**The Effect Of Problem Based Learning (Pbl) Model On Interests And Mathematics Learning Achievements Of Junior High School Students**

# D S Utomo and K Hidayati

Department of Mathematics Education, Universitas Negeri Yogyakarta, Indonesia

E-mail: dicky.salmon2016@student.uny.ac.id, kana@uny.ac.id

**Abstract.** This study aims to describe the effect of the Problem Based Learning (PBL) model on learning interest and mathematics learning achievement of seventh grade junior high school students on triangle material. This research is a quasi experiment conducted at SMP N 2 Sewon with a sample of students in class VII C as an experimental group and class VII A as a control group. The instrument used in the form of a questionnaire interest in learning, a matter of pretest and posttest. The research data were analyzed using Paired Sample T Test and Independent Sample T Test and then the effect was measured using Effect Size. The results of this study indicate that: (1) Problem Based Learning (PBL) model and the conventional model had an effect on the learning interest and mathematics learning achievement; (2) Problem Based Learning (PBL) approach is better effect on interest in learning mathematics; (3) Problem Based Learning (PBL) approach is better effect on mathematics learning achievement.

# Introduction

Interest is a desire in a person for a particular object through experience. interest in learning is very closely related to feelings of pleasure and interest can occur because of a happy attitude to something. Therefore, interest can arise because of feelings of pleasure in a person that causes to always pay attention and remember constantly. Thus, the desire / interest and will / will greatly influence the actions that will be considered by someone and the interest will focus or direct every physical or psychological activity in the direction he is observing.

Jennison and Beswick (2010: 286) revealed that students 'understanding of a material would affect students' interest in the material being studied. Students 'interest in learning will affect students' attention to the material delivered or studied [1]. This is in accordance with what was expressed by Renninger, Nerswandt, and Hidi (2015: 2) that interest positively influences students' attention, strategy use, and learning goals [2]. Growing students' interest in learning can be achieved through the presentation of mathematics learning in schools that are more attractive to students.

Fostering student interest in learning can be pursued through presenting mathematics learning in schools that is more attractive to students. Mathematics actually has many interesting sides. However, often this is not present in the learning process. As a result, the education participants do not know the whole thing Mathematics is only known by students as a mere collection of formulas, numbers and symbols. One of the efforts to present learning that is more interesting so that it affects learning interest is through the Problem Based Learning learning model.

Lack of students' interest in learning is caused by many factors both from within and from outside the students. One of the factors is that students have the view that mathematics is identical to memorizing formulas. Meanwhile, one of the external factors is the model or method of learning mathematics which is still not properly applied by the teacher.

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd 1

Good (2009) and Chien (1987), argues that learning achievement is the acquisition of knowledge or skills developed by subject matter, usually indicated by test scores or numerical scores assigned by teachers [3] [4]. Learning achievement is usually measured by a test or continuous assessment by the teacher using artificial tests or tests that have been standardized. Meanwhile, according to, learning achievement is a benchmark of student success so it needs to be studied about aspects that can support the improvement of learning achievement and quality of education in Indonesia.

According to Duch (1995) quoted by Aris Shoimin (2014: 130), problem based learning (PBL) is a teaching model characterized by real problems as a context for students learning to think critically and problem solving skills and gain knowledge [5]. The teacher's role in problem based learning is to raise a problem, give questions and facilitate inquiry and dialogue. Learning problem based learning, the environment must be arranged in such a way that is comfortable and open to exchange ideas.

The problem based learning model also has enormous potential to make learning experiences more interesting and meaningful. Besides problem based learning also facilitates students to investigate, solve problems, be student centered, and produce tangible products in the form of project results. students will enter into a competition with their groups, and each group competes to be the most superior among the others.

The Problem Based Lerning (PBL) model can have a positive influence on students' learning interest and learning achievement. According to Badudu and Zain (2001: 131), influence is a force that causes something to happen, something that can form or change something else and submit or follow because of the power or power of others [6]. So the influence is a reaction that arises from a treatment due to the urge to change or shape things towards a better situation.

These views finally concluded that the problem based learning model of learning would facilitate the success of students' mathematical problem solving abilities. Based on the explanation above, it can be seen that the Problem Based Learning (PBL) learning model can influence learning interest and learning achievement, besides the Problem Based Learning (PBL) learning model is rarely used by teachers. So that researchers are interested in conducting research with the title: The effect of the Problem Based Learning (PBL) learning model on the interest and mathematics learning achievement of students of grade VII in the triangle material.

# Research Methods

* 1. *Types of Research*

This research is a quasi experiment with Nonequvalent (pretest-posttest) Control Group Desaign design.

