International Conference on Science Education (ICoSEd)

IOP Conf. Series: Journal of Physics: Conf. Series **1006** (2018) 011001 doi:10.1088/1742-6596/1006/1/011001

Preface
International Conference on Science Education (ICoSEd)
Universitas Negeri Surabaya, Surabaya, Indonesia
November 11th , 2017

Wahono Widodo, Anna Permanasari, Munzil and Parmin

This International Conference on Science Education (ICoSEd) 2017 is the first international forum for mainly the members of Indonesian Society of Science Educators or Perkumpulan Pendidik IPA Indonesia (PPII) to join and gather ideas towards development of strategies to deal with the encountered challenges in 21st century. However, the borderless communication and the same intellectual basis of needs have attracted other people who are also working in the same field to participate in the conference. Therefore, the theme for the conference is "Strengthening science education practices for 21st century skills".

To deal with the theme, four experts are invited to become the keynote speakers to expand the knowledge of science education practices. They are:

1. Prof. David treagust, PhD (Professor from Curtin University of Technology, Australia);
2. Prof. Dr. Hans-Dieter Barke (Professor from Muenster University, Germany);
3. Prof. Dr. Abdullah Dolah Dalee (Professor from Yala Rajabhat University, Thailand); and
4. Prof. Dr. Muchlas Samani (Professor from Universitas Negeri Surabaya, Indonesia).

To make the conference in line with the recent innovative development in the field of science education the committee then successfully invite 172 presenters, and 112 participants. The presented papers are divided into six subthemes: assessment and evaluation, curriculum development, distance learning, higher order thinking, learning resources, models of teaching, multimedia, and teacher professional development.

We thank Universitas Negeri Surabaya for providing us the support of where the conference is held, the committee, keynote speakers, presenters, and all participants to be part of our conference. Without yours this conference is nothing to happen and will no longer contribute to science education.

Have a nice conference. Thank you

Surabaya, November 11th , 2017
Best Regards,

ICoSEd 2017 Committee

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International Conference on Science Education 2017

Universitas Negeri Surabaya, Surabaya, Indonesia

November 11th, 2017

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Accepted papers received: 9 April 2018
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The impact of problem solving strategy with online feedback on students' conceptual understanding

IOP Conf. Series: Journal of Physics: Conf. Series **1006** (2018) 012024 doi:10.1088/1742-6596/1006/1/012024

The impact of problem solving strategy with online feedback on students' conceptual understanding

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Abstract. The study aimed to determine the impact of the implementation of problem solving strategy with online feedback towards the students' concept understanding. This study used quasi experimental design with post-test only control design. The participants were all Physics Education students of Kanjuruhan University year 2015. Then, they were divided into two different groups; 30 students belong to experiment class and the remaining 30 students belong to class of control. The students' concept understanding was measured by the concept understanding test on multiple integral lesson. The result of the concept understanding test was analyzed by prerequisite test and stated to be normal and homogenic distributed, then the hypothesis was examined by T-test. The result of the study shows that there is difference in the concept understanding between experiment class and control class. Next, the result also shows that the students' concept understanding which was taught using problem solving strategy with online feedback was higher than those using conventional learning; with average score of 72,10 for experiment class and 52,27 for control class.

Introduction

Mathematic Physics is the sequence of Calculus and is a prerequisite to take Quantum Physics and Statistic Physics in Kanjuruhan University. The results of previous study using questionnaire to Physics Education students show that many students did not understand the concept. It will then give negative impact to students learning achievement [1,2]. It happens because of monoton learning models and delayed feedback. Therefore, it needs particular strategy that refers to problem solving strategy by which it has special quality in increasing learning achievement and training students to think critically [3]. Singh [4] reveals that problem solving is important part in learning physics because it can assist students to process the available information and to construct the knowledge they have. According to Slavin [5], the purpose of learning problem solving strategy systematically is to increase the advanced thinking and to broaden the concept understanding and to assist students to implement the concept and principles in any problems. Refer to those two statements, problem solving has important roles, they are assisting students in processing information and constructing knowledge, increasing the skills of advanced thinking, broadening the concept understanding and main principles of physics, and assisting students to apply the concept and principles in any problems. In such, students are able to increase the knowledge they have using problem solving skills to solve the problems toward different context, which eventually increase students' achievements in Physics.

