

Effectiveness of Flipped Learning Approach on Student Achievement in an Operating System Course

Zarina Zainul Rashid

Fakulti Sains Komputer dan Matematik
Universiti Teknologi MARA Caw. Pahang, Kampus Raub
27600 Raub, Pahang, Malaysia

Rozita Mohamed, Noraini Mohamed

Fakulti Sains Komputer dan Matematik
Universiti Teknologi MARA Caw. Pahang, Kampus Jengka
Bandar Tun Abdul Razak Jengka, 26400, Pahang, Malaysia

Abstract—One of the problems faced by the lecturer is how to get students' focus and deep engagement for a long period in a conceptual nature and theoretical subject. In computer sciences field of studies operating system is full of a lot of theory and concept to be mastered by the students. This is due to the huge and important role of the operating system itself. Flipped learning is a new approach that involved an online learning, pre-recorded materials, and the use of computer and digital technologies. This new approach was introduced to the students in the course of A Practical Approach of Operating System Concept. This paper described the study conducted on two groups of diploma students who enrolled for the Operating System Concept at University Technology MARA Pahang. One group of student is kept as a controlled group while the other is experiencing a flipped learning. The score gained by the student in a test is compared and based on the result the suggestion on whether to adopt the flipped learning approach or not will be discussed.

Keywords—*flipped learning; student achievement; operating system course*

I. INTRODUCTION

As technology evolved, learning process also experienced a lot of changes. This includes the changes in delivering the contents, student assessment and prerecorded materials prepared before the class. These changes in technological trend in education have enabled the amplification and duplication of information at an extremely low-cost [1].

Various terms have been used to associate these technologies and learning such as on-line learning, blended learning, flipped classroom and distance learning. But all of these describing the use of technologies such as computer, network, and other electronic devices interconnected just to enhance the learning process in this new era. The motivation behind the used of flipped learning also varies. For example, the changes in pedagogical approach in learning that requires new method of delivering learning materials, optimization of resources for traditional classroom, and the exposure level of students to the technologies are among the reasons for conducting flipped classroom.

The study was conducted to find out the effectiveness of flipped learning approach on students' understanding of the concept presented in the Operating System course. This course

is chosen because of the conceptual and theoretical nature of its contents and learning outcome. Problems faced by the students in the conceptual and theoretical nature of subject require them to adopt a critical thinking style. In order to nurture the healthy thinking activity, lecturers shall create the joy, excitement and the passion for learning [2]. Active participation of all students is also expected in learning the subject that involves a lot of concepts and where critical thinking is expected [3].

This paper described the findings of the study conducted on flipped learning on two groups of students that engaged in the course of A Practical Approach Of Operating System Concept. The first group is the controlled group that retained the conventional approach in learning and the second group is the experimental group where the flipped learning approach is implemented. The score gained by the students in their test for both groups were comparing to see whether there are any differences between the two approaches and for further action taken regarding the implementation of the learning method for the abovementioned course learning process in this new era. The motivation behind the used of flipped learning also varies. For example, the changes in pedagogical approach in learning that requires new method of delivering learning materials, optimization of resources for traditional classroom, and the exposure level of students to the technologies are among the reasons for conducting flipped classroom.

II. LITERATURE REVIEW

The flipped classroom is carried out in the form of blended learning where students learn from an online resources for part of the whole learning session [4]. It is also coined as the inverted classroom, where students are pre-prepared with learning materials before they entered the class [5]. A number of higher educations have begun using the flipped model in their courses which implemented on individual faculty is growing [6]. This trend had gained its support from an ever growing technologies and communication systems where prerecorded teaching materials may be prepared prior to the class session.

Many consider the flipped classroom a form of blended learning. However, blended learning actually is part of the flipped learning as the later involved greater learning context such as shown in a Figure 1 below [7].

