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The Effect of Inquiry Training Learning Model Based on Just in Time Teaching for Problem Solving Skill

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Abstract
One of the factors that can support successful learning activity is the use of learning models according to the objectives to be achieved. This study aimed to analyze the differences in problem-solving ability Physics student learning model Inquiry Training based on Just In Time Teaching and conventional learning taught by cooperative model so that it can be seen whether there is influence learning model Inquiry Training based Just In Time Teaching on problem solving ability of students in General Physics II study. This research is a quasi-experiment study, population are students of program Physical Education Department of Physics, State University of Medan. Sample selection is done by cluster random sampling. The instrument used was a test problem solving abilities. Data was analyzed using anova one way test. Results of testing the hypothesis showed that H_a accepted that there are differences in problem solving capabilities of physics students through learning model Inquiry Training based JITT and cooperative learning model so that it can be concluded that there is influence learning model Inquiry Training based JITT against problem solving ability of students in learning physics General physics II
Keywords: Inquiry Training Learning Model based on JITT, problem-solving skill

1. Introduction

The development of Science and Technology has contributed to the world of education (Nicholl, 2002: 17). Especially physics science education as part of education in general has a role in improving the quality of education, particularly in producing quality human Indonesia. Danty (2002: 21) states "qualified human means human beings capable of critical thinking, creativity, logical and initiative in responding to various issues in the society so as to solve the problems caused by the impact of the development of science and technology". Important targets of modern education, especially the education of physics is to educate people in order to overcome the problems found in everyday life. This is in line with Selcuk (2008: 151) states that education programs have the primary goal in teaching learners is to solve problems of mathematics, physics problems, health problems, social problems and problems of personality formation.

Troubleshooting is defined as a process of systematic approach to a problem, ranging from problem identification, data collection and analysis and information, alternative selection and design of measures that aim to find a solution. Solving the problem is the utilization of the thought process. A person's ability to solve a problem is determined by its understanding of the problem. The importance of understanding the concept of the learning process greatly influence the attitudes, decisions and ways of solving the problem (Trianto, 2007: 65).The ability to solve the problem basically is the main aim of education process (Dahar, 1996: 138). It is therefore important problem-solving skills possessed by students to determine the attitude and right action when faced with the problems that occur in the community. Within the constraints of physics learning, students are required to be able to solve the problem of test questions relating to physics concepts using mathematical analysis as a form of learning outcomes. But the reality of the preliminary study on the subject of General Physics, students often have difficulty working on the problems of physics. From the test results matters description of problem-solving ability using techniques Polya against 45 students Force 2012 Department of Physics, State University of Medan TA. 2013 / 2014 has gained the course of General Physics I and II (2013) obtained only about 23% to the stage of implementing the plan and 77% more to the stage of making plans. It is clear that almost more than 70% of the students are not able to answer the questions of physics are given. Though such questions categorized easily and often used as examples of questions in physics dictates.The trial results showed the students have not been able to use the troubleshooting methods in solving problems of physics thus indirectly be said students will find it difficult to face the problems that may have happened in her life. Besides lecturers as educators have not been effective to train problem solving skills so that students lack even do not have the ability to solve problems (Brok, *et al,* 2010: 45).

The facts based on the results of preliminary studies in State University of Medan show still necessary repairs at the General Physics lectures, professors are required to design learning activities based on problem solving and

investigation. In other words, the lecturer is expected to implement a model of learning that can improve the ability to discover, develop, investigate and reveal the student's own ideas. The learning model in question is the model with the inquiry approach. Learning by inquiry approach emphasizes the active role of students in doing the learning. In accordance with Dimyati and Mujiono (2002: 173), "The main purpose of inquiry is to develop intellectual skills, critical thinking and able to solve the problem scientifically". This means that students are expected to learn to understand the physics concepts with the scientific study as an alternative solution for answers.

