IMPROVEMENT OF STUDENT LEARNING OUTCOMES IN PHYSICS USING CASE STUDY METHOD

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Abstract

This research was carried outto study student learning outcomes using case study and conventional method and its comparison using both ofmethods.The problem of conventional class with teacher-centered learning are: 1) student doesn't understand how to connect physics concept in technology and daily life, 2) student can not solve contextual physics problems, 3) critical thinking is not developed. Case study method was choosen in this study in order to develop student critical thinking and their ability to solve contextual physics problems. Experimental research method using experiment and control class was conducted in this study. Research shows that the student learning outcomes using the case study is better than conventional method..

Key Word :casestudy, critical thinking, physics, learning outcomes, static fluid

Introduction

In Article 3 UU No20 of 2003 ofSistemPendidikanNasional (UUSPN) stated that the function of Education is to develop skills and form the character and civilization of a dignified nation in the context of the intellectual life of the nation. Teaching and learning at school level must be inline with the objectives. Success or failure of educational outcomes depends on how the learning process experienced by students as learners. Learning proces must be conducive in order to direct learning so that learners can develop their potential (Sanjaya, 2008). This means that the educational process must be oriented to students (student active learning).

Physics as one branch of the Natural Sciences (IPA) must be learned in order to understand natural phenomena and solve contextual problem encountered in daily life. Physics is also underlie the development of advanced technologies and the concept of living in harmony with nature. However, research report shows that student have unsatisfactory learning outcomes in physics.Most of the student have low motivation in learning physics. Motivation are important in contributing to students'success in their science courses (Pintrich&Schunk, 2002).

Case Studyis a way ofgivingstudents the chance toperformtasks based ondirect instructions, issues, events, or situationsthat have beenprepared by theteacher.Case study method could involved the student actively in learning and improve student interaction as shows previous research (Shiva in Jhonson, 2004). Student areallowed to find alternativesolution for the given contextual problem. In performingtheassignment,the studentscan explore the problem byhands-on experience.Taskscan be assignedin groupsorindividually. Through this method,studentscan developskills andhabituationtoan independent, honest, developcriticalthinking, andcreatively find a new solutionofa taskto be solved. This methodcan beapplied whenthe studenthas hadprior knowledgeabout theissuespresented.The stepsof using the case study method is to observe, think, and act in dealing with certain situations.

Research Method

This research was conducted at SMAN 1 TebingTinggi of North Sumatera province in May until July 2013. Quasi experiment method was use in this research using experiment class and control class.The topic of learning is static fluid.

Research Instrument

The research instrument used in collect data of students' achievement test of subject matter consists of 20 items multiple-choice

Content validity of the test is multiple choice questions that validated by lecturers and teachers. Predict validity of the test is giving a test to another students in different school.

Hypothesis Testing

The hypothesisis verified using t-test:

a.Pre-test of student ability Test

T testis usedto determine the similarity ofstudentabilityin both of sample.

The hypothesis will be test is:

H_0:$\overline{x_1} = \overline{x_2}$, The average value ofthe experimental classes as equal as the average value ofthe control classes.

H_a: $\overline{x_1} > \overline{x_2}$, The average value ofexperimental classeshigher thanaverage the control classes.

If research data have normal distribution and homogeneity, the test of hypothesis usingtest, which is:

$$t = \frac{\overline{X_1} - \overline{X_2}}{S\sqrt{\frac{1}{n_2} + \frac{1}{n_2}}}$$

(Sudjana,2008:239)

With S is combination of deviation standard that can calculate with the formula according to Sudjana (2002):

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

where :

$\overline{X_1}$ = The average value oflearning outcomesin the experiment class.

$\overline{X_2}$ = The average value of learning outcomes in the control class

n_1 = Total experiment class sample.

n_2 = Total control class sample.

S^2 = Varians two of class

t = Value of t

With the criteria is:

H_0 accept if $-t_{1-\frac{1}{2}\sim} < t < t_{1-\frac{1}{2}\sim}$ where $t_{1-\frac{1}{2}\sim}$ we get from t list with dk = n_1+n_2-2 and probability (1- $\frac{1}{2}\alpha$). To another value of t H_O not accepted.

Value of $t_{calculate}$ compare with t_{table} get from t table list to $\alpha = 0.05$. If $-t_{1-\frac{1}{2}\sim} < t < t_{1-\frac{1}{2}\sim}$ on the level α = 0.05 and independent degree df = n_1+n_2-2, so have the same nitial ability of student.

Ha accepted if $t_{calculate} > t_{table}$($t_{table}$ get from distribution t_{table} list for α = 0,05), it is mean have not same initial ability of student.

If $S_1 \neq S_2$, so, t test formula will be use is:

$$t' = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(S_1^2 / n_1\right) + \left(S_2^2 / n_2\right)}}$$

With test criteria : accept H_0 if:

$$-\frac{w_1 t_1 + w_2 t_2}{w_1 + w_2} < t' < \frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$$

with $w_1 = S_1^2 / n_1$; $w_2 = S_2^2 / n_2$

$t_1 = t_{(1-\frac{1}{2}\sim),(n_1-1)}$; $t_2 = t_{(1-\frac{1}{2}\sim),(n_2-1)}$

b.Post-test of student ability test

Two tail t-testused to determine the diffrenceof student learning outcomes usingcase study and conventional method.

The form of hypothesis will be test is:

H_0 :$\overline{x_1} \leq \overline{x_2}$: Case study method is not effecting to student learningoutcomes.