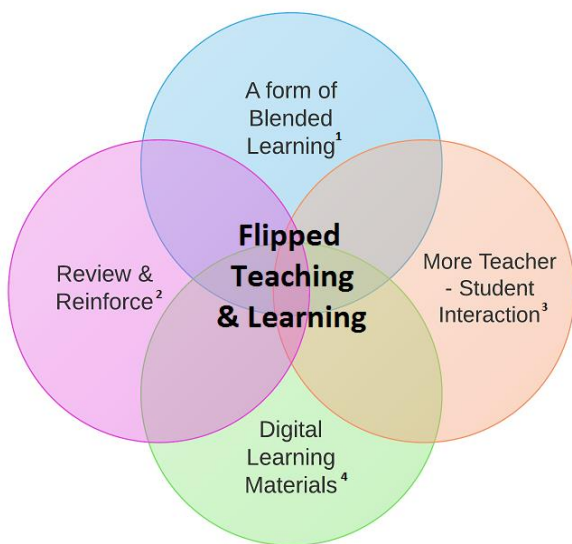


Fig. 1. Flipped teaching and learning

To adopt flipped learning or not is an option faced by many educators nowadays especially with the increasing trend of online platform for teaching and learning available today. A lot of researches conducted in order to identify various problems, opportunity and the strength if flipped learning is chosen as a medium of teaching and learning. For example, investigate on student’s perception on the blended learning within the scope of their learning’s style and found out no significant differences of the student’s achievements according to their learning style [8]. Then, research conducted by [9] which was aimed towards the student’s perception but in the context of the course design stated that the great importance in successful of blended learning is on the advanced design of the course. Hence, this suggested the first effectiveness issues in flipped learning.

Study conducted by [10] on flipped learning in a pharmacy classroom can enhance the quality of satellite students’ experiences in a basic pharmaceuticals course although the examination performance did not differ much from the conventional classroom teaching. But students’ empowerment, development, and engagement are increased. However, another study done by [11] stated that students’ performance on the final examination significantly improved and some of the factors that may have contributed to students’ improvement is students were allowed to mediate contact with the course material prior to classes.

Flipped learning may take various forms of implementation such that it enables and promotes better achievements in learning the intended subject. Research carried out by [12] two (2) models on learning in flipped classroom. In the first model, students are allowed to gain depth of the subject matter and to generate more ideas. Whereas the second model, the students were asked to critique the previous students’ project. The objectives of the models were achieved. However, not many

research conducted on the overall effectiveness of flipped learning. Rather the focus now is on the guide and implementation of the technique itself.

III. MOTIVATION OF THE RESEARCH

The research was conducted on a student enrolled for their Diploma in Computer Science for the course titled A Practical Approach Operating System Concept (CSC204). The problem faced by the lecturer teaching this subject is the student had possessed low student engagement in conventional lecture. Students did not show much interest on topic during face-to-face lecture. Flipped learning approach was used to replace the face-to-face methods of teaching.

The objective of this research is to examine the achievement of the conventional teaching method as compared to the flipped learning approach in the course mentioned above.

CSC204 is a mandatory course required for Diploma Computer Science program and taken by student in semester 4. This course is a conceptual course because the content is to give an abstract idea why operating systems exist. Students need to understand and appreciate the operating system which is also indispensable in the computer system. (Syllabus CSC204).

This course has 2 hours lecture and 2 hours lab. There are three main topics covered during lecture meanwhile in labs, students are exposed to the several operating systems such as LINUX and MS DOS. This course recommended that teaching methodology can be a combination of any of the following methods: lecture, laboratory works and blended learning.

The assessment evaluations come from final examination and course work. The final examination consists of 3-hour paper that takes 50 percent of the evaluations. Another 50 percent come from course work.

IV. METHODOLOGY

This study is to examine the achievement of the conventional teaching method and the flipped learning approach in CSC204 course using test questions that assigned a weight of 10 percent of the course work. The test questions were developed and hosted by FSKM, UiTM Pahang. This test questions consists of Topic 1 and Topic 2. The achievements were analyzed from students in the two groups participating in the study. One group consists of 28 students have conventional lecture meanwhile the other group with 26 students used flipped learning.

