

The Implementation of PBL Model by Using Demonstration Toward Problem Solving Skill and Student Learning Outcome

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Abstract

This research aims to find out differences between PBL model by using demonstration to PBL model by using expository method toward problem solving skill and Primary School student – affective learning achievement. This True experimental research was used with post-test only control group design. This research was used PBL with demonstration method given to experimental group and PBL with expository method given to control group. The data collection in this research was used observation, test, questionnaire, and documentation. The data analysis was used t-test. Based on the data analysis of this research, it revealed two data of problem solving skill and affective learning outcome with sig score (2 tailed) $0.000 < 0.05$. Based on the already determined criteria of the test, then H_0 was denied while H_a was accepted. H_a showed there was average difference of problem solving skill and affective learning outcome of both groups with 81.36 for experimental group and 62.20 for control group. Meanwhile, the affective learning achievement of experimental group was 0.59 and control group was 0.18. Therefore, it could be concluded that there was difference of problem solving skill and student – affective learning outcome by using PBL with demonstration method to PBL with expository method.

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INTRODUCTION

Education is a process influencing students to foster behaviour and personality and to develop their potencies with purpose to create qualified human. The quality of human resource, one of them, is determined by quality of education. It is in line with Rule No. 20 Year 2003 about National Education System. It states that in developing students' potencies to be faithful and pious to God the Almighty, to have good morals, to be healthy, eligible, reliable, creative, and independent, to be a part of democratic citizen, and to be responsible.

One of the efforts to reach educational purpose is by improving classroom learning. Mathematics is an important lesson in an education. Problem solving skill is an integral part and cannot be separated to learning mathematics (NCTM, 2000:5). NCTM (*National Council of Teachers of Mathematics*) put problem solving skill as main purpose of learning mathematics. Schunk (2012) stated that problem solving skill refers to an individual's effort to reach his purpose because he does not have automatic solution. According to Branca as quoted in Tarigan (2012), problem solving skill is a basic skill in learning mathematics. Problem solving skill prioritizes process and strategy done by students in solving problems rather than only to get the results.

Based on research done by Hino (2007) in Japan, problem solving skill facilitates to (1) comprehend and broaden knowledge of reasoning process and learning activeness of students, (2) stimulate our efforts to develop learning materials and effective ways to organize learning by problem solving, and (3) provide assessment method of reasoning and behaving process of students. Ulya's research (2016) stated that poor problem solving skill could be proven by current facts about education and teacher in Indonesia based on surveys of test data done by two international studies: *Programme for International Student Assessment (PISA)* and *Trends in International Mathematics and Science Study (TIMSS)*. The point to improve learning achievement of students in mathematics is by

developing and improving quality of teaching mathematics (Grane, 2011).

Students experienced difficulty while working on story question about two – dimensional figure. The data taken from daily test of students or percentage of mathematics task result, especially working on story question about calculating perimeter and area of two – dimensional figures, such as rectangle, square, and triangle materials obtained average score 55.78%. It meant only a half of the students classically passed the grade. Meanwhile, the remaining students had lower average score than the standard, especially about story question on two – dimensional figures which was considered difficult for the students.

The level of the students' understanding in learning mathematics material could be found out by assessing them. The assessment covered several aspects which described the development or behavioural changes of the students. Sanjaya (2006) stated the objective aspect to be assess are knowledge, cognitive, skill, value, attitude, and interest. In learning process, problem solving skill and affective domain contribute and have important role to student life. Thus, there is a need of innovative learning by involving students' activeness. One of them is by having innovative learning during learning process.

Problem Based Learning (PBL) is a learning model based on problem as an alternative in facilitating students in mathematics story question. As stated by Gunantara et al (2014) PBL is a learning model by involving students in solving real problem. It is also in line with Zaini (2016) stating that one of relevant ways to improve curiosity and problem solving skill by using *problem based learning*. Therefore, learning by using real world problem could be solved by PBL in which the model could emphasize on scientific solving process to make students able to think critically and skilfully in solving problem. Astriani et al (2017) also showed that *Problem Based Learning (PBL)* influenced significantly to mathematics problem solving skill. Fitriano (2015) showed influence of curiosity and mathematics literacy skill in PBL toward mathematics literacy skill of the students. There

was also improvement of mathematics literacy skill.

Besides learning model, the use of teaching method needs to be considered its effectiveness. In teaching mathematics – story question, there is a need of method to provide interaction between student and teacher to comprehend and solve certain problems. A developed method in mathematics learning process is by using demonstration method. According to Sanjaya (2006), demonstration is a learning method presentation by performing and showing the students about a certain process, situation or certain object both real and imitation. Sumantri (1999) stated that demonstration is as learning presenting ways by demonstrating and showing the students certain process and objects which are currently learnt, both real and imitation model shown by teacher or other learning source whom understand or from experts in the topic which must be demonstrated. Syaiful (2008) stated that demonstration was more appropriate to teach learning materials in the form of movements of a process or complex natured routine. Rini (2014) explained that there was improvement of student learning achievement after being intervened by demonstration method since it was used to make students and teacher interacting to analyse, solve, and comprehend problem. The purpose of this research was to find out difference of problem solving skill and affective learning achievement of the students taught by PBL with demonstration and taught by PBL with expository.

