International Journal of Engineering & Technology, 7 (3.36) (2018) 147-150

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Implementation of Flipped Classroom to Improve the Student's Learning Result in Senior High School Education, A case study: Senior High School 1 SETU BEKASI, INDONESIA

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Abstract

Chemistry lesson is one of the lessons considered difficult, especially in middle school students in Indonesia. This also happens in high schools in Bekasi. This study aims at improving the specific learning outcomes on chemistry subject by applying flipped classroom. The increased learning outcome is measured by comparing learning outcomes using an expository method on the same level. The selection of classes applying the flipped classroom and classes using the expository method is done randomly. From the result of the study, the difference in chemistry learning outcomes between students studied using Flipped Classroom and expository learning strategies. Based on the result of calculation is obtained difference in student learning outcomes between students who learn using the Flipped Classroom strategy and students who learn using the expository strategy.

Keywords: *Flipped Classroom, E- Learning, expository method*

1. Introduction

There are many methods and strategies implemented by teachers, thus the taught material can be well-accepted by the student. However, the result has not reached expectation. Learning strategy is a combination of sequence of activity, method of organizing subject material and student, tool and material and time utilized. Furthermore, learning strategy is an effort that is systematically implemented in order to easily convey a subject material to the student, thus the learning objective can be achieved [1-3].

E-learning, a method that really involves students who have interacted a lot with the internet, gives a wide opportunity to the students to study independently, conducts a research according to their ability, besides being the receiver of science and knowledge [4-10].

In a traditional class, a teacher conveys a subject material in a class and then gives students homework to do after the class is finished. Meanwhile, in the Flipped Classroom strategy, what is done is the opposite. The subject material is conveyed by the teacher through a video while the time in class is used for direct interaction and cooperation between the teacher and the students during the learning process [11, 12] [13].

Currently, the Flipped Classroom strategy can be implemented in senior high school, considering that all students have already used electronic media such as cellphone with sophisticated features and equipped with internet connection [14]. The Flipped Classroom strategy can overcome the limited time problem complained a lot by the teacher. This is because in the Flipped Classroom strategy, the students can independently learn facts, concept, theory or even basic laws. As a result, the time in class can be used to solve a problem, especially algorithmic calculation considered difficult in the chemistry subject by the student. The first step of this learning process is that the student studies independently at home through electronic media after that in the class, the student accompanied by the teacher implements a direct practice to complete exercise or solve the problem [15]. However, the teacher still has to be in control on the student's learning activity and the student is responsible for their own study.

High schools have characteristics that are very different from the characteristics of vocational high schools. In high school, the hours of learning used in the teaching and learning process are longer than vocational schools having more practice in learning activities[16, 17]. Thus, in this type of school, improvement for the teaching and learning process is possible.

Especially for chemistry lesson, which requires sharpness of mind and knowledge on chemical reactions, it is often made as one lesson that is highly disliked by students. It encourages researchers to apply the flipped classroom method as an alternative method of learning to increase the value of chemistry subject. By applying the flipped classroom method, the time used for chemistry lab is getting longer, thus the basic knowledge of chemical reaction by student increases. The data collection process by comparing the application of classroom and expository flipped methods can be arranged as in the following sub-chapter.

2. Method

A technology of the Flipped Classroom allows to give a lesson virtually by using an application. A record in the form of audio or video from the teacher can be shown to students. This process can be done outside the class (outside lesson hours), thus the time in class can be used to solve a difficult conceptual problem. In this research, with the steps provided in Figure 1, a quantitative experimental method is used. By comparing two learning strategies and considering the learning independence of the

student, the expository method will be comparison for the result of the Flipped Classroom implementation.

