The Effectiveness of Problem Based Learning Integrated with Islamic Values Based on ICT on Higher Order Thinking Skill and Students' Character

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Abstract: The focus of this research is to known the influence of Problem Based Learning (PBL) model application, that intergrated with Islamic values based on information and communication technology (ICT) towards the ability of higher-order thinking skill and the strenghtening of students' characters. This research is quasy experiment type with group design pretest-postest. The research was conducted in SMA Sampling by means of random sampling, to determine the control class and experimental class. Data analysis technique used is the t-test, based on the value of significance, as well as test-effect size. The research data shows that the model of problem based learning integrates Islamic values based on ICT has positive influence towards the increasing of higher-order thinking skill and the strenghtening of students' characters compared to the students that use conventional method.The result of effect size test on experimental class in on medium category. It means that the learning which use problem based learning (PBL) model, integrated with Islamic values based on ICT, can be said effective on increasing higher order thinking skill of students.

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INTRODUCTION

Lin & Lin (2016) said *"science educators have the responsibility to explore effective approaches for enhancing students' interest in and enjoyment of learning science.* It means that science educators have the responsibility to explore effective approaches for enhancing students' interest in enjoying of learning science. The science education which

intend here is Physics education, on the other point of view of the students, Physics subject is hard and very frightening (Hockicko, Krišt ák, & N mec, 2015). This statement is supported by Haji's (2013) experiment that stated "*physics is considered a difficult subject for some students*" (Ali, Gray, & Karnon, 2013). Their understanding of the concepts outlined in the various theories and formulas also makes

learners trouble understanding the material (Lebdiana, Hindarto, 2015).

Learning process for this still appears to be merely centered on educators who think that educators are the only major source and omniscient, while students just accept what is given by educators, so that the lecture is the only one considered most suitable in learning strategies (Sari & Nasikh, 2009). Ideally, Physics learning process emphasizes on providing direct experience to develop competencies that learners are able to explore and understand the universe around scientifically.Science education is directed to "investigate" and "do" so that it can help students to understand deeper understanding of surround universe (Maghfiroh & others, 2011).

Sabel, Forbes, & Flynn (2016) stated *"Teachers with higher levels of life science content knowledge more effectively evaluated students' ideas than teachers with lower levels of content knowledge"* whereasteachers with higher level of life science content knowledge will get more effective idea to evaluate the students compared to the teachers with lower knowledge. As well as, the chosen of learning model is needed a professional teacher. Physics learning models do not need to memorize, but need to choose model that able to boost students to apply what they have learnt into their daily life. The Model which involved active role will ease students to understand the material that learnt and learning will be on multi directional communication (Kharida, Rusilowati, & Pratiknyo, 2009). Therefore, on learning process teachers are expected to use a various learning model, so it can enhance students' learning spirit (Saregar, Sunarno, & Cari, 2013).

Problem based learning (PBL) model is a learning model which involve the daily event which experienced by the students (Kharida et al., 2009). The research assume that PBL model will be better if applied with ICT based learning especially o Physics learning. These supported

by Nicospapadouris that said on his research, that *"Computer technologies are becoming increasingly powerful components of science learning"* technology is a supporting component of science learning (Papadouris & Constantinou, 2009), (Sorensen, Twidle, & Childs, 2014). The richful environment of ICT has been proved to give a great potential on enhancing interest and learning result of the students (Webb, 2005). Besides the use of ICT based learning model are convinced will help teachers and students in achieving more effective learning (McFarlane & Sakellariou, 2002). There are not many Physics researchs that discuss PBL model based on ICT (Webb, 2005). Whereas the used of PBL model based on ICT that have been done correctly will support the success of learning, thus contributed on achieving the learning result wanted (Dwi, Arif, & Sentot, 2013).

As for sintax of PBL model based on ICT, i.e. : 1) to orient the students on *ICT based problems*; 2) to organize the students to learn with *ICT*; 3) to help the independent and group investigation based on *ICT*; 4) to develop and to present the result and display it; 5) to analyse and evaluate the process of problem solving (Dwi et al., 2013). Moreover PBL model based on *ICT* is a kearning model that present the problem to sharp the thinking skill and to enhance learning result (Rachmawati, Sudarmin, & Dewi, 2015), (Hamdayama, 2014), (Ngalimun & Pd, 2014).

