

Effectiveness of Flipped Classroom Model: Its Effect on Student`s Self-Directed Learning Readiness and Positive Attitudes Towards Practical Lesson in Automotive Vocational Education

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ABSTRACT

The Industrial Revolution 4.0 has forced teachers and lecturers to take creative strategies for students' learning. Therefore, this study aims to reveal the effect of flipped learning strategies on (1) students' self-directed learning readiness, (2) students' positive attitude toward engine management system practical learning in an automotive engineering educational program. This research is a quasi-experiment with a randomized control-group post-test only design. The experiment and control class members were determined randomly. One group of students was taught using the flipped learning strategies on practical learning, whereas the other group was taught using traditional instruction strategies. A questionnaire and checklist were used to collect the data. The result of this study shows that (1) there is a significant difference in self-directed learning readiness between the students who followed flipped learning strategy and those who followed direct instruction strategy, (2) there is significant difference in positive attitudes between the students who followed flipped learning strategy and those who followed direct instruction strategy.

Keywords: *flipped classroom, positive attitude, practical lesson, student directed learning readiness*

1. INTRODUCTION

Distance learning is learning that is often called Web-based learning, online learning, or e-learning [1]. In distance learning, the teacher and student are separated (entirely or mostly) in time and/or space, and therefore have to use a variety of media to communicate with each other [2]. With various types of activities, distance learning can be carried out synchronously or asynchronously according to learning needs [2]. On the one hand, in some vocational fields, distance learning of course cannot be fully implemented. This is because of the need for practical learning that must be carried out directly by learning. On the other hand, it is possible for distance learning to be used to support theoretical learning and to support practical learning to be more effective. In practical learning, it is usually carried out 100 minutes face-to-face, and 70 minutes with student self-study activities. Ideally, students learn together with

lecturers through face-to-face classical learning and they can study independently. However, independent learning in higher education will be difficult to control by the teacher if he/she does not have a structured learning program.

Vocational learning requires integrated practical and theoretical learning to achieve competencies according to the expectations of the program being held. In the schedule, practical and theoretical learning are often carried out simultaneously, or even practical learning is carried out earlier. As a result, student readiness is lacking because they do not have sufficient background knowledge about the practical topic that they will conduct. Therefore, this issue needs to be considered by educational practitioners so that practical learning could be done well.

There are several learning approaches that educators could use with the integration of technology to deal with

this issue. One of the learning strategies that combines face-to-face and online learning is blended learning. There are many models and teaching strategies in blended learning that can be done by teachers [3]. One of the blended learning strategies that are recognized as beneficial in encouraging students' readiness to learn is the flipped classroom strategy. The flipped classroom strategy can positively support the interest and motivation of teachers in applying technology tools [4]. Thus, this learning is thought to be able to encourage independent learning readiness for learning and students' positive attitudes toward the practical lesson.

Flipped classroom strategies encourage students to learn independently by accessing videos outside of class and participating in class preparation [5]. With this design, this learning is very likely to be used to prepare lessons before participating in classroom. Related to helping students for learning independently, the use of integrated flipped classroom encourages students' self-regulated learning abilities in the learning process [6]. However, the flipped classroom is not just online video learning, but the important point is the interactive activities done when the teacher and students are face to face [7]. According to Bergmann and Sams [4] in applying the flipped classroom strategy, teachers can start by assigning students to watch videos while they are at home. Apart from studying videos, this strategy allows teachers to assign students to watch videos, to do interactive challenges, and to do quizzes [8]. Students need to ask questions about the content that has been delivered via video for confirming the understanding, so they frequently ask questions at the beginning of learning [4]. This activity clears up students' misconceptions before practicing in class. Thus, in face-to-face learning with practical lesson, it is necessary to begin with confirmation regarding student activities and understanding when studying at home.

In accordance with the problems that exist in learning the engine management system practice, the use of the flipped classroom strategy is expected to support student-directed learning readiness (SDLR) and the students' positive attitude during practice. The important things about SDLR are as follows: (1) self-directed learning should have as its goal the development of the learner's capacity to be self-directed, (2) fostering of transformational learning, and (3) the promotion of emancipatory learning and social action [9]. However, the formation of SDLR capabilities is not easy. Many efforts must be made by the teacher. Students need to be trained to think critically, creatively, and reflectively, and they solve problems to realize self-directed learning abilities [10].