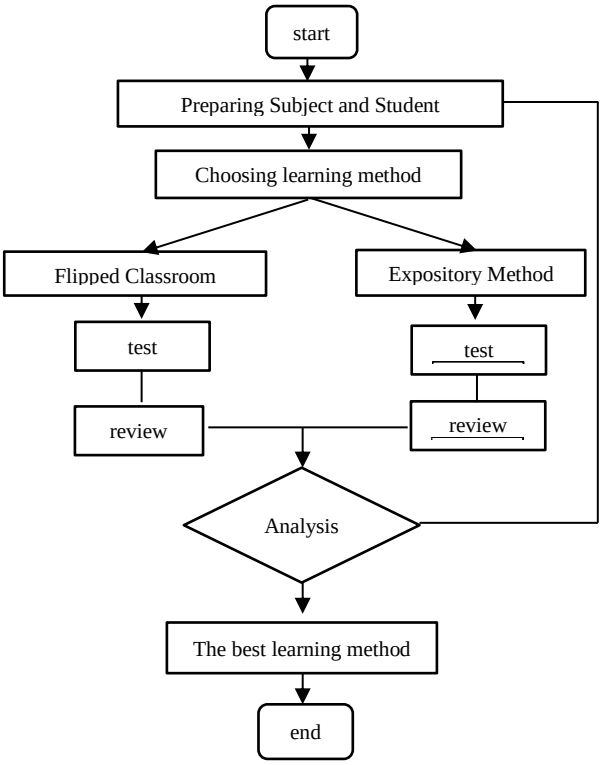

Fig. 1: Flow chart of the Research

This research was conducted at Senior High School 1 Setu, Bekasi District, on the first semester of 11th grade students in MIPA (Mathematic and Natural Science) program with Thermochemistry and Reaction Rate as the main subjects on research design by 2x2 level. An experimental class of the expository method is implemented in 17 meetings with Thermochemistry and Reaction Rate as the main subject. The research begins by giving a questionnaire as an analysis of learning requirement to the student and the teacher. The total respondent is 270 students.

The planning of face-to-face meeting and task proportion is adjusted to the learning plan appropriate with the 17 meetings regulation. With an adaptation in using a video as a lesson tutorial, every teacher prepares a material to be conveyed to the student in the form of recording.

The research sample is taken randomly from five available classes of MIPA program, one for experimental class and one for control class. The experimental class uses the Flipped Strategy (A_1) and the control class uses the expository learning strategy (A_2).

From each class, the student is divided into two groups, namely a group with high learning independence and a group with low learning independence. It is done by giving an instrument of learning independence.

The independence instrument of students consists of several indicators [18], including:

1. Non-dependence on others
2. Having high self-confidence
3. Behaving disciplined
4. Having a sense of responsibility
5. Having high initiative
6. being able to control itself

The dependence instrument above is given in the form of a questionnaire in each class used as an object of research. In the process of comparing the application of classroom and expository methods, the application of the flipped classroom method is done by conveying the theory by distributing videos to students from the selected class. The meeting class held in the classroom is used for direct interaction between teacher and student and lab work. Meanwhile, the expository method is done by combining theory and practice. Of the 17 meetings presented, for the flipped classroom and the expository methods, a test to determine the learning outcomes is conducted in the middle of the semester. And the result of the meeting, from the first test result is reviewed whether the method can be applied to the chemistry subject used as a test material. After the test result is obtained, a review of the result of study is conducted to improve the performance of each learning method for both the flipped classroom and the expository method. The result of the final test after the review has been done for improvement from the first test result, then it is analyzed to determine whether the flipped classroom method can be effectively applied to chemistry lesson for high schools.

Testing is then conducted, and also perquisite, normality and homogeneity tests are conducted for all research instruments. Afterward, regarding the research results data, a normality and homogeneity test are conducted and subsequently a Two Way ANOVA test is conducted.

After the result of analysis of the methods already applied, the learning method especially for the chemistry lesson in high schools occurred at Setu Bekasi may be selected to be the best method to increase the learning outcomes of the chemistry subject.

The data in this research consists of test data of the learning result on chemistry subject and data of learning independence. The data of student's learning independence is collected through a questionnaire with four choices of answer for the student as the object of the research. A grid of the test is arranged based on learning objective with the capability to be achieved by the student and it is included in the learning scenario.

