"TAQWA, MANDIRI, CENDEKIA"

MINISTRY OF RESEARCH, TECHNOLOGY AND HIGHER EDUCATION
YOGYAKARTA STATE UNIVERSITY
GRADUATE SCHOOL

Certificate

Certificate No: 10817/UN34.17/TU/2017

This is to certify that

BUNGA DARA AMIN

as a

PRESENTER

in The 3rd International Seminar on Science Education (ISSE) 2017
theme "Enhancing Interdisciplinary Practice of Science Education in the Realization of NGSS (Next Generation Science Standards)"
October 28th, 2017

Director

Dr. Moch. Bruri Triyono
19560216 198603 1 003

Chairperson

Prof. Dr. Djukri, M.S.
19480712 197811 1 001

Committee

Prof. Dr. IGP Suryadarma
1951225 197603 1 004

9 772476 953012

Proceeding of the International Seminar on Science Education Volume III

ISSN: 2476-9533

PROCEEDING

International Seminar on Science Education
Volume III

Enhancing Interdisciplinary Practice of Science Education in the Realization of NGSS (Next Generation Science Standard)

Graduate School
Yogyakarta State University

Batik Yogyakarta Motif Semen Sido Mukti

Tugu Yogyakarta

October 28th, 2017

ISSN : 2476-9533
Volume 3, October 2017

PREFACE

Praise to Allah SWT for all the blessings and guidance given to us all, so that the program of the International Seminar on Science Education (ISSE) 2017 with the topic about Enhancing Interdisciplinary Practice of Science Education in The Realization of NGSS (Next Generation Science Standards) which held on October 28th 2017 at Rectorate Hall, Yogyakarta State University can be completed successfully.

This proceeding is presented in four sections: 1) Science; 2) Physics; 3) Biology Chemistry; and 4) General Education. This comprises number of papers that have been presented in the seminar, written by lecturers and students from Yogyakarta State University and other universities.

We owe many parties for the success of the seminar. Therefore, we would like to sincerely extend our gratitude to:

1. The rector of Yogyakarta State University, Prof. Dr. Sutrisna Wibawa, M.Pd for facilitating all the activities of the International Seminar on Science Education (ISSE) 2017;
2. The director of Graduate School of Yogyakarta State University, Dr. Moch. Bruri Triyono for providing all the facilities of the International Seminar on Science Education (ISSE) 2017;
3. The invited speakers for their willingness to share thoughts and insights on science teaching and learning in the seminar;
4. All committee members for the time, effort, and thoughts for the success of this activity; and
5. All presenters and participants who have come a long way to contribute to the success of the seminar.

However, we truth fully understand that some imperfections might be find in this proceeding and in the seminar. Thus, suggestions and constructive criticisms are very much welcome. Finally, we hope that this proceeding may contribute in science and science education

Yogyakarta, Oktober 28th 2017

Chair Person

Prof. Dr. I Gusti Putu Suryadarma, M.S

ISSN : 2476-9533
Volume 3, October 2017

TABLE OF CONTENTS

ISSN : 2476-9533
Volume 3, October 2017

ISSN : 2476-9533
Volume 3, October 2017

ISSN : 2476-9533
Volume 3, October 2017

ISSN : 2476-9533
Volume 3, October 2017

ISSN : 2476-9533
Volume 3, October 2017

3rd International Seminar on Science Education
Yogyakarta State University, Saturday 28th October 2017

ISSN : 2476-9533
Volume 3, October 2017

The Implementation Of Problem Based Learning Model Toward Conceptual Understanding At Senior High School

Indri Eka Putri[1], Herman[2], Bunga Dara Amin[3], Pariabti Palloan[4]
[1,2,3,4] Physics Department, Universitas Negeri Makassar
[1]Ekaputri.indri139@gmail.com

Abstract. This research was experiment using posttest-only control group design. The study was conducted at SMA Negeri 3 Makassar with students of X MIA 3 as experiment class and X MIA 8 as control class. The implementation problem based learning model of this research was used at experiment class and conventional model at the control class. After finishing this learning, the students was given posttest based on conceptual understanding test with form of multiple choice. The result showed that the average score of conceptual understanding experiment class and control class are relatively 10,25 and 4,81. Based on inferential statistic using t-test, it is clearly shown that $t_{calculation} > t_{table}$ that means H_0 rejected and H_1 accepted. Therefore, it was concluded that there are significant differences on variables of conceptual understanding between students who studied through problem based learning model and their counterparts model who studied through conventional model at class X MIA SMA Negeri 3 Makassar in 2016/2017 academic year.
Keywords*:* conceptual understanding, problem based learning

1. Introduction

The development of educational system maintains the balance of global flow and human learning quality. Based on the improvement of technology students should become more communicative, mastery of high material with an adequate of information access. This is in according with 21st century education that focuses on developing of integrated intelligence in the real world. Therefore, learning requires not only understanding skills and being able to practice, but also emphasizing how students produce findings from the process of adaptation to the environment [1].