The result of study shows that the implementation of authentic evaluation using feedback can increase the students' skills in composing scientific report [6]. Another study states that implementing formative feedback also assists students in understanding physics concepts. Formative evaluation

which is applied in the end of learning can give students information. The information will be capable of assisting students to learn and to understand what changes are necessary for concept improvement [7]

The purposes of the study are finding out the difference between students learning using problem solving strategy with online feedback and students learning conventionally and examining the influence of problem solving strategy with online feedback towards the concept understanding. The stages used in the study of problem solving follow the stages stated by Gok & Silay [8]; they are *Understanding* (focus on problems includes drawing sketch, defining symbols, and describing connection qualitatively), *Planning* (planning solution includes determining suitable mathematic equation, such as basic concept or basic principle), *Solving* (implementing plan includes implementing concepts to solve problems) and *Checking* (evaluating answers).

Research Method

The method used in this study is Quasi Experimental Design. The design used is Posttest Only Control Design because the researchers refer to the previous skills of students from the available data; the previous quiz on multiple integral lesson. The researchers implemented problem solving learning with online feedback to experiment class, and conventional learning to control class. The design of experimental study is listed in the following table.

Table 1. Posttest only control design.

Class	Implementation	Posttest
Experiment	X_1	O_1
Control	X_2	O_1

Explanation:
X_1 = Problem solving strategy learning with online feedback
X_2 = Conventional learning
O_1 = Posttest about the skills of solving problems in class of experiment and class of control

The researchers gained and processed the data of students' initial skills from pretest. The researchers acted as lecturers in class of experiment and control. They gave feedback through online in each meeting using *moodle*. Afterwards, the students took test to measure their concept understanding. The participants of the study were all students of Physics Education year 2015 who were divided in two classes, class A for experiment and class B for control.

The study data focused on concept understanding. The instrument used was multiple choice test consisting of 20 items for multiple integral. The test was developed based on taxonomy Bloom Cognitive Process. The hypothesis was to find out whether there is difference on concept understanding between experiment class and control class. The data gained was normal and homogenous, thus the researchers used T-Test to seek the difference in the first hypothesis evaluation. To find out the influence of sample implementation which was implemented to both classes, with solving problem strategy learning with online feedback to experiment class and conventional learning to control class., the researchers utilized *Tukey* test. Tukey test was chosen due to the similarity of both classes.

The study used problem solving strategy learning and followed the stages of *Understanding* (focus on problems includes drawing sketch, defining symbols, and describing connection qualitatively), *Planning* (planning solution includes determining suitable mathematic equation, such as basic concept or basic principle), *Solving* (implementing plan includes implementing concepts to solve problems) and *Checking* (evaluating answers). The following is learning stages used as listed in Table 2.

Table 2. Stages of problem solving strategy learning.

Stage	Activity
Introduction	Preparing learning then continued with apperception and motivation
Main Activity 1. Understanding 2. Planning 3. Solving 4. Checking	Assigning students into heterogenous groups , then giving them problems to solve and to perform Presentation
Closing	Giving confirmation and making Conclusion

Result and discussion

Based on the result of data pretest, the researchers find out that the experiment class and the control class were normally and homogenously distributed. Then the researchers performed hypothesis evaluation to examine the difference of concept understanding.

Table 3. The result of concept understanding using t-test.

