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**PETUALANGAN BERSAMA CBI (COMPUTER BASED INSTRUCTION)-
FLIPPED CLASSROOM PADA MATA PELAJARAN JARINGAN
KOMPUTER: EFEK EMPIRIS**

***THE ADVENTURE WITH CBI (COMPUTER BASED INSTRUCTION)- FLIPPED
CLASSROOM IN COMPUTER NETWORKING MATERIAL: THE EMPIRICAL
EFFECTS***

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ABSTRACT

CBI- flipped classroom is one of computer instructional media solutions that relevant with learning development on the revolution industry 4.0 era. The development of internet, virtual communication and learning management system, there are many universities and education institution that interest to CBI-flipped classroom. Research on the effect of CBI- flipped classroom on the students skills however, have not been consistent indicating that the approach may not be suitable for all context. So, the purpose of this study is to assess the effect of CBI- flipped classroom on students' skill in Computer Networking. This study is based a deductive approach using quantitative methodological choice. The results showed that students who were taught using CBI-flipped classrooms had far more skills than students who were not taught using CBI-flipped classrooms.

Keywords: *Computer based instruction, flipped classroom, computer networking*

ABSTRAK

CBI-flipped classroom adalah salah satu media pembelajaran berbasis komputer yang relevan dengan perkembangan pembelajaran pada revolusi industri 4.0. Perkembangan internet, komunikasi virtual dan sistem manajemen pembelajaran, terdapat banyak universitas dan institusi pendidikan yang tertarik pada CBI- flipped classroom. Penelitian tentang dampak dari CBI- flipped classroom pada keterampilan siswa, terdapat hasil yang tidak konsisten yang ditunjukkan oleh media tersebut mungkin tidak cocok untuk semua konteks pembelajaran. Sehingga tujuan dari penelitian ini adalah untuk melihat dampak dari CBI- flipped classroom pada keterampilan siswa pada mata pelajaran Komputer Jaringan. Penelitian ini didasarkan pada pendekatan deduktif menggunakan metode quantitative. Hasil dari penelitian ini menunjukkan bahwa siswa yang diajarkan menggunakan CBI- Flipped classroom telah meningkatkan keterampilan dibandingkan siswa yang tidak menggunakan CBI- flipped classroom.

Kata kunci: Computer based instruction, flipped classroom, komputer jaringan

INTRODUCTION

The development of Information Communication and Technology (ICT) has bring changing aspect in human entire life. The Change also brings human to enter in global competition that increasingly fierce competition. The revolution industry 4.0 era that is happening, it is faced to complex challenges and human resource competition that increasingly fierce

competition. So, it is needed the quality human resources that master the knowledge and technology (Ahmed & Parsons, 2013; Hermann, Pentek, & Otto, 2016; Vojtovič, Navickas, & Gruzauskas, 2016), so they can compete in global competition. So, the country has to develop the quality human resources, one of efforts to produce the quality human resources is through education (Ai, 2017).

Technology has reached level which is education has to transform to be education that relevant with revolution industry 4.0 era (Jaschke, 2015). On the revolution industry 4.0 era, the challenges that faced by education is the new technology development (Collins & Halverson, 2009). Computer as an education and tools has assisted to form the education environment. Computer-based education (CBE) was strated in military (Lowe, 2001), then develop and entet in the education world. Computer instructional media can develop students' skill (Hawkins, 2016), so computer instructional media has important rule in the learning process, ie interactive learning media (Sukardi, 2017), animation (Rosen, 2009), mobile learning (Crompton et al, 2016), e-learning with flipped classroom (Rahayu, 2017), virtual lab (Kleintien & Wannasawade, 2016) and all of computer instructional media that is developing today.

CBI- flipped classroom is one of computer instructional media solutions that relevant with learning development on the revolution industry 4.0 era (Overmyer, 2014; Kenna, 2014). The development of internet, virtual communication and learning management system, there are many universities and education institution that interest to CBI- flipped classroom (Berrett, 2012; Bull, Ferster, & Kjellstrom, 2012). The technology using in CBI- flipped classroom has been used for many years in several diciplines (Brame, 2012, p. 1). The university courses in the Harvard, MIT and Stanford have used CBI- flipped classroom in learning process for many years with successful documented (Bull, Ferster, & Kjellstrom, 2012). The idea is students have first contact with new material out of class and then enter the materials in the learning activity in the

next day.

CBI- flipped classroom has flipp learning when students use class time to increase what they have learned first in home by solving the work sheets, doing lab activity, participating in discussion or doing another project that need critical thinking skill (Bull et al., 2012). CBI- flipped classroom process involves all students in the various learning mastery levels with some students are given more free time to work if needed (Ash, 2012). Students will watch the videos and do a series of activities to show that they understand the materials by their own way. CBI- flipped classroom anecdotally has been proven to increase the goals set up and time management (Bergmann & Sams, 2012). CBI- flipped classroom also has been proven to meet the needs of learnin style (Marlowe, 2012). CBI- flipped classroom using makes didactic directly learning and out of class learning become students' friendly technology. Main pedagogic concept is not change with the using of CBI- flipped classroom, but it makes students can participate actively in the learning process (Nolan & Washington, 2013).

