

Educational Innovations: Online Learning by Flipped Classroom Method

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Abstract—This study aims to innovate in mathematics based online learning at Taiwan Open University. This campus created by the Indonesian government aims to solve the problem of education in Indonesia. The number of Indonesian people who do not get the opportunity to study at a university. One factor is economic problems. So this university can help Indonesians to learn at the same time also work. One of the campuses is in Taiwan, because there are so many Indonesian workers in Taiwan. But this online-based learning system provided by the Indonesian government has not been able to run perfectly, especially in mathematics learning. There are still some obstacles that occur during the learning process. Based on previous research by (Ramadoni, 2018) about the investigation of student difficulties in mathematics learning, it was seen that students' difficulties in online-based mathematics learning were in terms of content, process and assignments. So innovation needs to be done in this learning, because learning is metamorphosis. The difference between students made teacher has to arrange new methods to develop this learning. Differences in student backgrounds require us to innovate. The innovation carried out in this learning is online based learning using the flipped classroom method. Usually flipped classroom learning uses two stages, namely face to face and learning outside the classroom. But in this study used in two stages as well, first online learning using skype application and learning before the class starts. Flipped classroom methods are designed to solve students' difficulties in learning mathematics online both in terms of content, process and assignments. The formulation of the problems raised in this study are: How is the process and results generated by the innovation of mathematics learning by using online learning by flipped classroom method?

Keywords: Innovations, Online Learning, Flipped Classroom, Mathematics.

I. INTRODUCTION

Technology has been developed in education. A flipped classroom is a technology-based approach to student center learning (Adams, 2016; Lai, 2016; Lo et al. 2017; Sergis, 2017; Araujo, 2016; Sun, 2017). This approach is considered capable of improving learning outcomes and student skills. The flipped classroom offers the concept of out-of-class and in-class learning to students which begin with the transition stage. Outside classroom method is done through video and online discussion, while in-class activities provide an evaluation of the students' abilities.

The flipped classroom needs planning and training. Previous studies have suggested that there are some important things that need to be done during the flipped classroom approach such as asking students to make notes of the concept which explained in video out-of-classroom (Adam, 2016) and giving the best time for out-of-classroom (Lai, 2016). Lo et al. (2017) also add 10 important principles that help the success of flipped classroom.

Having good preparation in a flipped classroom is not enough. Determining appropriate strategies for out-of-class learning should be taken into consideration to get better in-class learning (Araujo, 2016; Sun, 2017). Social media as a part of technology can be used in order to support learning system and increase student interest in a subject. Many college students use social media almost every time to interact and communicate with their friends or groups. Some research has proved the use of social media in such learning system (Zdravkora, 2016; Ali, 2016; Won, 2015; Pohl, 2017). Therefore, this study purposes to combine some positive values from previous studies (Adam, 2016; Lai, 2016 and Lo et al., 2017) also including the influence of technology based on culture (Indonesia and Taiwan) in flipped classroom approach to get more information and better method. The qualitative and quantitative method conducted to measure the success of flipped classroom method.

This innovation is done because it is based on the experience of researchers about teaching using online methods in the previous two semesters and is accompanied by prior qualitative research on the analysis of student difficulties in online mathematics-based learning. Analysis was carried out from interviews conducted with students, coding and conclusions from the study. Based on the previous research, the difficulties of students in general are divided into three, namely: topics, process and assignments (Ramadoni, 2018).

Students' difficulties with statistical topics include: (1) Difficulty understanding. (2) Difficulty to calculate (complicated calculations). (3) Complicated formula (a formula that is not easy to remember). (4) Unrealistic (Unreasonable).

Students' difficulties in online-based statistical learning processes include: (1) Limited time. (2) Network problems. (3) Explanation of formulas and examples of questions are not written in detail in online learning. (4) The strategies used in online learning make some students become negligent in learning. (5) The number of online meetings is still lacking. (6) Online learning can be helpful but not maximized.

Students' difficulties in completing assignments include: (1) Questions on assignments differ from the questions in the example. (2) The formula is very much available. (3) The book has several errors. (4) Students do not understand the stages in solving problems. (5) Difficulty in determining the symbols used in the story problem. (6) Difficulty in calculating it. (7) Difficulty in imagining the application of the formula into real life.

Based on the difficulties of the above students in online-based mathematics learning, the researcher makes an innovation of learning aimed at so that students do not feel any more difficulties in learning. The principle of flipped classroom is used by researchers because it is considered to be able to solve some of the above problems and carried out several innovations to solve other problems. The principle of flipped classroom learning is the presence of pre-class learning and classroom learning. In this study also uses the principle of learning before class with students watching learning videos according to the topics to be taught at each meeting. But learning in the classroom is replaced by using online-based learning with the help of the Skype application. Skype is an application used by the Open University of Taiwan that can accommodate a large number of students discussing in a group.