Table 1. Design Nonequivalent Control Group Design

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Class**  | **Initial interest questionnaire** | **Preliminary test** | **Treatment** | **Final Test** | **Final Interest Questionnaire** |
| **Eksperiment** | **P1** | **X1** | **A** | **Y1** | **Q1** |
| **Control** | **P2** | **X2** | **B** | **Y2** | **Q2** |

Keterangan :

P1 : Initial interest questionnaire in eksperiment class

P2 : Initial interest questionnaire in control class X1 : Pretest eksperiment class group

X2 : Pretest control class group

Y1 : Postest eksperiment class group

Y2 : Posttest control class group

A : *Problem Based Learning* model

B : Conventional learning model

Q1 : Final Interest Questionnaire in eksperiment class

Q2 : Final Interest Questionnaire in control class

* 1. *Time and Place of Research*

This research was conducted at SMP N 2 Sewon, which is located on Jl. Parangtritis KM 6, Pandes, Panggungharjo, Sewon, Bantul, Yogyakarta. The study was conducted in February-April 2020.

* 1. *Research Subjects*

The population of this study were 8 class students of SMP N 2 Sewon, totaling 260 people. The sample of the study was randomly selected 2 classes, class VII C as the experimental class and class VII A as the control class. Each number 32 people.

* 1. *Data, Instrument, and Data Collection Techniques*

The instruments in this study consisted of a questionnaire of early and late learning interest, as well as pretest and posttest questions. The instrument has been tested for validity, namely content validity. The result is that the instruments used are valid and reliable. The learning tool used is the Learning Implementation Plan (RPP) with PBL and conventional models, as well as the Student Activity Sheet (LPKD) for the experimental class.

* 1. *Data analysis technique*

There are 3 analyzes in this research, namely descriptive analysis, prerequisite test analysis, and hypothesis test analysis. Descriptive analysis was conducted to find a general description of student achievement based on the results of the pre-test and post-test used to measure learning achievement, as well as the initial questionnaire score and the final questionnaire score of interest in learning mathematics in the experimental class and the control class, while in the prerequisite test there were three stages: the test normality, homogeneity test and average difference test. Hypothesis test analysis is used to determine the effect of Problem Based Learning (PBL) models on learning interest and mathematics learning achievement of seventh grade junior high school students on triangle material

The research data were analyzed using the Paired Sample T Test in the first hypothesis testing, to determine the effect of the Problem Based Learning (PBL) learning model on interest and learning achievement using Effect Size. With the help of IBM SPSS.

# Results and Discussion

The data in this study were the initial score and the final score of the learning interest questionnaire and the students' pretest and posttest scores. The results of the data were obtained from two classes, namely class VII C as a class with Problem Based Learning (PBL) learning model and class VII A as a control class with a conventional learning model. The results of initial interest scores and final interest scores are presented in Table 2, while the categorization criteria can be seen in Table 3. In the learning interest data there is an increase in the average in both classes.

Table 2. Results of the Initial Questionnaire and the End Questionnaire for Interest in Learning

|  |  |  |
| --- | --- | --- |
|  | **Initial Interest** | **Final Interest** |
| **C** | **A** | **C** | **A** |
| Mean | 48,97 | 53,09 | 63,72 | 60,06 |
| Median | 51,00 | 56,00 | 65,00 | 61,00 |
| Mode | 41a | 58a | 65 | 60 |
| Std.dev | 7,575 | 9,812 | 5,107 | 8,048 |
| Min | 32 | 34 | 53 | 44 |
| Max | 60 | 65 | 72 | 74 |

Table 3. Learning Interest Categorization

|  |  |
| --- | --- |
| **Average Score** | **Criteria** |
| $$x > 68$$ | Very good |
| $$56 < x \leq 68$$ | Good |
| $$44 < x \leq 56$$ | Enough |
| $$32 < x \leq 44$$ | Less good |
| $$x \leq 32$$ | Not good |

Table 4 presents the pretest and posttest results data. Based on these data an increase in the experimental class.

Table 4. Pretest and Posttest Learning Achievement Results

|  |  |  |
| --- | --- | --- |
|  | ***Pretest*** | ***Posttest*** |
| **C** | **A** | **C** | **A** |
| Mean | 48,958 | 47,469 | 86,011 | 77,381 |
| Median | 45,240 | 50,000 | 88,095 | 80,952 |
| Mode | 28,57a | 33,33 | 100,00 | 85,71 |
| Std.dev | 17,157 | 14,985 | 12,391 | 18,620 |
| Min | 23,81 | 23,81 | 57,14 | 28,57 |
| Max | 85,71 | 95,24 | 100,00 | 100,00 |

The prerequisite test analysis consists of 3 stages: normality test, homogeneity test, and average difference test.