Research on the effect of CBI- flipped classroom on the students skills however, have not been consistent indicating that the approach may not be suitable for all context. On critical thinking skills, positive effect was found by Bergmann dan Sams (2012a) and Overmyer (2014) whose participants were computer science and algebra students respectively. Others such as Rahayu (2017), Sales (2015), Berret (2012) whose participants were visual arts students, agriculture students and nursing students respectively did not however, find positive result of CBI- flipped classroom on critical thinking. On problem solving skills, positive effects of CBI- flipped classroom was found by Kenna (2014) who studied

physical students but not by Siregar (2019) who studied math students. Thus, inconsistent results were found on the effect of CBI- flipped classroom on the two skills and further studies are needed to determine if CBI- flipped classroom is indeed an appropriate approach for the current computer education population (Johnson, 2013). The purpose of this study is to assess the effect of CBI-flipped classroom on problem solving skill and critical thinking skill in Computer Networking.

METHOD

This study is based a deductive approach using quantitative methodological choice. The trials are carried out to test the hypothesis and find a new causal relationship. By comparing between experiment class and control class. Experiment class use experimental method and control class use conventional method in the learning process. Next, the both of class is evaluated to see improvement that happen in the academic achievement after obtaining instructions by using experimental method. The CBI-Flipped Classroom was run at Vocational High School in Padang over the 10 weeks of the fall quarter in 2019. This study uses experimental pretest and posttest, with a control-experiment group design, the pretest and posttest are perfectly designed to demonstrate the effectiveness of CBI- flipped classroom and the pretest and posttest that used in this study was test. The survey instrument that used in this study was questionnaire that adapted from Clemens et al (2013), it is the instrument that developed to survey the students skill after using flipped classroom.

The population of this study is all Universities that have major of Information and Computer Engineering. The randomization sample choosing can

be achieved with two levels (Lohr, 2010). Randomization sample is achieved through selection of subject from homogeneous population. In this study, sample is selected by using random sampling, where each student of Informatics Engineering of Education that take Networking course at Vocational High School in Padang have the same opportunity to be selected as sample for this study.

RESULTS AND DISCUSSION

Some of the study results that reported by students are shown in Figure 1, there are comparisons of genders that are shown for students that register and complete the course.

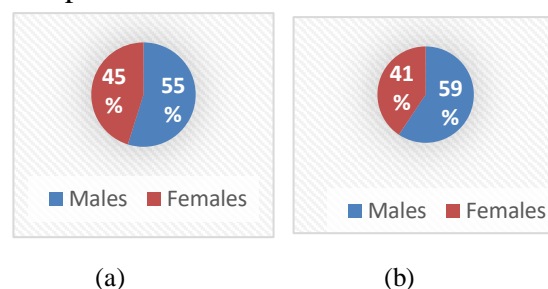


Figure 1. Gender distribution of experimental class (a) and control class (b)

A total of 62 students participated in this study, consisting of 58,1% male and 43,5% female in both the control and experimental groups. The experimental group consisted of 32 students; 59% were male and 41% were female. The control group consisted of 31 students; 45% were male and 55% were female. In this study, gender was almost evenly matched between the experimental and control group.

A survey was given to student to measure the successful of their learning experience that given by CBI- flipped classroom. It is proven by Table 1 and Figure 2. The means of students' score in the control and experimental group in relation to pretest and posttest are provide in Table 1 and the survey result are shown in Figure 2.

Table 1. Means of pretest and posttest students' score

Group		Mean
Experimental	Pretest score	75,37
	Posttest score	83,28
Control	Pretest score	70,19
	Posttest score	77,21

Table 1 shows the comparison of the mean of pretest and posttest students' score of experimental and control group. The pretest in the experimental group was 75,37 and the control group was 70,19. Then, the posttest in the experimental group was 83,28 and the control group was 77,21.