Interest *Inquiry Training* learning model is an effort to help students to develop critical thinking skills, problem-solving abilities and in general to develop intellectual skills. This objective is achieved through a five-step learning model *Inquiry Training* (Joyce *et al,* 2011: 215), namely: confronts the problem (present situation to the contrary, describes the research procedures), formulate hypotheses (asking questions that already contains answers), the collection of experimental data, organize, formulate and formulate an explanation, and to analyze the research process of *Inquiry Training* course on General Physics combined with the use of strategies *Just In Time Teaching* (JITT) to streamline the learning time in the classroom using intermediate media information and communication technology. JITT strategy helps to identify strengths, weaknesses and learning styles of students before the learning directly in the classroom (Gavrin, *et al,* 2004: 51; Gavrin, 2006: 17). Therefore, JITT strategy has been developed for a long time to encourage active learners role in inquiry-based learning through the use of technology and service-learning (Novak, 1999: 3).
Based on these descriptions, it is expected *Training Inquiry-based* learning model JITT could encourage the activity of the students in understanding the concepts of physics through experiments or experiments that directly affect the physics problem-solving abilities of students. General Physics learning by developing in accordance with the needs and available resources and forward in the development of technology and the demands of globalization, including the application of the model-based *Training* JITT *Inquiry* is expected to impact on improving learning outcomes and competencies of physics.

Methods

The method used is quasyexperimentdesign withtwo group pretest-posttest study design involving two classes of experiment class with Training Inquiry-basedlearning model JITT strategy (IT-JITT) and the control class with Cooperative Learning. The research instrument used was a test of physics problem-solving ability of students with problem solving skills scoring guidelines were modified from rubric created by Selcuk (2008: 153) is based on four criteria assessment rubrics follow Polya problem solving techniques. The analysis data used Anova one way test. The procedure consisted of three stages, namely the preparatory stage, the stage of implementation and data analysis stage.

Preparation phase**,** During the preparation stage of this research carried out several activities, namely to develop learning tools (teaching materials and worksheets to be applied using a media website), tested the worksheet to some students outside the samples, the testing of test questions problem-solving ability, observe the activities of students in conduct experiments, learning and revising the latter chose a random sample of all students in the Department of Physics of two classes to be used as an experimental class and control class.
Implementation phase**,** The implementation stage begins with giving the test physics problem-solving ability of students in the form of questions form the description associated with the concept of physics as an early test of the study. This was followed by implementing learning activities in the classroom according to the schedule set by the model IT-JITT the experimental class and the control class Cooperative models. In this study, researchers serve as lecturers with a view to reducing the bias for the difference of treatment in each group. The phase Training Inquiry-basedlearning model JITT strategy is show in Table 1:

Result and Discussion

From the results of hypothesis testing data in Table 2 is shown posttes obtained $F = 55.725$ and sig. = 0.000, it means H_a received and $H_{0\ is}$ rejected, meaning that there are differences in problem-solving abilities of physics students through learning model *Inquiry Training* based JITT and cooperative learning model so that it can be concluded that there is influence learning model *Inquiry Training* JITT based on problem-solving ability of students in learning physics General physics II.

Table 1. *Training Inquiry* phase models based strategy JITT

No.	Phase models *Inquiry-basedTraining* JITT	Description Implementation Activities	Important Points Implementation Activities
1	Exposes problems (done with a combination of strategies JITT)	In this phase, the lecturer makes review the material and assignments to students via the website and the student must do the work that is before the classroom	Review issues, settlement procedures and a summary of the material as well as pre-class assignments were made as comfortable as possible by lecturers so easy to understand students
2	Finding problems (done with a combination of strategies JITT)	In this phase, students completed the pre-work associated with the formulation of hypotheses to be answered through experimentation	Pre-tasks created lecturers should be up to facilitate the phase-2 of the model for learning in the classroom can be directly started from the 3rd phase
3	Reviewing the data and conducting experiments	In this phase lecturer review the completed pre-assignment of students briefly for additional materials conduct experiments for students	This phase is done in the classroom to review the pre-assignment that has been done by the students. In this phase faculties are as facilitator and director of student conduct experiments
4	Organize, formulate and explain	In this phase, the students tried to test the hypotheses that have been made while practicing to do research until the results	This phase is expected to be done by the students to the maximum in order to answer the questions that will be given after the study ended lecturer
5	Analyzing the research process and communicate	In this phase, students have found the solution of the problem and communicate in the form of a presentation to be assessed by the class	Students make inferences using the media to make it easier for a power point presentation in class