Class	**Dk**		t_{count}	t_{table}
Experiment Control	58	0,05	6,1131	2,0017

Based on table 3, it is obtained obtained that t_{count} is 6,1131 > 2,0017 ($t_{table\ 58;\ -05}$) which means H_1 is accepted. The alternative hypothesis happened because there was different concept understanding between students in both different classes. The difference can be proven by the average posttest score of experiment class students with 72,1 and control class students with 57,27. In accordance with the study performed by Karatas *et al* [9], problem solving strategy towards cooperative learning can increase the achievement of learning physics, shown by normalized gain average from test result of physics learning achievement which was 0,72 in high category. Jakel *et al* [10] also agrees to state that the students' achievement increases after joining the learning which implements problem solving strategy learning with contextual approach.

One of the factors which support the result above is that the students are trained to intensify the concept understanding through problem solving. According to Selcuk *et al* [11], problem solving is effective in increasing learning achievement, motivation, and behavior. The students real experience during problem solving learning reflects on the main learning. *Understanding* stage the students are asked to focus on problems include drawing sketch, defining symbols, and describing connection quantitatively. In *Planning* stage, through team discussion the students are accustomed to planning solution includes determining suitable mathematic equation such as basic concept or basic principle; in *Solving* stage the students are brought to perform the plan includes implementing concepts to solve the problems. *Checking* stage asks students to to discuss the problem. In this stage the students get real experience through discussion to affirm the physics concept understanding.

To overcome the lack of time, lecturers use *moodle*. Thus, if students meet unsolvable problem in class, they may ask their lecturer. Beside, real time feedback facilitates students to find out the weakness quickly without waiting for the next meeting. Formative assessment with real time online feedback which is implemented in the end of the learning can give information to the students. The information assists students to understand and to perform necessary change for improvement in the next learning. This is suitable with Shavelson *et al.* [12]; Majerich *et al.*[13]; and Shute [14]

statements that formative feedback is functioned as equitable information for students to understand about what they have found out and have implemented during learning process and to perform necessary change to improve in the next learning. The statement is supported by study result performed by Shute [14], that is formative feedback which is continuously performed can increase the concept understanding.

Based on analysis result, it can be proven that there is influence in using problem solving strategy with online feedback towards students concept understanding. It is said that the concept understanding of experiment class is higher than of control class. It is in accordance with the study performed by Ayu *et al* [2] that learning which develops the skills of problem solving is much better than learning in conventional method. Learning which trains the skills of problem solving is better implemented through real experiment during learning process, so the concept understanding will improve and it results to the increasing in learning achievement. The improvement of concept understanding happens because in solving problem students are not only connected to the precise solution obtained, but also the skills since recognizing the problems such as finding alternative solutions, choosing one of the alternative solution, and evaluating it. The skills to solve problems needs to be implemented early to the students. Thus, the students are expected to be ready in facing physics problems in the future. Based on the explanation, the implementation of problem solving strategy with online feedback can increase the students' concept understanding.

Observing the average result, the experiment class has higher average score than the control class. However the score obtained has not met the expected target yet. Not meeting the target might happen due to some reasons. First, the basic weakness of the quasi experiment itself because the sample was not taken by randomization or matching of grouping subjects into problem solving strategy with only feedback group and conventional group, the researchers cannot assume that the two groups are the same in all factors which might influence the bound variable. Second, the level of concept understanding which was too low, so that treatments implemented only few times have not been able to give significant impact. Problem solving strategy learning with online feedback has not been entirely optimal because this learning strategy needs relatively long time but short in implementation. Third, the students have not been exposed enough to problems online due to time constriction.

Conclusion

Based on analysis data and discussion performed, the researchers can conclude as follows. There is different concept understanding in students of problem solving strategy learning with online feedback and students of conventional learning. Concept understanding of problem solving is optimized by giving formative assessment with online feedback. Moreover, students from class of experiment were given opportunity to disentangle problems and to choose alternative problem solving. Hence, the students found alternative solutions from the activity of collecting information in experiments and discussions.

Acknowledgment

This research activity is supported by DIPA LPPM Kanjuruhan University through activity development of the Quasy experiment.

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