METHODS

This *true experimental* research with quantitative model. It was called *true experimental* research since the samples used for experimental group and control group were taken randomly as seen in Figure 1 (Sugiyono, 2016).

The sampling technique is a technique to take sample (Sugiyono, 2016). The sampling technique used in this research was *nonprobability* sampling. It is a technique to give equal chances for all members of population to be selected into members of sample.

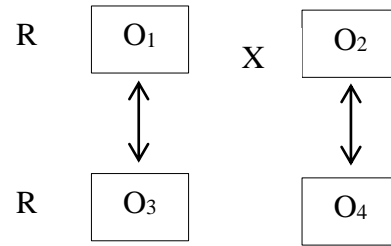


Figure 1. Scheme of Research Design

With O_1 : *pre-test* of experimental group, O_2 : *post-test* of experimental group, O_3 : *pre-test* of control group, O_4 : *post-test* control group, X: PBL model intervention by using demonstration method.

The data collection in this research was used observation, test, questionnaire, and documentation. The instrument of the research is a measuring tool in this research to measure phenomenon or observed society. All of them specifically are called research variables (Sugiyono, 2016). The test of the instrument covered difficult level, distinguishing power, validity, and reliability tests.

The independent variables in this research was PBL with demonstration to improve problem solving skill and affective student learning outcome. The dependent variables were problem solving skill and student affective learning achievement intervened by collaboration of PBL with demonstration method. The data analysis was used t-test.

RESULTS AND DISCUSSION

Learning achievement in this research was *post-test* result on problem solving skill and student affective learning achievement of mathematics. *Post-test* is an assessment done to see final skill score of experimental and control groups. Based on the result of implementing stage and the test, it can be obtained the data as follow:

The variance test was done to find out whether there was difference of *post-test* learning outcome and student – affective learning outcome average scores.

The hypothesis of this research was null hypothesis (H_0): no difference of problem solving skill and student – affective learning of both

groups. The alternative hypothesis (H_a) showed there was difference between problem solving skill and student – affective learning outcome of both groups. The decision was taken based on probability score comparison (Sig). If the probability > 0.05 , H_0 was accepted. If probability < 0.005 , H_0 was denied.

Problem Solving Skill

The test of variance used *independent sample t-test* assisted by SPSS 16. The result of learning outcome of problem solving from the *post-test* could be seen on the table.

Table 1. Independent Sample t Test Result

		Levene's test for equality of variances		t-test for equality of means		
		F	Sig.	t	df	Sig. (2-tailed)
Student learning achievement	Equal variances assumed	.326	.571	10.122	48	.000
	Equal variances not assumed			10.122	47.189	.000

Based on the table, it could be concluded that the hypothesis test with testing criteria: when the result was significant > 0.005 , then H_0 was accepted and when the result < 0.05 H_0 was denied. H_0 showed there was no difference of problem solving skill average for both groups. H_a showed there was difference of problem solving

skill average of both groups. The sig score of both groups (2 tailed) was $0.000 < 0.05$. Thus, there was difference of problem solving skill between experimental and control groups. To check the difference of the groups' average could be seen on Table 2.

Table 2. Group Statistic Test Result

	Groups	N	Mean	Std. deviation	Std. error mean
Student learning achievement	Experiment grup	25	81.36	7.117	1.423
	Control grup	25	62.20	6.238	1.248

Based on Table 2, the average score of experimental group taught by PBL with demonstration model was 81.36 while the control group taught by PBL with expository was 62.20. It could be concluded that there was difference of problem solving skill average score of both groups after being intervened by PBL with

demonstration and PBL with expository method.

Affective Learning Outcome

The variance test of this research used *independent sample t-test* assisted by SPSS 16. The test showed result of affective learning outcome from *post-test* could be seen on Table 3.

Table 3. Independent Sample t-test Result Independent Samples Test

		Levene's test for equality of variances		t-test for equality of means		
		F	Sig.	t	df	Sig. (2-tailed)
Student learning achievement	Equal variances assumed	.160	.691	12.081	48	.000
	Equal variances not assumed			12.081	47.942	.000

Based on the table, it could be concluded that the hypothesis calculation with the testing criteria: when the result was significant > 0.05 , then H_0 was accepted and when the result was < 0.05 , H_0 was denied. H_0 showed there was no

difference of affective learning outcomes of both group. H_a showed there was difference of affective learning achievement of both groups. The sig score of both groups (2 tailed) was $0.000 < 0.05$. Thus, there was difference of affective

learning achievement of both groups. To see the average of the variance of both groups, it could be seen on Table 4.