The normality test is performed by using Kolmogorov-Smirnov method and the homogeneity test is performed by using Bartlett test with significant value of $\alpha = 0.05$. The result of the normality test in this research from all groups, either for the Flipped Class method in class room (A1) or the expository method, for high learning independence (B1) or low learning independence (B2), includes: A_1, A_2, B_1, B_2, A_1B_1, A_2B_1, A_1B_2, A_2B_2, is declared normal if the significant value is > 0.05, with the requirement that H_0 is accepted. On the other hand, for the homogeneity test, all groups are declared having the same variants if the significant value is > 0.05. Therefore, all populations have the same variant.

3. Result and Discussion

The strategy used is expected to improve the student's learning result on the chemistry subject after following the chemistry learning process that can be manifested in the form of mastery towards the learning material, including: knowledge in the form of fact, information, law principle or rules of working procedure, or theory of value system and so forth. On the other hand, the data description includes average score, deviation standard, maximum score, minimum score and mode, frequency distribution and histogram on each treatment group.

There is a difference in the learning result on chemistry subject of the students taught using the Flipped Classroom strategy and the Expository learning strategy. Based on the calculation result, it is obtained a different learning result of the students between the ones learning using the Flipped Classroom strategy and the ones with the Expository Strategy. It is obtained $F_{calculate} = 24{,}935$ and F_{table} 3.18. Since the value of $F_{calculate} > F_{table}$ then H_0 is rejected. On the other hand, the significant value of 0.000 means the learning strategy affects significantly towards the learning result on the chemistry subject. It is described on Tables 1 and Table below.

However, there is an interaction influence between the learning strategy and learning independence on the learning result of chemistry subject. Based on the calculation of the Two Way Anova, it is obtained $F_{calculate} = 4.500$ and $F_{table} = 3.18$. Since the value of $F_{calculate} > F_{table}$ then H_0 is rejected, and H_1 is accepted.

In the implementation step, the Flipped Classroom method is compared to the Expository method. High learning independence gives a significant value on the result of the Flipped Classroom implementation, which is different from the Expository method. In the Flipped Classroom, high learning independence indicates a learning capability which is a direct interaction. The students can easily receive the transfer of knowledge through online media.

Besides that, a group of students with high learning independence can adapt quickly on the relatively new application or learning method. A different data is shown by this group of student on the expository method. (See Figure 2 Estimated marginal means of learning outcomes).

Table 1: Tests of Between-Subjects Effects

Dependent Variable: Learning outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	621,729[a]	3	207,243	10,596	,000
Intercept	14386,687	1	14386,687	735,564	,000
Strategy	487,688	1	487,688	24,935	,000
Self-directed_learning	46,021	1	46,021	2,353	,132
Strategy * Self-directed_learning	88,021	1	88,021	4,500	,040
Error	860,583	44	19,559		
Total	15869,000	48			
Corrected Total	1482,313	47			

a. R Squared = ,419 (Adjusted R Squared = ,380)

Table 2: Unvaried Tests

Dependent Variable: Learning_outcomes

	Sum of Squares	df	Mean Square	F	Sig.
Contrast	487,688	1	487,688	24,935	,000
Error	860,583	44	19,559		

The F tests the effect of Strategy. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Table 3: Independent table test of low learning independence

		Levene's test for equality of variances		**t-test for equality of means**						
		F	Sig	T	df	Sig (2 tailed)	Mean difference	Std error difference	95% confidence interval of the difference	
									lower	upper
Learning outcomes	Equal variances assumed	,833	,371	4,667	22	,000	9,083	1,946	5,047	13,119
	Equal variances not assumed			4,667	19,560	,000	9,083	1,946	5,018	13,149

