

SE-011

EFFECT OF PROJECT BASED LEARNING MODEL WITH KWL WORKSHEET ON DIVERGENT THINKING IN SOLVED PHYSICS PROBLEMS

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ABSTRACT

This study was aim to analyze effect of project based learning model with KWL worksheet on divergent thinking in solved physics problems. The type of this research was quasy-experiment with one-group pretest and posttest design. The instruments of the research was an essay test in higher order thinking with five item. Every item will be assessment for divergent thinking indicators. The result shown that Student in above average Divergent Thinking was greater than under average Divergent Thinking in learning for using KWL in learning. It proved there were effect in the divergent thinking of Students who have Under Average and Above Average category to solved Physics problems more be effective in using KWL worksheet.

Keywords: *Project Based Learning Model, KWL Worksheet, and Divergent Thinking*

INTRODUCTION

In the development of education in Indonesia, learning at this time directs the students to be able to think and behave scientists. It is also an impact on not only based on the assessment of cognitive abilities but also activity in the learning process. Thus, the use of a model of learning that can lead students to be able to achieve over the Government's recommended to be applied to the study, one of the models of Project Based Learning (PjBL).

PjBL can also improve Student's creative thinking that can lead to the creation or realization of the planned project. Hong, et al, (2010) states that PjBL is a significant approach in enhancing the potential of changing the way teaching and learning is passive to enable Students with the tools and media support to improving learning outcomes. According Holubova (2008) PjBL has advantages in this type of teaching on Student activities and opportunities to solving multidisciplinary problems. This is confirmed ChanLin (2008) which states that it is important to do PjBL implementation by integrating technology in learning as Students planning on the experience of self-exploration.

In other case, Barron and Hammond (2007) stated PjBL as a model to explore Students learning to real world problems, competition, and collaborate in groups. In a study Mahanal, et al, (2012) PjBL proved effective in improving attitude, empowering attitude towards the environment, interaction in groups, and learning outcomes. In addition, Rillero and Zambo

(2006) confirmed the increased participation in science at the level of Teacher training on Student interest in science at a low level. In this case, Doppelt (2003) indicates that technology can be used as PjBL science at an elevation of Student motivation and self-image at all levels. Kteily and Hawa (2010) also explained that the application of PjBL Students through an extended process from inquiry in the face of a problem, a complex question, and challenge. In other words, the instrument used for the assessment of Higher Order Thinking Test (HOT Test).

The HOT Test is a question which gives to see high-level thinking skills students. Students are directed to think hard to answer questions that require a high understanding of the concept. To that end, students are trained to think and provide answers to a wide range of possibilities and different viewpoints in solving a problem. For that, use the Know-Want-Learn (KWL) worksheet as controlling the activities to be more systematic and efficient use of time because it can focus more on Student works. In addition, Teacher was expected to be able for giving encouragement, motivation, and facilitation of referrals when Students need it. This is done so that Students are more excited that the results are expected to be more optimal (Al-Khateeb and Idrees, 2010; Tucker, et al, 1997). The KWL worksheet is proven to streamline the use and effectiveness of performance based on research Tucker, et al, (1997). KWL provides a framework for learning that can be used across content areas to help students become active constructors of meaning. The KWL with strategy to help students write reports without copying, to guide exploratory science activities, and to increase learning from multiple sources including films and video-tapes. In each instance the basic purposes and thinking activities have been retained. Student's ideas and knowledge about the content and structure are the beginning point.

Based explanation Munro (2004) that creativity is seen as synonymous with divergent thinking. But, the link between divergent thinking and convergent thinking measured by the traditional intelligence is complex. The results obtained with traditional tasks intelligence measures not indicate creative potential. A divergent thinking is a way of thinking that saw the settlement of the problem from different viewpoints direction with some aspects that support and enable problem resolution. This is confirmed by McCrae (1987) which said that defines divergent thinking as the ability to generate many difference possibilities for solving a problem.

According Reed (2009) A divergent thinker will often arrive at apparently erroneous answers but, when asked to explain such answers, can usually prove the “wrong answer” is valid if looked at from another point of view. The divergent thinker is also the person with the strange senses whose remarks are humorous in retrospect after one has an opportunity to realized or comment, or the unusual association drawn. Divergent thinking requires open-ended questions; as opposed to convergent thinking problems that always has one or very few correct

or conventional answers. Divergent thinking characteristics as possible indicators of giftedness: First, Student are fluent and abstract thinkers. Second, Student are flexible thinkers, able to use many different alternatives and approaches to problem solving. Third, Original thinkers, seeking new, unusual or unconventional associations, and combinations among items of information. Fourth, Elaborate thinkers, producing new steps, ideas, responses, or other embellishments to a basic idea, situation, or problem. Fifth, Show a willingness to entertain complexity and seem to thrive in problem situations. Sixth, Make good guesses and can construct hypotheses or “what if” questions readily. Seventh, Aware of their individuality and shows emotional sensitivity. Eighth, Demonstrate leadership qualities. Ninth, Have a high level of curiosity about objects, ideas, situations, or events. Tenth, Display intellectual playfulness, and imagine readily. Eleventh, Less intellectually inhibited than their peers in expressing opinions, ideas and often exhibit spirited disagreement.