In order to support 21st century learning, transformation of learning method is necessary, from teacher-centered to student-centered learning. Student have an opportunity to build concepts during learning activities actively. Teachers also should create a learning environment, provide creative surrounding, and build their students' talents. This learning can be done by scientific approach. This approach includes of systematic scientific steps that are suitable to apply in science learning. Physics is part of science , that requires the ability to think and investigate with certain methods. Hence, the information or explanations that can be tested and verifiable.

Based on observations in class X MIA SMA Negeri 3 Makassar 2016/2017 academic year the researcher obtained information as follows: 1) the standard of mastery learning can not be achieved by students, 2) learning was still using conventional method. The completeness of learning can not be completed due to of a low understanding of physics concepts. Therefore, to improve the quality of physics learning, it requires learning model using a scientific approach. The problem based learning model provides a forum that allows students to do inquiry activities for developing essential skills in problem solving. Problem given should be increased students' curiosity, self-directed learning, and inquiry [1,2]. Problem based learning has a several characteristic as follows: 1) learning starts with unstructured real world problems, 2) team work in small groups, 3) critical thinking in solving complex problem, 4) learning issues [2]. Therefore, pbl can be improve thinking ability and mastery of matter. The results showed that applying problem based learning model can improve conceptual understanding [3,4,5,6,7].

Based on these facts the researcher believes that by applying the problem based learning model correctly, the understanding of the physics concept can be better. Thus, the title of this research is **"The Implementation of Problem Based Learning Model Toward Conceptual Understanding at Senior High School"**

2. Method

This research was true experiment research based on posttest only control group design. It was implemented in SMA Negeri 3 Makassar. This research was conducted in even semester of academic year of 2016/2017. The population was all of class X MIA with total 314 students. The sampling technique was selected randomly and class X MIA 3 selected as the experimental class and class X MIA

ISSN : 2476-9533
Volume 3, October 2017

8 was selected as the control class. The independent variables were problem-based learning and conventional model, while the dependent variable was conceptual understanding of physics.

The research instrument used a test of the physics conceptual understanding with a set of multiple choice which has been tested for its validity and realibility. Furthermore, the data obtained were analyzed through descriptive statistics and inferential statistics. Inferential analysis includes normality test, homogeneity test, two tail test, and average estimates. t-test formula to test the hypothesis is:

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(n_1-n_2)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}} \qquad (1)$$

3. Result and Dicussion

The description of physics conceptual understanding of control class and experiment class can be shown in table 1 as follows:

Table 1. Physics Conceptual Understanding Description

Statistic	The statistic value	
	control class	experiment class
total samples	32	33
maximum score	9	14
minimum score	2	7
Mean	4,87	10,67
Deviation standar	1,84	2,06
Varians	3,40	4,23

Based on the table 1, it was clearly seen that the experiment class has an average score of 10.67 higher which was then control class of 4,87. Furthermore, physics conceptual understanding scores were categorized by frequency distribution in the following table:

Table 2. Score Frequency Distribution of Physics Conceptual Understanding

Interval	Category	control class		experiment class	
		Frequency	percentage(%)	Frequency	percentage(%)
0 - 4	very low	0	0.0	16	50.0
5 - 8	Low	3	9.1	14	43.8
9 - 12	Medium	23	69.7	2	6.3
13 - 16	High	7	21.2	0	0.0
17 - 20	very high	0	0.0	0	0.0
Total		33	100.0	32	100.0

ISSN : 2476-9533
Volume 3, October 2017

Table 3. Physics Conceptual Undestanding for Each Indicators

Indicators	control class		Kelas Kontrol	
	Mean	Percentage %	mean	Percentage %
Comparing	1.79	59.60	1.28	42.71
Interpreting	5.0	55.56	2.22	24.65
Summarizing	1.48	37.12	0.44	10.94
Classifying	1.06	53.03	0.91	45.31
Exemplifying	1.33	66.67	0.16	7.81