Higher order thinking skill is one of the potentions that students really need on this developing era of knowledge and technology, because besides Science and technology results that can be enjoy edit also create some problems for human and environtment (Saregar, Latifah, & Sari, 2016). The students, especially university students, must have higher order thinking skill, according to Lin & Lin (2016) on his research, stated that "Learners actively construct their understanding by connecting new knowledge with their prior knowledge" that students actievely construct their

understanding by connecting new knowledge with their prior knowledge (Lin & Lin, 2016).

Heong et al. (2011) Heong defines that "*Higher Order thinking is defined as the expanded use of the mind to meet new challenges*", the ability of someone to think broadly in order to achieve the new knowledge. Higher order thinking skill able to identify from cognitive ability of the students on analysis level (C4), synthesis (C5), and evaluation (C6) (Kawuwung, 2012).

The learning material that delivered on learning based on *ICT*consist of: Text, graphic, animation, simulation, audio, video, and multimedia. Computer simulation also involves students on investigation and able to explore the knowledge (Smetana & Bell, 2012) and simulation also supports science learning (Chen, Wu, & Jen, 2013). The loaded material based on *ICT* able to sharp high order tinking skill of students and *problem based learning*model based on *ICT* stressed on the students learning center (Park, Khan, & Petrina, 2009). On this research the material that will be investigate is the course of Basic Electronics 1. By learning Basic Electronics 1 course students are expected able to apply what they have learnt on their daily life.Therefore, the knowledge that students achieve can be more meaningful and students have the real purpose on following the learning process (Saregar et al., 2013).

The aims of the research is to determine the infuence of *Problem based learning (PBL)* model*integrated with Islamic values* based on*ICT* towards high order thinking skill of the students on the temperature and heatsubject.

METHOD

This research is used *quation experimental*. Cluster random sampling was used to choose two classes. An experimental class by using PBL was given to Physics education students of 3rd semester of class A

and conventional class to 3rd semester of class D. The data collected by using HOTS test, questionnaire, and observation in order to get the strengthening character information.The research hypothesis was used by t-test.

Statistic test is done on significance level 5%. On this research there are requirements to be fulfilled before data analysis by conducting prerequisite test analysis, i.e. normality and homogeneity of variance testing. Below, on the table 1, is the HOTS data of the students.

Table 1. The description of Pre-Test and Post-Test in HOTS of PBL Class and Conventional Class

No	Data	HOTS of PBL Class		HOTS of Conventional Class	
		Pre-test	Post-test	Pre-test	Post-test
1	Mean	31,4	77,06	29,0	71,05
2	Standar Deviasi	3,01	11,9	4,2	8,5

Normality testing is aim to find out whether the sample comes from the population that normal or not distributed These are the procedure of the testing:

1. Determine the hypothesis

   Zero hypothesis (H$_0$) is a sample that come from population that distributed abnormally, and alternative hypothesis (H$_1$) is a sample that come from population that distributed normally.

2. Assigntesting statistic

   The normality testing toward dependent variable are, the learning achievement of cognitive and affective aspects. Both of it using *Kolmogorov-Smirnov* (KS) which the the calculation is done with PASW 18 program.

3. Determine significance level ( )

Significance level is the number that show how big the chances of fault analysis on this normality testing, the significance level ( ) that used is 0,05 or 5%.

4. Set a testing decision

Normality testing decision determined by criteria:

If probability < so H_0 accepted it means the data distributed abnormally.

If probability > so H_0 rejected it means the data distributed normally.

Below is the result of homogienety testing from HOTS data, can be seen on the table:

Table 2. Test of Normality

Method	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
HOTS in PBL Class	.111	31	.200[*]	.972	31	.573
Conventional Class	.133	32	.158	.959	32	.257

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

Table 2 shows that data are distributed normally. Homogeneity testingcan be used to find out whether the sample comes from homogeneous population. These are the procedure of the testing:

1. Determine the hypothesis

Zero hypothesis (H_0) is a sample which come from in homogeneous population and the alternative hypothesis (H_1) is the sample which comes from homogeneous population

2. Assign testing statistic

Homogeneity testing toward dependent variable of learning achievement on cognitif and affective aspects by using *F-Test* and *Levene's Test* which the calculation is done with 18 program of PASW.