METHODOLOGY

The type of this research was quasy-experiment with one-group pretest and posttest design. The instruments of the research was an essay test in higher order thinking with five item. Every item will be assessment for divergent thinking indicators. The analysis data was used paired sample t-test for find effect KWL worksheet in the divergent thinking of Students who have Under Average and Above Average category.

First time, find category group from class in pretest scores. Then, we give treatment to both of group with KWL worksheet. The Final, giving posttest to Student. For analysis effect of KWL worksheet in learning to Divergent Thinking with paired posttest score and pretest score. Then, for analysis effect of KWL worksheet to Divergent Thinking in group with ANOVA two ways in compare Divergent Thinking Score of pretest-posttest and Group Category.

RESULTS AND DISCUSSION

From Table 1 shown that $\text{Sig} < 0.05$ ($0.000 < 0.05$), it means H_0 is rejected and H_a is accepted. In other word, there are differences in divergent thinking of Students through between posttest and pretest to solved problems in Physics. Based on average value of test shown if Student divergent thinking in posttest has been higher than Student divergent thinking in pretest ($77.5293 > 65.8716$). It caused in PjBL model with KWL worksheet activity Student more giving ideas to groups for reach project finished. All of idea which are Student collect will be discussed and selected for make finish Project in learning.

Table 1. Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence				
					Lower				Upper
Pair 1	ScoreDT-Test	70.200	14.693	1.708	66.796	73.604	41.101	73	.000

Source: Mihardi (2013)

Table 2. Descriptive Statistics

Test	DT	Mean	Std. Deviation	N
Pretest	Under Average	54.7992	10.28228	22
	Above Average	82.1111	6.34544	15
	Total	65.8716	16.19062	37
Posttest	Under Average	64.5250	5.14782	10
	Above Average	82.3457	5.55324	27
	Total	77.5293	9.65769	37
Total	Under Average	57.8385	10.01457	32
	Above Average	82.2619	5.77217	42
	Total	71.7005	14.48136	74

Source: Mihardi (2013)

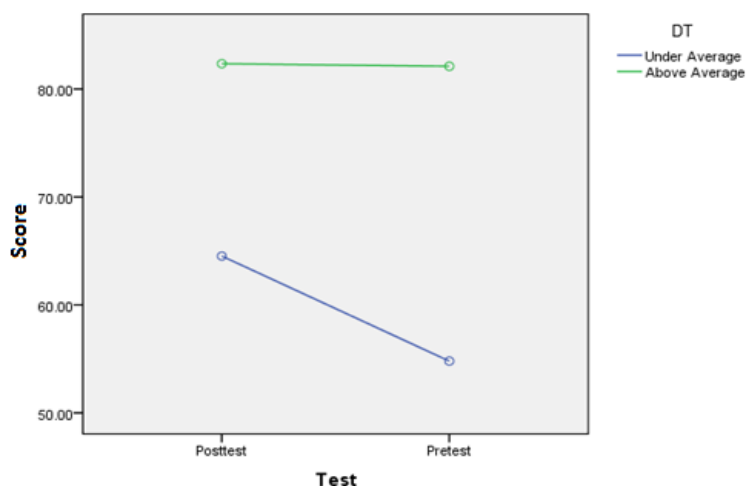


Figure 1. Interaction of Cognitive thinking Level and Result Test of Learning Model

In KWL analyze has found that in assessment activity at treatment showing advance ways of thinking in learning to make planning through KWL worksheet (Table 2). This is appropriate with Bell (2010) said that implementation of PjBL make Student drive their own learning through inquiry. From Table 3 shown that the correlation of variables is 0.750 and sig. value for variable Test (Result test of learning model), DT (Cognitive thinking level) has less

than 0.05 (sig. < 0.05). It means there are significantly different in Student through of learning models and divergent thinking level. Then, generally for variable interaction shown that sig. < 0.05 (0.012 < 0.05). It means there are any interaction in the divergent thinking Student through of learning model and Cognitive thinking level. For clearly will be shown in Figure 1.

The results showed that there are differences in divergent thinking of Students through between the Project Based Learning model with KWL Worksheet and Cooperative Learning model to solved problems in Physics. This is strengthened by the assessment of value average students divergent thinking in the posttest was higher than pretest. It shown project based learning model is greater than cooperative learning model to reach divergent thinking of student in learning. It caused in learning of PjBL model with KWL worksheet that Student trained to design, analyze, and applying of their idea and this is appropriate with Hong, et al, (2010), Holubova (2008), Rillero and Zambo (2006), Kteily and Hawa (2010), and Mahanal, et al, (2012) which is concluded that PjBL model in learning would be trained Student to thinking in solved problem. It caused in PjBL model activity Student more giving ideas to groups for reach project finished. All of idea which are Student collect will be discussed and selected for make finish Their Project in learning. The process of learning make student to thinking applied idea for get solution for problem physics based on theoretical in practise.

Table 3. ANOVA Test

Dependent Variable: ScoreDT

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	11484.581 ^a	3	3828.194	70.072	.000
Intercept	323214.964	1	323214.964	5916.225	.000
Test	398.173	1	398.173	7.288	.009
DT	8175.314	1	8175.314	149.643	.000
Test * DT	361.548	1	361.548	6.618	.012
Error	3824.237	70	54.632		
Total	395739.458	74			
Corrected Total	15308.818	73			

R Squared = .750 (Adjusted R Squared = .739)

Source: Mihardi (2013)

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