A. Literature Review

Education is an important part of that need to develop in order to get better future for world generation. Because of computer technology, particularly Internet, scholars believe that the flipped classroom system should be kept developing. Lai and Hwang (2016) explained that flipped classroom is extraordinary learning method that not only make students receive information from their teacher in class but also increasing their abilities to have knowledge by themselves through practicing, doing projects, discussion, and solving problems in class (Missildine, Fountain, Summers, & Gosselin, 2013 cited in Lai and Hwang, 2016).

Flipped classroom could be defined from many studies as an educational technique which done inside classroom (essential to promote student learning) and outside the classroom (need instruction for computer-based individual) (Bishop and Verleger, 2013; Abeysekera & Dawson, 2015; Dove & Dove, 2015; He, Holton, Farkas, & Warschauer, 2016; Jungi_c et al., 2015; He et al., 2016 cited in Lo et al., 2017). The Flipped Learning Network (2014) as cited in Lo et al., (2017) defines "Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter."

According to Araujo (2016) application of the flipped classroom model has many advantages over traditional learning models. The availability of material in the form of video gives students the freedom to stop or repeat the material anytime in areas they do not understand. In addition, the use of classroom learning sessions for projects or group assignments makes it easier for students to interact and learn from each other. Adams (2016) said the learning steps of flipped classroom are as follows: before face to face, students are asked to study independently at home about the material for the next meeting, by watching the teacher's own learning videos or learning videos from the uploads of others. In the classroom, teachers take place to facilitate the discussion with cooperative learning method and prepare some questions (questions) of the material.

According to Araujo (2106) during this flipped classroom learning to give video before learning, there are still many who have not conducted online discussion so that many students are confused about the concept given outside the classroom. Students also not given outside practice classes and quizzes so they are lazy to watch videos, but this is an important part of learning flipped classroom. Actually, there are some researchers who use the web in learning flipped classroom, but the constraints that occur is the limited knowledge of teachers and students on the manufacture and use of the web.

As research conducted by Zdravkova (2016) on the use of social media in learning that affects the improvement of student knowledge, although this research has not been done in mathematics learning and has not fulfilled the 10 principles developed by Kwan (2016). Another study conducted by Ali (2017) on the use of social media in learning. Therefore, it is necessary to design instructional design using flipped classroom approach by social media.

Online based learning has also been carried out by several previous researchers, including: Bettinger (2017: 68) based on the results of his research saying that the size of the class on online learning has an effect on the success of the quality of learning. Client-based goals aim to enable many students to access and respond to posts. Here the teacher must be actively involved in online conversations. Furthermore by Moghavvemi (2017:121) said that video and visual are important to be used as a learning tool. Many students use Youtube online in learning, but this is only a supporter of classroom learning. Learning is very helpful and makes achievement more significant. And this is also expressed by Lopes (2018: 105) who says online learning is very helpful in learning in the classroom, so learning in the classroom becomes more effective and saves some time, both by teachers and students. Khorasani (2012:3546) also said that online-based learning has a positive impact and a negative impact on learning. The positive impact is that online-based learning is better for students in conditioning themselves, students are more responsible for themselves in learning, improving students' ability to use computers and the internet. But online-based learning also has a negative impact, namely changes in learning become more slowly, testing different subjects will create obstacles, and find the right technology as a support in learning control.

B. Research Method

Online mathematics learning using the flipped classroom method was applied in the 2019 management class in UT Taiwan in the economic mathematics class. This method is applied in one class with 28 students. Out-of-class learning conducted by using social media (video, online discussion, and exercise). In-class learning starts with quizzes to make students feel that learning is out-of-class is important to do. Furthermore, an applied cooperative learning strategy is done by peer-assisted group learning with facilitated learning. To see student learning outcomes also carried out a pre-test and post-test. And questionnaires and interviews were conducted to get more information about the impact of the learning innovations carried out.

II. RESULTS

The following is explained by the stages of innovation in online mathematics learning conducted by researchers in detail:

1. The teacher divides students into eight groups (each group gets one chapter on learning topics).

The researcher considers that group learning is considered to be able to help students study harder. Because online learning is based and all students are Indonesian workers in Taiwan. So sometimes students cannot be too focused on learning when online because some people are still working. Although the time taken to study is at 22.00-24.00 Taiwan time in each meeting, there are still some people who are still working. So the solution that is considered to be able to solve it is in groups. With groups students can develop their abilities, utilize the time they feel is right to learn together outside learning and help each other in understanding the material.