In supporting independent learning before participating in the engine management system practice,

students must have self-directed learning readiness (SDLR). To guide them in achieving SDLR, the SDL approach needs to be integrated into the syllabus, learning resources, assignments, and learning activities to understand independent learning [10]. SDLR emphasizes the attitudes, abilities, and characteristics of students to learn independently [11]. SDLR consists of three aspects, namely: self-management, desire for learning, and self-control [12]. Hence, the students' interaction behavior in learning activities (less/intense) affects their learning performances, their motivation, and self-regulated learning [13]. Tutorial, exercise, concept map intensive use students have higher organization, elaboration, and meta-cognitive self-regulation strategies. Thus, the flipped learning strategy is expected to have an impact on student SLDR in practical lesson.

Another problem that arises is the students' positive attitude that must be formed in learning EMS practice. Attitude is an emotional and evaluative reaction that affects the likes and dislikes of the object [14]. Furthermore, a positive attitude is a powerful way to encourage enthusiasm and create a conducive learning environment [15]. Thus, with a positive attitude, students will be happy in participating in EMS practical learning. For developing positive attitudes, teachers have to develop their students' ability or skill in reading, provide a variety of interesting and meaningful materials, and provide opportunities to read aloud [16]. Flipped learning has been proven to have positive impacts on student attitudes. When flipped learning is applied to flipped classrooms, the students who understand the topic of the lesson will show a positive effect and increased interest and motivation [17]. With this assumption, this study also examines the application of the flipped classroom learning strategy to students in the practice lesson.

Based on the condition of the practical lesson carried out with the various problems above, this study aims to reveal: (1) the effect of flipped learning strategic on student's self-directed learning readiness in engine management system practical learning, (2) the effect of flipped learning strategies toward student's positive attitude in engine management system practical learning in automotive engineering educational program.

2. RESEARCH METHOD

2.1. Type of the Research

This study is a quasi experiment with randomized control-group post-test only design. The population is undergraduate students of 2017 of Automotive Engineering Education, Faculty of Technology, Yogyakarta State University. The sample group was

taken in an intaq group, namely choosing two classes to be used as experimental and control classes. Each member of each group was chosen at random, because the practical lecture group was formed randomly from the theoretical lecture group members. Therefore, there were no differentiation between the groups. From the group member selection, the results showed that the 34 students were the experimental class, and 37 students in the control class.

2.2. Research Procedure

The research began by determining the experimental class and the control class. The experimental class consisted of 34 people, while the control class consisted of 37 people. The research was conducted on-board diagnosis I and on-board diagnosis II lesson materials. Teaching-learning processes took four weeks with four meetings. In the experimental class, students were treated with the flipped classroom learning strategy. Before participating in classroom practice, students were given learning activities in the form of accessing the LMS be-smart platform, which contains job sheets, video tutorials, discussion forums, and quizzes related to practical learning. The media and platforms used in this flipped classroom have met the eligibility for use in flipped classroom learning [18]. In the control class, traditional practice learning (direct teaching) was carried out with the following steps: briefing, demonstration, practical learning, and assignments in the form of making practical reports. The observation sheet was used to ensure that each stage of the learning strategy was carried out properly. At the end of the practice, students in both classes were given a questionnaire to measure SDLR and positive attitudes.

2.4. Research Instrument

For collecting research data, this study used questionnaires and a check list. The questionnaires were used to measure students' SDLR and positive attitudes. Meanwhile, the check list was used to determine the

implementation of learning with the flipped classroom strategy and direct teaching and learning. The SDLR questionnaire adopted a questionnaire which consisted of 40 items [12]. The positive attitude questionnaire was developed into 30 items according to the indicators adopted by the research [19].

2.5. Data Analysis

The research data were obtained from questionnaires and analyzed through descriptive analysis to determine the lowest, highest, mean, median, mode, variance, and standard deviation scores. Furthermore, the data were analyzed using inferential statistics through a comparative test. The test began with testing assumptions by administering normality test and homogeneity of variance test. To test the difference between the two groups, both variable SDLR and positive attitude were tested for comparative statistics with an independent sample t test.