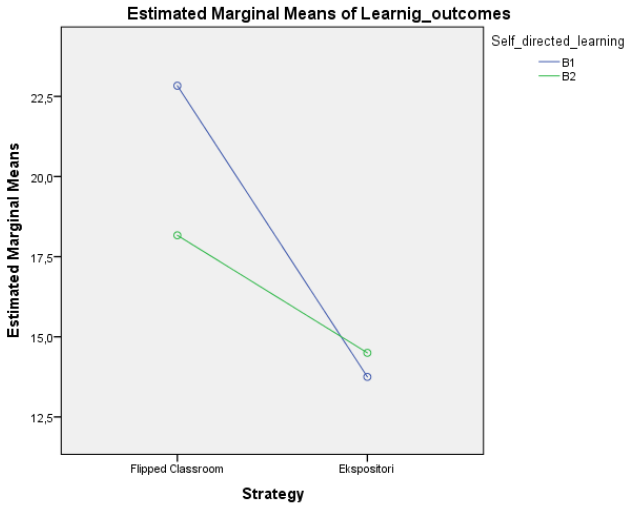

Fig. 2: Estimated marginal means of learning outcomes

Table 4. Independent table test with flipped classroom

		Levene's test for equality of variances		**t-test for equality of means**						
		F	Sig	T	df	Sig (2 tailed)	Mean difference	Std error difference	95% confidence interval of the difference	
									lower	uper
Learning outcomes	Equal variances assumed	,266	,611	2.218	22	,037	3,667	1,653	,239	7,095
	Equal variances not assumed			2.218	21.529	,037	3,667	1,653	,234	7,099

On the Expository method, the learning result between the student with high and low learning independence has no significant difference. In the implementation of the Expository method, the student with high learning independence is not demanded to

develop a lesson topic in every meeting. It is because the teacher tends to give same lesson load to both students with high and low learning independence.

Meanwhile, from the point of view of the learning result value, the implementation of the Flipped Classroom method, either on the student with high or low learning independence, has a higher value compared to the Expository method. The average of marginal means value on the Flipped Classroom method for the student with low learning independence is 18.5 while for the student with high learning independence is above 22.5. A different result is shown in the implementation of the Expository method, the marginal means value for the student with low learning independence is higher than the student with high learning independence. The marginal means value for the student with low learning independence is 13 while the student with high learning independence is 13. From the analysis result, concerning the independent sample test, it is obtained a significant value of (2 tailed) 0.000, by using the significant value of $\alpha = 0.05$ as can be seen in the Table 3 above.

By obtaining the significant value of < 0.05, H_0 is therefore rejected. It means that there is a difference in the learning result of chemistry subject between the student with high learning independence who is learning using the Flipped Classroom strategy and the Expository strategy.

Of the table above, in every learning method implementation, either using the Flipped Classroom or Expository, the student with high and low learning independence have a significant difference as described in the following Table.

Generally, in the implementation of the Flipped Classroom method compared to the Expository method, with analysis of independent sample test as described in Table 4, with the significant value (2 tailed) of 0.037, by using the significant value of $\alpha = 0{,}05$, it is obtained the Significant value of $0.03 < 0.05$, and therefore H_0 is rejected.

It indicates that there is a significant difference between the implementation of the Flipped Classroom and the Expository methods on the chemistry subject in Senior High School education. There is an indication that the implementation of the Flipped Classroom method on certain subjects is very effective. It means the characteristic of subject has to be appropriate with the chosen learning method.

4. Conclusion

On the chemistry subject, the learning strategy of the Flipped Classroom is very effective compared to the Expository strategy either on students with high or low learning independence. It can be achieved with the learning concept that focuses on the student. It stimulates the improvement of student's motivation in learning as their desire of learning according to their interest and opportunity is fulfilled. Students learn according to their own speed, opportunity and capability. The students enter the class by carrying knowledge, high curiosity and some problems they have while studying independently. The interaction improvement factor between the teacher and the student, and the interaction among students also increase the student's spirit in the process of problem solving. The time in class is more effective, by being used for direct problem solving with the guidance of the teacher.

On the other hand, for the teacher, the Flipped Classroom learning strategy has stimulated them to keep producing innovation in teaching, or innovation in creating a learning media appropriate with the technology advances. With the Flipped Classroom learning strategy, the teacher is challenged to design a learning media that is effective and easy to be received by the student.

In class, the student will have the spirit to solve difficult problems as they can freely discuss it with their friends who have mastered it or with their teacher. The teacher is always present in the class discussion in order to assist and direct the difficulties faced by the student. The teacher acts as a facilitator in the class, they can keep working by planning and designing a material and media that are most appropriate with the learning objective to achieve and used as an independent learning material for the student before entering the class.

Whereas to sharpen the application of the flipped classroom for chemistry subject especially for high schools, the percentage of theory and practice in applying the flipped classroom can be used for further research.

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