3. Determine significance level ( )

The significance level is a number that shows how big the chances of analysis fault. On this homogeneous testing, significance level ( ) that used is 0,05 or 5%.

4. Set a testing decision

Homogeneity testing decision determined by the criteria:

If probability < so H_0 accepted it means sample come from in homogeneous population.

If probability> so H_0 rejected it means sample come from homogeneous population.

Below is the result of homogeneity testing from HOTS data, can be seen on next table 3.

Table 3. Homogeneity Testing Result

Levene's Test of Equality of Error Variances[a]
Dependent Variable: HOTS

F	df1	df2	Sig.
.571	1	61	.453

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept + Method

Table 3 shows that the data distributed homogeneously. Arikunto (2010) said that, if the analyzed data distributed normally then to test the hypothesis can be used Statistical techniques parametric t-test, while if the data that analyzed is distributed abnormally then statistical non-parametric U-test must be used.

The effectivity of PBL model which integrated Islamic values tested by *effect size* (Saregar et al., 2013) that is the size of how big the effect of the variable on others variable. The variable that often connected usually independent and dependent variable.

Effect size can be calculated with the formula (Cohen, 1977) and then describe spesifically by (Hake, 2002).

$$d = \frac{m_A - m_B}{[(s_A^2 + s_B^2)/2]^{1/2}}$$

Information:
d   = *effect size*
m_A = medium score gain experimental class
m_B = medium score gain control class
sd_A = standar deviasi experimental class
sd_B = standar deviasi control class

The criteria of big and small of the *effect size* can be seen as below.

Tabel 4. The Criteria of *effect Size*

Effect Size	Category
d < 0,2	Low
0,2 < d < 0,8	Middle
d > 0,8	High

RESEARCH FINDINGS

The result of t-test statistical analysis of the research data can be seen as follow:

Table 5. Hypothesis testing result t-test HOTS

No	Hypothesis t-test	Significance of HOTS	Decision Testing
1	Method	0,022 <0,05	HOTS = Ho rejected

Table 5 shows that the result testing influence of contextual learning with experimental learning method and the discussion demonstration of students HOTS achievement on Table 5, *t-test* shows that there are influence which significance on both model shown with significance score each *P-value*=0,022. It means that the medium cognitive achievement have the influence on both methods that applied. Therefore, it can be concluded that *problem bassed learning* (PBL) model based on *ICT can* give a better effect against high order thinking skills of students of the learning model directly through the lecture method.

Effect size is used as the measurement level of success in research (Huck, Cormier, & Bounds, 1974). The effectiveness of *Conceptual Understanding Procedures* (CUPs) learning model toward the ability of higher order thinking skill using the *effect size* formula. Below is the result of *effect size* analysis achievement:

Table 6. *Effect Size* Result

Class	Gain (M)	Standar Deviation (sd)	Effect Size (d)	Info
PBL	45.66	6.470	0,53	Middle
Conventional	42.05	7.812		

Table 6, shows that *effect size* gain as 0,53, thus, it includes on middle category. These prove that *Problem Based learning* model based on *ICT*, integrated Islamic values give significant effect towards students' ability of higher order thinking skill and strengthening of students' characters on Basic Electronics course.

CONCLUSION AND RECOMMENDATION

Basede on data analysis result and discussion concluded that *Problem Based Learning* (PBL) model based on ICT, integrated Islamic values, declared has significant effect towards the ability of higher order thinking skill and strengthening students' characters.

It is recommended that careful delivery model of learning should be undertaken before starting of every intake taking into consideration of diverse background of students. Comparisons should be made between the effectiveness of PBL and conventional model via students' assessment after treatment. It is also recommended that the institution to look into the issue of familiarity of with information and communication technology amongst students before introducing the learning process.

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