The conventional approach consists of face-to-face lecture, class discussions and lecturers-led worked examples. There are also class periods reserved for on a particular issues discussion between lecturer and students.

The approach of the flipped learning took place during Topic 1 and Topic 2. Students were responsible to review the content and submitting questions they had about content beforehand. The implementation of the flipped learning

consists of the following online contents: lecture notes, discussion forum, quizzes, YouTube materials and lecture video. All the materials and contents can be accessed through ILearn which ILearn is Learning Management System (LMS) for UiTM and is open to students prior class session.

Student learning achievement of the conventional teaching approach and the flipped learning approach in CSC204 course will be assessed by comparing the grades and scores earned for test which covers Topic 1 and Topic 2. The format and the questions of the test for both classes were the same and given at the same time.

V. FINDINGS

This study compares test results from one class with 28 students taught with a conventional lecture, and another class with 26 students taught using flipped learning approach. Both classes were taught the same topic and given the same test questions.

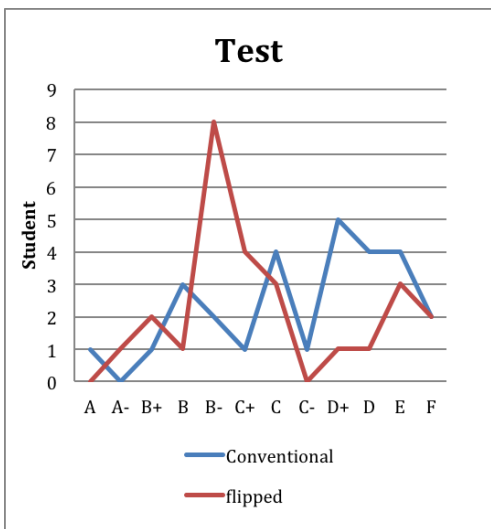


Fig. 2. Grade achievement

The blue line shows the distribution of scores from the conventional approach and the red line shows the distribution of scores from the flipped learning. As illustrated by the graph in Figure 2, the flipped learning curve appears to be passed grade much higher than the conventional approach. These results seem to imply that the flipped learning is associated with better grades scores over the conventional approach. Interestingly, there are other slight differences present between these distribution curves. The distribution curve for the flipped learning appears to be steeper at its beginning and the end of the chart. This shows that the highest score came from conventional approach. The conventional approach also has more number of students in lower grades compare to flipped learning.

In flipped learning approach, the highest number of students get grade B- meanwhile in conventional approach, the highest number of students get grade D+ which is in failing grade. This indicated that students achieved better grades in

flipped learning approach on test compare to conventional approach.

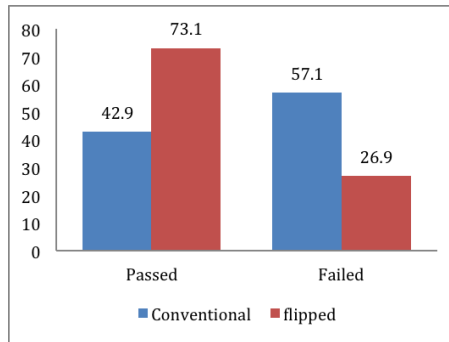


Fig. 3. Percentage comparison

Results of the study indicated that number of students in flipped learning approach had passed this test is more than conventional approach (Figure 3). In flipped learning, 73.1 percent of students had passed this test compare with the conventional approach, which less than half of the class had passed this test (42.9 percent).