3. RESULTS AND DISCUSSION

3.1. Research Result

In accordance with the research objectives, this study was conducted to determine the effectiveness of using flipped classroom learning strategies compared to traditional practical learning (direct teaching) on students' readiness for independent learning and positive attitudes. The process of giving treatment to the experimental and control classes was observed to determine the implementation of the learning strategies used. Based on the observations made, all stages of learning were carried out according to the lesson plans. After the treatment was carried out, the students were given a questionnaire to know their SDLR and positive attitudes. The data from the SDLR instrument (40 items) and students' positive attitudes instrument (30 items) were then analyzed descriptively. The results can be seen in the Table 1.

Table 1. The data of descriptive analysis

Item	Experiment group		Control group	
	SDLR	PA	SDLR	PA
Minimum score	102	90	90	72
Maximum score	192	132	178	114
Mean	158.44	104.57	147,76	97.56
Median	163	104.50	152	100
Varian's	405.102	135.151	509.356	96.49
Standard deviation	20.13	11.625	22.57	9.82

The data were then analyzed statistically to determine normality and homogeneity before being analyzed using comparative inferential statistics. The normality test used the Kolmogorov Smirnov Z technique while the homogeneity test used the Levene test. The calculation of each score was carried out with the help of the SPSS 26 program. The normality test was carried out using the SPSS 26 program. The criteria, if the value of sig. or p value > the specified significance level or alpha: 0.05 then the distribution of the data obtained can be stated as normally distributed as the population. The results of the normality test can be seen in Table2.

Table 2. Data normality test results

Data	Strategy	KS-Z	p (Sig.)	Remarks
Positive attitude	Flipped classroom	0.125	0.054	Normal
	Direct teaching	0.124	0.394	Normal
SDLR	Flipped classroom	0.148	0.056	Normal
	Direct teaching	0.126	0.146	Normal

Table 2 shows that the value of p (sig) exceeds the value of 0.05. Thus, each datum in the experimental class and control class is normally distributed. Homogeneity test of the variance of the data was also carried out to check the data in each sample group. If the test significance value or p value was higher than the specified significance level or alpha value (α) of 0.05, then the variance is homogeneous. The results of the data homogeneity test can be seen in Table3.

Table 3. Homogeneity of variance test results

Data	Strategy	Levene statistic	p (Sig.)	Decision
Positive Attitude	Flipped classroom	0.013	0.909	Homogeny
	Direct teaching			
SDLR	Flipped classroom	0.696	0.407	Homogeny
	Direct teaching			

Table 4. The results of the sample group mean t test

Test data	dk	Sig. (2-tailed)	α	Decision
Positive attitude	69	0.044	0.05	There is a significant difference
SDLR	69	0.040	0.05	There is a significant difference

According to the results of the homogeneity test, the value of sig. or the p value of the Levene test results is more than the specified significance level value (0.05). This means that each sample group data being compared has a homogeneous variance. The data between the control group and the experimental group were then tested comparatively using an independent sample t test. The results of the comparison test are shown in Table 4

Table 4 shows that the significance value of the positive attitude data and SDLR is below the specified significance. Thus, it can be interpreted that there is a significant difference between the ability of the SDLR between the experimental group and the control group, and there are differences in students' positive attitudes between the groups. With the experimental group's mean value being higher than the control group, the use of flipped classroom strategies is better than that of traditional practical learning in supporting students' SDLR and positive attitudes.

3.2. Discussion

Teaching by applying the flipped classroom strategy tends to require students to study independently. From the design given, before participating in face-to-face learning in EMS practice, students have conducted independent learning through online learning activities. They access learning resources that are provided according to the practical needs of students. In addition, they are given an overview of the practice through video tutorials and quizzes given. This is very supportive of practical learning in situations where theoretical lessons and practical lessons must be scheduled in the same week.