* 1. *Normality test*

Normality test is performed to determine whether the study population is normally distributed or not. Normality test calculations are performed using the Kolmogorov Smirnov test which has a significance level with the help of IBM SPSS. If the significance value is more than 0.05, it can be concluded that the data come from normally distributed populations. Calculation results show that all data have a significance value of more than 0.05 so it can be concluded that all data are normally distributed.

* 1. *Homogeneity Test*

Homogeneity test is used to determine whether the data has the same variance or not. Normality test calculations are performed using the Levene's Statistic Test which has a significance level with the help of IBM SPSS. If the significance value is more than 0.05 then the variance of each dependent variable is the same. Calculation results show that all data have a significance value of more than 0.05 so it can be concluded that all data are homogeneous or have the same variance.

* 1. *Average Difference Test*

After the normality and variance homogeneity tests are met, then the average similarity test will be carried out in the experimental class and the control class before being treated. The test was carried out using the Independent Sample T Test statistic with a significance level of 0.025 with the help of IBM SPSS. The results of the calculation show the data in the experimental class and the control class have the same initial ability (no average difference).

* 1. *Hypothesis test*

3.4.1 Effect of Problem Based Learning (PBL) and conventional models on learning interest and mathematics learning achievement of seventh grade students in the triangle material

Hypothesis testing begins with the difference between the initial interest score and the final interest test as well as the pretest and posttest using the Paired Sample T Test. The test was conducted to determine the effect of the Problem Based Learning (PBL) model on learning interest and mathematics learning achievement of VII grade junior high school students on triangle material, the Paired Sample T Test was performed. The calculation results are presented in Table 4 and Table 5, based on these results obtained significance values so that it can be concluded that there is an influence of learning Problem Based Learning (PBL) models on learning interest and mathematics learning achievement of VII grade junior high school students on triangle material.

This is partly due to the steps implemented in the Problem Based Learning (PBL) model which presents challenges to students, where students are expected to think critically to find a material concept. Where students are given the freedom to think individually or in groups without avoiding the learning topics being taught through the direction of the teacher. This is consistent with the opinion of Arends (2008: 41) that the essence of PBL in the form of presenting a variety of authentic and meaningful problematic situations for students, which can serve as a stepping stone for investigation and investigation [7].

Table 5. Paired Sample T Test Results in Experiment Classes

|  |  |  |
| --- | --- | --- |
| **Variabel** | **T** | **Sig.(2-tailed)** |
| Interest learning | 8,218 | 0,000 |
| Achievement learning | -13,69 | 0,000 |

Then the test is carried out on conventional models, the calculation results are presented in Table 6 and Table 7, based on the results obtained significance values so that it can be concluded that there is an influence of conventional model learning on learning interest and mathematics learning achievement of VII grade junior high school students on triangle material.

This happens because in the conventional model students are always facilitated and directed. The teacher presents the concepts before the investigation, so that the investigation conducted by students is only an activity that was discussed earlier. This is in accordance with what was stated by Sanjaya (2009: 179) that the conventional learning model is learning that emphasizes the process of verbally delivering material from a teacher to a group of students with the intention that students can master the subject matter optimally [8].

Table 6. Paired Sample T Test Results in the Control Class

|  |  |  |
| --- | --- | --- |
| **Variabel** | **T** | **Sig.(2-tailed)** |
| Interest learning | -4,805 | 0,000 |
| Achievement learning | -8,417 | 0,000 |

3.4.2 The effect of the Problem Based Learning (PBL) model and the conventional model on the mathematics learning interest of seventh grade students in the triangle material

Based on the previous test, it was found that both treatments affected the interest in learning mathematics of VII grade junior high school students on triangular material. To see which model is more influential on learning interest, a difference test of the difference between initial learning interest and final learning interest in the two treatments is carried out, in this case the Independent Sample T Test. The calculation results are presented in Table 8, based on these results obtained significance values, so it can be concluded that the PBL model has a better effect than the conventional model of mathematics learning interest of seventh grade students in triangle material. Furthermore, the influence is obtained by the medium effect category. So it can be concluded that the influence of PBL models on learning interest is 36.33%.

This is because interest in learning entirely is one's involvement in achieving something that is driven by one's attention to gain knowledge and achieve maximum understanding. Someone who has an interest in learning has the characteristics that in the learning process students feel happy without coercion in learning, involved and active in the learning process, besides that students have an attraction to an activity in learning, and students always pay attention lesson when the teacher explains a material. The use of Problem Based Learning (PBL) models in teaching and learning really helps learning success. Through the Problem Based Learning (PBL) model, students can think critically where students are required to find their own concepts.