Table 2. Anova One Ways Result

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	3608.712	1	3608.712	55.725	.000

The difference between the problem solving skills with a class-based model of *Inquiry Training Just In Time Teaching* cooperative learning model can be explained by the theory that basically learning model *Inquiry Training* is a learning model that gives problems in the classroom, and problem solving technique is implemented with the experiment. Once the problem is resolved, the students do in the classroom discussion to convey the concept that has been found.

In the implementation model of *Inquiry Training* assisted with the strategy JITT to streamline the learning time in the classroom using an intermediary medium information technology and communications. Strategy *Just In Time Teaching* combines the use of information technology and active learning in the classroom that is feedback between students and lecturers so as to encourage learning-centered student *(student oriented).*While as the *cooperative* model of learning through the implementation of priority to the learning experience of students friendly, fun, creative but still meaningful for students. However, the cooperative model has not been able to encourage students to conduct investigations and direct experiments to find a solution to the problems of physics. In addition, the cooperative learning model focused only on student discussion in discussing the subject matter is not the result of problem solving. Therefore, the cooperative model gives less influence on the physics problem-solving abilities of students compared to the *Training Inquiry-based* learning model JITT.

This theory is consistent with research conducted by Rajshree S. Vaishnav (2013) that the model of *Inquiry Training* is significantly effective in improving cognitive and affective learning outcomes as well as contribute to the attitude of learners than conventional approaches. In addition, Pandey, et al (2011: 7-20) based on the results of research concludes that using models *Training Inquiry* learning is more effective than using conventional methods is seen from the students' academic learning. More specifically in physics problem solving skills performed by Hartono (2012: 44-49) and Dwi, et al (2013: 8-17) concluded physics problem solving skills using problem-based learning model that has a learning phase is similar to the model *Inquiry Training* more compared with the results of direct instructional model as conventional models.Besides differences in the average value of the class with a model of *Inquiry Training* based *Just In Time Teaching* cooperative learning model can be described as the application model of *Inquiry Training* combined with strategies *Just In Time Teaching* wherein the steps of this strategy put in syntax models of *Inquiry Training*. Implementation of this strategy is very effective to help students identify the strengths and weaknesses of the material being studied before the direct learning in the classroom because of this strategy is based on the interaction between the learning and activity in the classroom. This is consistent with the results of research Gavrin (Gavrin, *et al,* 2004: 51; Gavrin, 2006: 17) and Novak (1999: 3), which has found that the strategy of *Just In Time Teaching* is effectively used to improve the learning outcomes of students with effort minimize the time in the classroom. In its application, the problems solved by a student who takes a class given on the web so that students have ample time and opportunity seeking solving solutions to be tested or presented in the inquiry classroom so that students are more skilled in problem solving abilities. While the model of cooperative learning, application of learning to do as the basic syntax of the cooperative model without having to focus on the part where the material that has not been understood by the students and the problems to be solved immediately given student in the class so it takes a longer time in the solution.

Conclusion

The average value of problem-solving abilities with *Training Inquiry-based* learning model *Just In Time Teaching* higher than cooperative model. It proved by results of testing the hypothesisshows that H_a accepted that there are differences in problem solving capabilities of physics students through learning model of *Inquiry Training* based JITT and cooperative learning model so that it can be concluded that there is influence learning model *Inquiry Training* based JITT against problem solving ability of students in learning physics General physics II.

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