2. The teacher asks students to learn about the topic of the section from the guidebook and powerpoint (PPT) made by the teacher. After that make a video of their explanation of the topic in part. And the group that served that week made a video also had to provide 5 math questions with the answer.

The teacher provides teaching materials in the form of books and PPT. Students are asked to learn from the material before the online meeting begins. So that the teacher does not release the student as a whole but still continues to guide him. The videos students make afterwards are intended so that students can use technology, develop their ability to use it. And also other friends can also learn from it and evaluate it.

3. Each student uploads an explanation video on the social media group (Line or FB) per week. And students also prepare PPT from groups to explain important things and more questions that will be discussed in online learning. Discussion of these questions is usually done outside the classroom in flipped classroom learning conducted in online learning classes. Discussion of these questions is very important in learning mathematics so that students can be known to be aware of a topic and can improve their critical thinking skills and problem solving.
4. Other students are tasked with watching videos and making important notes from the videos sent by the group that will appear in each online learning meeting by Skype Application. The notes are collected during face-to-face learning or sent photos to the group with the condition that each pages must be named, (the teacher checks as feedback and ensures students watch the learning video before online learning). As well as each student is asked to give comments from a friend's video, both suggestions in the form of explanations of the material or how to deliver it.
5. In online learning learning the teacher takes over learning by explaining important parts of the student's video as well as explaining some important topics that need to be added and emphasized.

The teacher needs to repeat the explanation of the video the student made at the beginning of learning in the online class, aiming to explain what is still not right, emphasizing the important things and strengthening the concept for students.

6. After the topics considered important have been explained, the teacher opens the opportunity for students to convey their questions about the topic of learning. (In accordance with the purpose of the Flipped Classroom where students learn the material before learning and when learning focuses on the discussion of answering mathematical questions). The discussion opportunity given was intended for each student to be able to ask what they thought they did not understand from his friend's explanation of the topic of learning or problems related to the topic being taught.
7. The presentation group must provide 5-10 math questions given to other groups, where groups who can answer correctly and correctly will get points, making learning more interesting and can increase students' desire in learning.

At this stage we have entered into the learning goal of flipped classroom where learning in online classes is used by discussing many mathematical questions.

8. The teacher gives math questions using the kahoot application that is answered by each individual, and students who get the highest score will get additional points from the teacher.

The use of the kahoot application is considered to be able to add students' ability to solve math problems in a more interesting way (innovation) and use technology in learning.

Based on the innovations made, it can be seen that the student achievement of student learning outcomes is higher. Students' difficulties in the content, process and assignments are resolved. In terms of content students become understanding because they repeatedly understand it. First the students are asked to read the material given by the teacher, then make a video of the understanding of the students and other friends to comment and make a summary of the video of his friend. In online learning the teacher explains again and much in discussing mathematical questions. In terms of the learning process students have no more difficulties, because there are friend videos sent before learning, teaching materials from teachers, online learning videos also uploaded on youtube, and group learning can help students discuss. As well as students can also discuss on social media that is Line with classmates and teachers about the problems they face. So time is no longer the reason for students, because they can learn from the video and discuss in Line whenever they have free time. In terms of assignments students also have no difficulty. Because students do not work on questions outside of learning, but only understand the concept. For working on math problems done in online learning with the teacher. So that this innovation is considered to have succeeded in solving the existing problems.

III. DISCUSSIONS

Innovation needs to be done because of the demands of the times. As stated by (Hallissy, 2010) that the 21st century has its own challenges in education, along with the development of technology education even though it must follow developments as well. So it is necessary to do the difference in class instruction with the times and student differences (Tomlinson, 2001). Because education as natural development is true, we as teachers must always think about the development of education and the abilities of our students (Dewey, 1915). Our experience as teachers must always be developed. Never stop with what we have. If doing that will make us miss and not develop. That will conflict with the demands. In developing innovation in learning we must consider the factors that influence it in order to achieve the learning objectives in the innovation that we do.

According to (Lai, 2016) suggest flipped classroom learning has been able to improve student performance in mathematics learning. Here also explains the importance of innovating in learning with technology. According to (Lo et al., 2017) who reviews all articles about flipped classroom. Of 1,469 articles about flipped classroom. There are several important points to do in classroom flipped learning. There are two important parts in flipped classroom, namely: 1) Out-of-class: (videos, text-books, online exercises/quizzes, worksheets, and online discussions), 2) In-class: (exercises, lectures, practices, activities, students presentation). The things above also exist in innovations that have been developed along with other innovations that have been designed by the teacher. The teacher has succeeded in innovating and overcoming the problems he faces. It is recommended for future researchers to develop further innovations and try on other subjects.

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