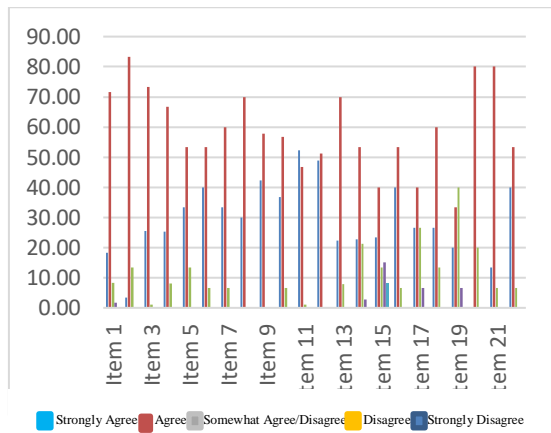


Figure 2. Results of students' skill survey

Figure 2 indicates the results of students' skill survey. Some results show at the Figure 2, it shows that CBI- flipped classroom can increase the students' skill and they assume the CBI- flipped classroom course was valuable. Most of students stated the positive experience and satisfy using CBI- flipped classroom, it reflected in average rating of 83,33 on a scale of 100. The effect of CBI- flipped classroom can be seen in Table 2.

Table 2. The Effects of CBI- flipped classroom on students' skill

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	714.276 ^a	2	357.138	1.231	.308
Intercept	1826.735	1	1826.735	6.299	.018
Score_of_posttest	524.137	1	524.137	1.807	.190
Gender	171.023	1	171.023	.590	.449
Error	7830.391	27	290.014		
Total	349878.000	30			
Corrected Total	8544.667	29			

a. R Squared = ,084 (Adjusted R Squared = ,016)

Table 2 indicates the *F* values and *p* value of CBI- flipped classroom on the students' skill. It shows that there is significant effects between CBI- flipped classroom and students' skill [$F(1, 59) = 6,299, p < 0,05$]. The effect size (.361) was medium. Basen on the result of Table 2, it can be interpreted that the students used CBI- flipped classroom have the high score and can increase their skill than the students was not using CBI- flipped classroom.

The research subjects consisted of 63 first-year students in two classes from the vocational High School. They are among students who enroll in the first semester core subjects of Computer Networks. These classes are chosen randomly from participation and randomly assigned as control and experiment groups. In the case of this study, the experimental group used the inverse CBI class while the group used the conventional method. Experimental teaching takes place over four weeks to complete teaching four topics.

Pretest and posttest are implemented before and after instructions are given to students. Two separate sequential tests were carried out to measure each increase in the value of the variable in

terms of student skills. A total of 30 items were used to measure students' skills from the two units taught. To measure students' responses to the improvement in their skills, an instrument consisting of 22 items was used, to detect changes in students' abilities.

Students have different abilities after being taught using CBI-flipped classroom, after 10 weeks. The results showed that students who were taught using CBI-flipped classrooms had better skills than students who were taught not using CBI-flipped classrooms. Finally, regarding the relationship between CBI-flipped classroom and student skills, the findings indicate that CBI-flipped classroom has effectively improved students' skills.

CBI-flipped classroom in this study got various responses from students. Students did not feel difficult to manage the time, due to the assignment and course problems that has been finished as homework out of the class. Students show their effort to be able to concentrate to the video, the video can be watched everywhere and anywhere, some students postponed it and some students never watch it. Some videos have more views than the number of students in the class. However, the ability to pause and rewind videos, watch them again, take notes and add additional information to notes from various sources while learning from lectures is needed by many people. In this case, going back and forth to work. Video quizzes are very valuable for understanding tests. Guest talks and problem sessions are also held. The problem session in the team, which was drilled by the teaching team, was considered the most valuable for the class. Teams that prepare diverse backgrounds, and talk through problem solving methods are supported to gain

understanding. Enthusiasm is high for laboratories, laboratory projects as well as poster presentations, which see heavy participation by collectors and scholars. The peer evaluation scheme for the poster project works well.

For online homework, the CBI-flipped classroom platform provides immediate feedback by accepting input as a correct answer or rejecting input as incorrect. A smarter platform that is able to provide more feedback will be more appreciated. Although this format does not have the advantage of providing direct feedback, it might encourage trial and error and pay less attention to details, and does not encourage self-checking of problem solutions. Feedback received about homework exercises encourages us to allow students to submit written documents from their work on the final exam, to give them partial credit.

This course is delivered with lectures and assignments which are released periodically throughout the duration of the course. This helps encourage communities in the forum and beyond, with students forming study groups directly in various locations. The class forum fosters discussion about problem sets and sharing relevant resources, and provides valuable feedback to the instruction team on how the course is received. Many students invest considerable energy in the presence of their forums, taking the time to provide answers to questions posted and provide additional resources for students. For example, although we provide translations for all lectures, some students post transcripts and even translate the audio component of lectures. Overall the tenure of the forum was positive, supportive and respectful, with the main source of complaints revolving around the technical difficulties of the set of problems.

CONCLUSION

In relation to the sample of this study, the results showed that students who were taught using CBI-flipped classrooms had far more skills than students who were not taught using CBI-flipped classrooms. Especially students taught using CBI-flipped classroom have far better skills, have better problem solving skills than the concept of Computer Networking. Therefore, CBI-flipped classroom engages students in deep concept learning and thus achieves one of the intended learning outcomes.

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