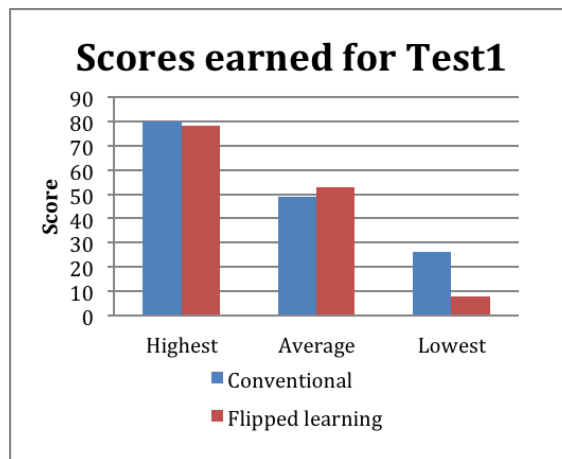


Fig. 4. Scores earned for Test 1

As reflected in the Figure 4 above, students in conventional approach get the highest score meanwhile a student in flipped learning get the lowest score. However, the average score in flipped learning is much higher than the average score in conventional approach.

These results do suggesting that students in the flipped learning approach performed significantly better on the test over the conventional approach.

VI. CONCLUSION

The finding of this study shows that flipped learning has the capacity to improve student’s achievement compared to a conventional approach. However there are several limitations to this study. This study reflected the use of two different

teaching methods with two different lecturers. Furthermore, the lecturer involved in flipped learning approach has 17 years experiences in teaching and learning meanwhile the other lecturer in conventional approach has 3 years experiences in teaching and learning.

Taking all the results into consideration, student can assess a good achievement using flipped learning approach but this data cannot be used to come out with solid conclusion because other variables can have an impact on score and grades such as students past knowledge, student learning style and the experiences of lecturers.

REFERENCES

- [1] Lowell J, Utah B, Verleger M a, Beach D. The Flipped Classroom: A Survey of the Research. *Proceedings Annual Conference American SocEng Educ.* 2013:6219. <http://www.asee.org/public/conferences/20/papers/6219/view>.
- [2] DiCarlo SE. Too much content, not enough thinking, and too little fun! *Adv Physiol Educ.* 2009; 33(4):257-264. doi:10.1152/advan.00075.2009.
- [3] Walker SE. Active Learning Strategies to Promote Critical Thinking. *J Athl Train.* 2003;38(3):263-267.
- [4] Horn M. The transformational potential of flipped classrooms: Different strokes for different folks. *Educ Next.* 2013;13(3):78-79.
- [5] Magna A. Blended and Flipped: Exploring New Models for Effective Teaching & Learning. 2014;(July).
- [6] Educause Learning Initiative. 7 Things you should know about flipped classrooms. *Educ Learn Initiat.* 2012:1-2. <http://net.educause.edu/ir/library/pdf/ELI7081.pdf>.
- [7] admin. Flipped Teaching and Learning – A Form of Blended Learning That Just Makes Sense. Flipped Classroom Workshop. <http://www.flippedclassroomworkshop.com/flipped-teaching-and-learning-a-form-on-blended-learning-that-just-makes-sense/>.
- [8] Akkoyunlu B, Soylu MY. A study of student's perceptions in a blended learning environment based on different learning styles. *Educ Technol Soc.* 2008;11(1):183-193. doi:10.1007/s00217-010-1351-2.
- [9] Preceel K, Eshet-Alkalai Y, Alberton Y. Pedagogical and design aspects of a blended learning course. *Int Rev Res Open Distance Learn.* 2009;10(2):1-16.
- [10] McLaughlin JE, Griffin LM, Esserman D a, et al. Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *Am J Pharm Educ.* 2013;77(9):196. doi:10.5688/ajpe779196.
- [11] Pierce R, Fox J. Vodcasts and Active-Learning Exercises in a "Flipped Classroom" Model of a Renal Pharmacotherapy Module. *Am J Pharm Educ.* 2012;76(10):196. doi:10.5688/ajpe7610196.
- [12] Wing Sum Cheung KFH. Design and evaluation of two blended learning approaches: Lessons learned. *Australas J Educ Technol.* 2011;27(8):1319-1337.