Table 4. Group Statistic Test Result

	Groups	N	Mean	Std. deviation	Std. error mean
Student learning achievement	Experiment group	25	0.59	0.85	0.32
	Control group	25	0.18	0.55	0.17

Based on the table, it obtained average score of experimental group taught by PBL by using demonstration model was 0.59. Meanwhile, the control group taught by PBL with expository was 0.18. It could be concluded that there was difference of affective learning outcome of both groups after being intervened by PBL with demonstration and PBL with expository method.

The findings and the analysis showed that the score of PBL with demonstration could improve problem solving skill and affective learning outcome in learning process. It was supported by Kodarayati (2016) stating that PBL influenced positively and significantly to problem solving skill and communication skill of students. Several influences affecting variances of both group students' competences were determination and skill related to problem solving on the learning and activeness to participate in the learning.

CONCLUSION

It could be concluded that there was difference of learning outcome of both groups. It could be proven by independent sample t-test result analysis. The sig score (2 tailed) was $0.000 < 0.05$, meaning there was difference of both groups. Therefore, it could be concluded that there was difference of problem solving and affective learning skill of the students taught by PBL with demonstration method and PBL with expository method.

REFERENCES

Astriani, N., Edy,s., & Edi, S. 2017. "The Effect of Problem Based Learning To Students' Mathematical problem Solving Ability".

Internasional Journal of Advance Research And Innovative Ideas in Education. 3 (1): 3441-3446.

Fitriyono, Y., Rochmad., & Wardono. 2015. " Model PBL Dengan Pendekatan PMRI Berpenilaian Serupa PISA Untuk Meningkatkan Kemampuan Literasi Matematika Siswa". *Unnes Journal of Mathematics Education Research*. 4(1): 56-65

Gunantara, S & Riastini. 2014. "Penerapan Model Pembelajaran Problem Based learning Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika Siswa Kelas V". *Jurnal Mimbar PGSD Universitas Pendidikan Gaesha Jurusan PGSD*. 2(1),1-10

Hino, K. 2007. "Toward the Problem-Centered Classroom: Trends in Mathematical Problem Solving in Japan". *Journal ZDM Mathematics Education*, 3(9), 503-514.

Juliawan, M & Wayan.R. 2017. "Pengaruh Model Problem Based Learning (PBL) Terhadap Kemampuan Pemecahan Masalah Matematika Siswa Kelas III". *E-journal PGSD Universitas Pendidikan Ganesha*. 5(2): 1-10.

Kodariyati, L & Budi A. 2016. "Pengaruh Model PBL Terhadap Kemampuan Komunikasi Dan Pemecahan Masalah Matematika Siswa Kelas V SD". *Jurnal uny*. 4 (1): 93-106.

NCTM. 2000. *Principles and Standards for School Mathematic*. Reston, Va: NCTM.

Rini, T., & Irwan, S. 2014 "Meningkatkan Hasil Belajar Siswa Melalui Penggunaan Metode Demonstrasi Pada Mata Pelajaran IPA Di Kelas III SDN Inpres Tunggaling". *Jurnal Kreatif Tadulako*. 2(1), 67-81.

Ruchaedi, Diding & Ilham Baehaki. 2016. "Pengaruh Problem Based Learning (PBL) Terhadap Kemampuan Heuristik Pemecahan Masalah dan sikap Matematis Siswa Sekolah Dasar". *Jurnal Cakrawala Pendidikan Dasar*. 2(2).

Rudtin, Nur Afrianti. 2013. "Penerapan langkah Polya Dalam Model Problem Based Learning Untuk Meningkatkan Kemampuan Siswa menyelesaikan soal cerita Persegi Panjang".

- Jurnal Elektronik Pendidikan Matematika Tadulako*, 1 (1): 17-31
- Sanjaya, Wina. 2006. *Strategi Pembelajaran*. Jakarta Pusat Grapika: Fajar Interpratama.
- Sugiyono. 2016. *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung Alfabeta
- Ulya, H. 2016. “Profil Kemampuan Pemecahan Masalah Siswa Bermotivasi Belajar Tinggi Berdasarkan Ideal Problem Solving”. *Jurnal Konseling Gusjigang*. 2 (1): 90-96
- Zaini, N. 2016. “Peningkatan Kemampuan Pemecahan Masalah Dan Pengembangan Karakter Siswa Kelas VII Melalui Model PBL Berbantuan Scaffolding”. Unnes, *Journal of Mathematics Education*. 5(1): 62-68.