H_0 :$\overline{x_1} > \overline{x_2}$: Case Study Method is effecting to student learning outcomes.

If data distribution is normal and homogenity, the hypothesis in the research using t-test with the formula is :

$$t = \frac{\overline{X_1} - \overline{X_2}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

With:

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

With test criteria is :

Ho accepted if $t_{calculate} < t_{(1-\sim)}$ where $t_{(1-\sim)}$ get from distribution table t with independent degree (df) = $n_1 + n_2 - 2$ and the probability (1-~) with ~ = 0.05 for another value of t H_0 not

accepted, so Case Study Method have effect in student learning outcomes .
If $S_1 \neq S_2$, so the formula t-test will use :

$$t' = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(S_1^2 / n_1\right) + \left(S_2^2 / n_2\right)}}$$

Test criteria is not accepted(H_0 is rejected) if:

$$t' \geq \frac{w_1 t_1 + w_2 t_2}{w_1 + w_2}$$

with $w_1 = S_1^2 / n_1$; $w_2 = S_2^2 / n_2$

$$t_1 = t_{(1-\sim),(n_1-1)} ; t_2 = t_{(1-\sim),(n_2-1)}$$

Research Result

The study involved two classes with treatment using different learning methods, namely the case study method (experiment class) and conventional method (control class). Before the treatment is applied, the first two classes are given pre-test in order to determine the ability of students before conducting the treatment.Furthermore, after a given treatment, the two classes are given post-test to determine student learning outcomes.

Student competency in test completion is show in table1 !

Table 1. Pretest Score and Post Test Score in Experiment Class and ControlClass

Statistic	Experiment Class		Control Class	
	Pre Test	Post Test	Pre Test	Post Test
Sum	161	272	129.5	210.5
Average	4.47	7.5	3.81	6.19
Deviation Standard	1.64	1.072	1.2	1.5
Variance	2.71	1.1	1.44	2.1

Data normalitytest was examinedusingLiliefors testing. Using thistest, it is found that thevalue ofthe secondpretestsample grouphad anormal data,reveal from$L_0 < L_{tabel}$atsignificance levelof 0.05 andn=36and34.

Table 2. Summary ofCalculation Normality Test of Pre-test and Post-test Data

Data	Class	L_{count}	L_{table}	Conclusion
Pre-test	Experiment	0.0413	0.1477	Normally
	Control	0.0151	0.1519	Normally
Pos-test	Experiment	0.0526	0.1477	Normally
	Control	0.0111	0.1519	Normally

Based on Table 2 shows that $L_{count} < L_{table}$, we can conclude that pre-test and post-test data are two groups of samples which are normally distributed

Homogeneity test performed using the F-test to determine the homogeneity of the population.The results of homogenity test of pretest is F_{count} = 1.9. While the significance level α = 0.05 F_{table} = 1.94. For $F_{count} < F_{table}$, we can conclude that then the second pretest sample data is homogeneous. The results of calculations of data homogenity test pre-test of both classes are shown in Table 3 below:

Table 3. Data of Homogeneity Test Results

Data	Class	Variance	F_{count}	F_{table}	Conclusion
Pre-test	Experiment	2.71	1.9	1.94	Homogeneity
	Control	1.44			

Tabel 4 Summary of Hypothesis Test

To determine the influence of the case study method to student learning outcomes, then the data of pre-test and post-test was analyzed using two ways (t-test).

Results of hypothesis testing at significance level of 0.05, and df = 68 obtained t_{count} = 1.97 with t_{table} = 1.9973. It can be shown that $-t_{tabel} < t_{count} < t_{table}$ (-1.9973 < 1.97 < 1.9973) so can be conclude that the experiment class and the control class have the same initial capabilities.

Analysis of post-test shows that $t_{count} > t_{table}$ (4.53 > 1.9973), then H_o is rejected and H_a is accepted. It means that there is a difference in student learning outcomes using the case study method and conventional method.

Tabel 5 Summary of Students' Activity

Num	Notes			Total of Students	Gain
	Pre-Test	Students's activity	Post-Test		
1.	Good	Active	Very Good	12	8-10
2.	Bad	Moderate	Moderate	2	2-3
3.	Bad	Active	Good	7	2-3
4.	Moderate	Active	Very Good	9	4-5
5.	Bad	Very Active	Good	1	2-3
6.	Very Bad	Very Active	Moderate	1	0-1
7.	Moderate	Active	Good	1	4-5
8.	Very Bad	Moderate	Very Good	1	0-1
9.	Good	Active	Good	1	6-7
10.	Moderate	Moderate	Good	1	4-5

Significant improvement of student activity when learning using case study method is shows in Table 5. This condition give result to student learning outcomes.

Several difficulty encountered in this study are : a)The student need more specific explanation with their environment relating to daily activities. b) Lack of laboratory apparatus is handicap in performing demonstration. This condition consumes extra time in learning with case study method.

Conclusions

Based on researchresult and discussion, can be concluded that:

(1) There are differences instudent learning outcome esusing the casestudy method and the conventional method in sub topic static fluid in class XIIPA SMA Negeri 1 TebingTinggi. (2) Student learning outcomes with case study method is more better than conventional method.

Suggestions

Based on discussion of research result and conclusion above, some suggestionsis proposed: (1) Teacher should make a smaller condition based on their topic (2) Teacher should give more specific explanation to student with their environment relating to daily activities (3) More time must be allocated for student learning activities using case study method.

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