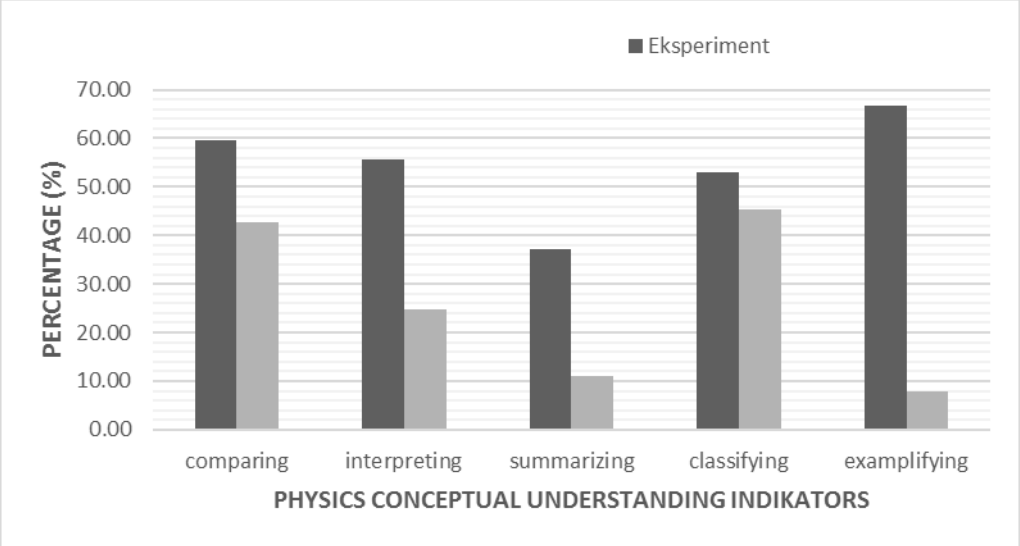

Figure 1. **Percentage Of Students' Score Based On Physics Conceptual Understanding**

Scores of physics conceptual understanding in the experimental class was in the high category (21.1%) while the control class was in medium category (69.7%) Based on table 3, it is found that, the average score relatively increase for each indicator of physics conceptual understanding in experimental class rather than in control class. There was a significant increase in indicators starting examplifying, interpreting, and summarizing. It was cause by pbl model that trained students for identifying, analyzing, solving, communicating problems [9]. Learning using the pbl model encourages students to find much information related to the issues studied. students become active and be able to self-direction learning in accordance with the demands of the 21st century.

Students solved the problems presented in the worksheet. The following steps are firstly, students were given an authentic problem to enhance their curiosity and to motivate. Furthermore, students conduct investigations process through experimental activities or literature review. After that, students should answer the questions available in worksheet. These questions led them to resolve the issues presented at the beginning of the assessment. This activity can improve the ability of critical thinking and mastery of the content of knowledge. In addition, cooperatively students do inquiry to solve problems so that learning becomes more meaningful.

The result of inferential analysis indicate that the sample from normally distribution and homogeneous population so that requirements for t test were met. The results of hypothesis testing using t-test is $t_{calculation}$ = 9.52967 and t_{table} = 1.999, due to $t_{calculation} > t_{table}$ so H_1 was accepted and H_0 was rejected. H_1 hypothesis is there was a difference understanding of physics concepts between learners who were taught by using a model of problem-based learning with the control class which has taught by conventional model in students of class X MIA SMA Negeri 3 Makassar. Furthermore, the average estimated value

ISSN : 2476-9533
Volume 3, October 2017

was estimated value of 9.78 <11.21 It means that if the problem based learning model applied to the population will get a score that is in the range of 9.78 to 11.21.

4. Conclusion

4.1 The average score of physics conceptual understanding students of X class MIA SMA Negeri 3 Makassar taught using the problem based learning model was 10.67 which was higher than the students in the control class which was shown as 4.87.

4.2 There was difference of physics conceptual understanding between students' who were taught using problem-based learning model with the conventionally taught students in class X MIA SMA Negeri 3 Makassar 2016/2017 academic year

References

[1] T. Oon-seng, Problem-based Learning Innovation: Using Problems to Power Learning in the 21st Century. Cengage Learning: Singapore, 2003.

[2] D. Barbara J, G. Susan. E, A. Deborah. E, The Power of Problem–Based Learning. Stylus Publishing: Virginia, 2001.

[3] S. Pinar & F. Kabapinar, 2010, "The Effect of Inquiry-Based Learning on Elementary Students Conceptual Understanding of Matter, Scientific Process Skill and Science Attitudes," Procedia Social and Behavioral Sciences: Istambul vol. 2, pp1990-1994, 2010.

[4] L. Sofie. M. M, S. H. Jones, J. Mikkers, and T. V Gog, "Problem Based Learning as a Facilitator of Conceptual Change," Learning and Instruction: USA vol 38, pp34-42, 2015.

[5] B. Ibrahim, E. Senock, and M. Sözbilir, "The Effect of Problem Based Learning Instruction on University Students' Perfomence of Conceptual and Quantitative Problems in Gas Concepts," Eurolasia Journal of Mathematics, Science and Technology Education: Turkiye vol 5, pp153-164, 2009.

[6] B. Luck, M. W. J. Van de Wiel, T. Imbos, and M. P. F. Berger. "The Effect of Direction Guidance on Students' Conceptual Understanding of Statistic in Problem Based Learning", British Journal of Educational Psycology: Netherlands vol 81, pp309-324, 2011.

[7] S. Mehmet, "The Impact of Problem Based Learning on Engineering Students' beliefs about Physics and Conceptual Understanding of Energy and Momentum," European Journal of Engineering Education: Turkey vol 35 pp 519-537, 2010.

[8] Sugiyono, Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D, Alfabeta: Bandung, 2015.

[9] Sudewi Ni.L, IW. Subagia, and IN. Tika, "Studi Komparasi Penggunaan Model Pembelajaran Problem Based Learning (PBL) dan Kooperatif Tipe Group Investigation (GI) Terhadap Hasil Belajar Berdasarkan Taksonomi Bloom. E-journal Program Pascasarjana Universitas Ganesha, vol 4: Singaraja, 2014.