a scientific approach. Students with high interpersonal
intelligence had a better learning achievement than low interpersonal intelligence and medium interpersonal intelligence, students with low interpersonal intelligence and medium interpersonal intelligence gave the same mathematics learning achievement. In PjBL model with scientific approach, students with high interpersonal intelligence had a better learning achievement than low and medium interpersonal intelligence, students with low and medium interpersonal intelligence gave the same learning achievement. In PBL model with a scientific approach, students with high and medium interpersonal intelligence had a better learning achievement than low interpersonal intelligence, students with high and medium interpersonal intelligence gave the same learning achievement. In high interpersonal intelligence, students subjected PjBL with scientific approach had a better learning achievement than students subjected PBL with a scientific approach. In medium and low interpersonal intelligence, students subjected PjBL with a scientific approach gave same learning achievement than students subjected PBL with a scientific approach.

4. Conclusion
The result of the research showed that: (1) Students subjected PjBL with a scientific approach had a better learning achievement than PBL with a scientific approach; (2) students with high interpersonal intelligence had a better learning achievement than low and medium interpersonal intelligence, students with low and medium interpersonal intelligence gave the same learning achievement; (3) In PjBL with a scientific approach, students with high interpersonal intelligence had a better learning achievement than low and medium interpersonal intelligence, students with low and medium interpersonal intelligence gave the same learning achievement. In PBL with a scientific approach, students with high and medium interpersonal intelligence had a better learning achievement than low interpersonal intelligence, students with high and medium interpersonal intelligence gave the same learning achievement; (4) In high interpersonal intelligence, students subjected PjBL with a scientific approach had a better learning achievement than students subjected PBL with a scientific approach. In medium and low interpersonal intelligence, students subjected PjBL with a scientific approach gave same learning achievement than students subjected PBL with a scientific approach.

References
[1] Budiyono 2015 Pengantar Penilaian Hasil Belajar (Surakarta: UNS Press).
[2] Hosnan 2014 Pendekatan Saintifik dan Kontekstual Dalam Pembelajaran Abad 21 (Bogor: Ghalia Indonesia)
[3] Muhammad Y and Nurdin I 2013 Pembelajaran Berbasis Kecerdasan Majemuk (Multiple Intelligences) (Jakarta: Prenadamedia)
[4] Paul E & Don K 2012 Strategies and Models for Teachers : Teaching Content and Thinking Skills (Boston: Allyn & Bacon)
[5] Padmavathy & Mareesh K 2013 Effectiveness of Problem Based Learning In Mathematics International Multidisciplinary e-Journal 2(1) 45-51.
[6] David P, Baker, Cocta, Rose, & Cui 2009 Detecting and Understanding The Impact of Cognitive and Interpersonal Conflict in Computer Supported Collaborative Learning Environments Educational Data Mining 2009.
[7] Program for International Student Assessment 2016 PISA Results in Focus (www.oecd.org/pisa)
[8] Stephanie B 2010 Project-based learning for the 21st century: Skills for the future The Clearing House 83(2) p 39-43
[9] Suparno 2004 Teori Intelligensi Ganda dan Aplikasinya di Sekolah (Yogyakarta: Kanisius)
[10] Trianto 2012 Model Pembelajaran Terpadu (Jakarta: Bumi Aksara)