The results of the study are in accordance with research conducted by Novela Budi Prasetia (2016) "the effect of applying the problem based learning (PBL) learning model to the interest in learning mathematics in class XI SMK Negeri 7 Yogyakarta". The results of Novela Budi Prasetia's research (2016), concluded that the problem based learning (PBL) learning model had a positive influence on interest in learning mathematics [9].

Table 7. Independent Sample T Test Results on Student Study

|  |  |  |
| --- | --- | --- |
| **Variabel** | **T** | **Sig.(2-tailed)** |
| Interest learning | 3,075 | 0,003 |

3.4.3 Effect of Problem Based Learning (PBL) and conventional models on mathematics learning achievement of seventh grade students in the triangle material

Based on the previous test, it was found that both treatments affected the interest in learning mathematics of VII grade junior high school students on triangular material. To see which model is more influential on learning achievement, a difference in the difference between the pretest and posttest data in the two treatments, in this case the Independent Sample T Test. The calculation results are presented in Table 9, based on these results obtained significance values, so it can be concluded that the PBL model has a better effect than the conventional model on mathematics learning achievement of seventh grade students in triangle material. Furthermore, the influence is obtained by the small effect category. So it can be concluded that the influence of PBL models on learning achievement is 24.6%.

In the control group has little effect because when learning students are less active because what is used is a conventional model that makes students bored. The Problem Based Learning (PBL) model influences students' learning achievement because in experimental group learning there are stages of PBL learning. Students look active in the process of solving real problems contained in the surrounding environment, in addition to that it can foster students' curiosity about the learning material and students are also more eager to learn so that it will affect the learning achievement of students to get optimal value.

The results of this study are consistent with research conducted by Iwan Supriyono (2014) "the effect of problem based learning (PBL) on mathematics learning achievement in the subject matter of fractions in SMP Negeri 2 Nogosari Boyolali". The results of Iwan Supriyono's research (2014), concluded that (1) there was a significant difference in mathematics learning achievement between students who were taught using conventional learning and problem based learning towards mathematics learning, (2) with problem based learning students could learn easily through group discussions, students are taught to have responsibilities with their groups [10].

Table 8. Independent Sample T Test Results on Learning Achievement

|  |  |  |
| --- | --- | --- |
|  | **T** | **Sig.(2-tailed)** |
| Interest learning | 3,075 | 0,003 |

# Conclusion

# Based on the results of data analysis and discussion, it can be concluded as follows:

1. There is an influence of the Problem Based Learning (PBL) model and the conventional model on the learning interest and mathematics learning achievement of seventh grade students in the triangle material.
2. The Problem Based Learning (PBL) learning model has a better effect on the mathematics learning interest of students in grade VII in the triangle material.
3. The Problem Based Learning (PBL) learning model has a better effect on the mathematics learning achievement of VII grade junior high school students on triangular material.

# References

1. Jennison, M. & Beswick (2010). Student Attitude, Student Understanding and Mathematics Anxiety.In L.Sparrow.
2. Renninger, K.A. & Hidi. (2015). *The Power of Interest for Motivation and Engagement.* 1st Editon. New York: Routledge.
3. Good, T. (2009). Teacher effectiveness in the elementary school: What do we know about it now? *Journal of Teacher Education*, 52-64.
4. Chien, M. (1987). *Psychological tests and statistical methods.* Taipei: Psychological Publishing Co., Ltd.
5. Shoimin, Aris. (2014). *68 Model Pembelajaran Inovatif dalam Kurikulum 2013.* Yogyakarta: Ar- Ruzz Media.
6. Badudu & Zain (2001). *Kamus Umum Bahasa Indonesia.* Jakarta: Pustaka Sinar Harapan.
7. Arends, R I. (2008). *Learning to Teach: Belajar Untuk Mengajar.* Yogyakarta: Pustaka Belajar.
8. Sanjaya, W. (2006). *Strategi Pembelajaran.* Jakarta: Kencana.
9. Prasetia, N.B. (2016). Pengaruh Penerapan Model Pembelajaran *Problem Based Learning terhadap Minat Belajar Matematika Siswa Kelas XI SMK Negeri 7 Yogyakarta*. Thesis, Universitas PGRI Yogyakarta.
10. Supriyono, Iwan. (2014). *Pengaruh Model Problem Based Learning terhadap Prestasi Belajar matematika pada Sub Pokok Pecahan*. Skripsi,