3.2.1. Effect of Flipped Learning Strategy on Student's Self-Directed Learning Readiness

In accordance with the research results obtained, this study contributes to the use of flipped classroom learning strategies in practical learning. These results show that the flipped classroom strategy can improve self-regulated learning, improve independent learning abilities among students, and regulate students' preferred learning resources [6]. These results are also aligned with the research result that students in flipped classroom apply their self-learned knowledge and adopt better self-regulation strategies for their online activities [20]. He also mentions that self-regulation or online help-seeking self-regulation strategy in improving overall self-regulated learning. Another study that is in line with the results states that through the flipped classroom strategy students are seen to be more aware and skilled in managing their time and studying

independently [17]. Flipped classroom seems to encourage students' sense of responsibility. Therefore, with a systematic flipped class-room arrangement, it will help students to organize their learning activities at home in a directed manner. In the context of practical learning, this means that it can help students achieve habits and readiness to learn independently. After the students have learned what will be practiced independently, they can have an overview and understanding of the concepts, procedures, and analyzes that must be carried out during practice. Thus, even though practical learning is carried out in the same week as theoretical learning, students can be more prepared and have a positive attitude towards the practical learning carried out. The widespread application of flipped classroom strategy can provide several advantages, including: (1) students are helped on difficult topics, (2) teacher-student interaction is encouraged, (3) it allows differences between students, (4) students can learn according to their needs. with his wishes, (5) it helps students who are not present in class, (6) it helps teachers when they cannot attend class, and (7) it promotes better relations among students.

3.2.2. Effect of Flipped Learning Strategy on Student`s Positive Attitudes

In relation to the impact on students' positive attitudes, the flipped classroom strategy quantitatively has encouraged the creation of positive student attitudes toward the learning process of engine management system practices compared to traditional learning using direct teaching. The results of this study are in accordance with the research entitled "Effects of the Flipped Classroom Model on Students' Self-Directed Learning Readiness and Attitudes towards the English Course" whose results indicated that the flipped classroom model affects students' self-directed learning readiness and attitudes towards the English course significantly [17]. Even, the flipped classroom strategy will improve social connectedness of students by enhancing their interpersonal relationships. In addition, the teacher also encourages students' interpersonal relationships during class activities [6]. Based on this information, the flipped classroom learning strategy is expected to have an impact on student achievement. The implication is that the strategy will encourage them to have positive attitudes, such as enthusiasm, promoting self-esteem, and participating in conducive learning.

From the two variables observed above, the flipped classroom learning strategy in the practical learning has been proven to encourage students' independent learning readiness and positive attitudes. The students with flipped engineering classes strategy performed significantly better than those in traditional classes with a small effect size [21]. In his research, he found the

benefits that can be obtained in the three phases of the flipped classroom, namely: (1) during pre-class learning, the flipped classroom enables self-paced learning; (2) during pre-class and in-class connection, pre-class learning helps students prepare for class activities; and (3) when they are in the classroom, flipped classroom supports problem solving activities and interactions with teachers and friends so that they contribute to student achievement.

In addition, as one of the blended learning strategies, flipped-classroom has been identified as having various advantages, including that the flipped classroom mode provides a greater potential to assist students in their academic experience [6]. In addition, teachers reported that the students were more engaged in class as a result of using the flipped classroom [8]. Compared to traditional learning, the flipped classroom can also encourage students' independent learning abilities (self-directed learning). By knowing the role of the flipped classroom learning strategy, teachers should be able to prepare learning strategies that are used as well as possible, both learning scenarios, learning platforms, learning resources, and the media used. Students can access lecture videos whenever and wherever they want and it provides students to learn at their own speed [22]. To carry out a good flipped classroom with various learning resources, activities, and videos, students are involved in learning interactions at home, thus supporting interest in doing homework [8]. Thus, the flipped classroom learning strategy is recommended to be used in teaching the subjects like the engine management system practice.

4. CONCLUSIONS

Vocational learning such as in engine management system practical learning requires mastery of skills that involve mastery of knowledge to support the procedures, steps, and analysis of the results of the practice. With the application of the flipped classroom learning strategy, students have been given a platform to guide their learning activities before taking part in the classroom practicum. Students have been given video tutorials, learning resources, and quizzes accommodated on the LMS platform so that lecturers can know the activities and the results of the quizzes that students are doing. Compared to the direct teaching and learning that is usually used, the application of the flipped classroom has been proven quantitatively to conclude that: (1) there is a significant difference in self-directed learning readiness between the students who followed flipped learning strategic and those who followed direct instruction strategy, (2) there is significant difference in positive attitudes between the students who followed flipped learning strategy and direct instruction strategy.

Thus, flipped classroom learning can be recommended to help support students' readiness to learn independently and to enhance positive attitudes.

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