Flipped classroom model of mathematics learning outcomes

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Abstract. The aim of this research was to investigate the flipped classroom model. Students experienced difficulties in learning mathematics. Thus, learning innovation is needed to help them maximize their learning and practice in solving maths problems. The learning model dicussed in this research was the flipped classroom learning model. This model is the reversed learning model and considered suitable for mathematics learning.

1. Introduction

The Characteristics of learning mathematics in educational unit contained in process standards refers to passing standards and content standards [1]. Process standard is a criterion of the implementation of learning on the fishpond unit. The learning process in the educational unit is held in an interactive, inspirational, fun, creative, and independent way. One of the principle of learning in process standards is the advocates who take place at home, in schools and in communities with the use of technology, in achieving these goals required the skills of teachers to the models of learning, especially in learning mathematics.

Mathematics has an important role in the development of human life. Aside from being a basic science that supports the development of human life, mathematics is also one of the supporting technological advances and has relevance to other fields of study. Mathematics has several characteristics depending on the person's perspective. As for the opinion that mentions "mathematics as a human activity" [2], can mean that everyone in his life activities involved with mathematics. As the holder of an important role in the life and advancement of human, mathematics must be learned through the learning of mathematics. The implementation of mathematics learning embraces: the principle of lifelong learning, active learning, and the principle of "learning how to learn". In other words, in the learning process, teacher acts as a facilitator, motivator, and manager of learning for his students because the learning of mathematics is directed to meet the needs of the present and the future [2].

However, not a few students have difficulty in learning mathematics so that the students' learning achievement on the subjects of mathematics is low. This is illustrated from the results of a teacher's research which indicates that the subjects with the results are not destructive based on the order of one, the mathematics subjects as much as 61.3% of students get the value which is not in accordance with the minimum criteria of mastery in learning (KKM) [3]. It can be seen that the learner's learning results showed that the students have difficulty in learning. The trigger of this problem is that too many subjects have to be given to the students with very little time. Thus, the teachers tend only to provide materials in the classroom by giving the exercise as a task, but few of the students do the exercises and others neglect the task when the task contains the exercises as reinforcement in

understanding the material. Lack of interest and motivation is also a problem in learning mathematics. This possibility is caused by boredom in learning. When the students experience saturation in learning, they will have difficulty in the learning process. Mathematics teachers tend to overstress methods than the routines and skills at the expense of long-term learning strategies, and that, as a result, the students become less skilled in Mathematics [4]. It can be interpreted because the learning of mathematics that is too long applied causes the students to have difficulty in the process of realizing their abilities. In response to the problem mentioned above, the teacher must innovate on learning.

One attempt to overcome this problem is to choose the right model that gives the student the opportunity to practice in solving problems and still get the explanation of the material. It is necessary to reverse the learning process from the originally in the classroom to be at home and from home into the classroom. Home study is conducted by watching the video as an explanation from the teacher. This can encourage the students to become more independent in learning by selecting learning resources as needed so they can get a lot of information. Home learning activities such as exercises are conducted at school by having discussions with friends to solve problems or asking the teacher when having difficulty in completing math exercise questions. This process will support the students' active learning. One of the learning models that has two activities at once is the flipped classroom model. Flipped classroom is a learning model in which minimizing the number of direct instructions but maximizing one-on-one interactions. It also embraces the strategy utilizing technology that supports additional learning materials for the students that can be accessed online and offline whenever and wherever. Meanwhile, classroom learning time is used to collaborate with colleagues to receive feedback [5]. It can be stated that the flipped classroom model is an inverted learning model. This means that the learning model is done in reverse, which is what usually done in the classroom are done at home to obtain information for the students to further record and study independently, then bring the materials as classroom lessons to be discussed with friends and teachers. Home learning is like exercising conducted in the classroom so that the students can discuss to solve problems and do questions and answers about materials that have not been understood.

Based on the background of the problems above, the purpose of this paper is to describe the results of students' mathematics learning through classroom flipped learning model.

2. Method
This type of research is the study of literature so that the method used was summarizing and analyzing the result of the relevant research that has been done. So the provide information can be used to answer the research question and in accordance with the purpose of the research. Relevant research in this study was related with flipped classroom model.

3. Result and Discussion
Learning outcomes are a behaviour change that occurs after attending the learning process with educational objectives [6]. Viewed from the two sides of the learning outcomes of the teachers and the students, the learning outcome is a better level of mental development than it was before the study [7]. Thus, it can be concluded that the learning results obtained after carrying out the learning process. The learning content is influenced by the intelligence and the students' initial ability about the material to be studied. Teachers need to set learning goals with students' capability [8]. Based on the tory of learning Skinner, after the learning process needs a stimulus-response, among others, trying to answer questions in the teaching process should be continued strengthening, among others, in the form of exercise questions [9]. Thus, learning should make the design of learning process in accordance with the capacity of students and provide time for practice in solving math problems. The form of learning is typically presented as an overview of the learning process from the beginning until the end [10]. Thus, the importance of the model of learning as a guide in the process of learning mathematics is an effort to improve student learning outcomes. The learning model is needed in accordance with the students' capability in learning and maximizing the learning time by getting the material and exercises as reinforcement of the material learned. It is an important appropriate learning models innovation to accustom the students to learn at home and in the classroom.

Ordinary learning is conducted in the classroom by having discussions or explanations from the teachers and asking to do mathematics exercise at home. Based on the theory that has been described, it is necessary to try to reverse the habit of learning to reduce the saturation in learning. The lessons usually learned in the classroom are being learned at home and what being learned at home becomes classroom learning. So, the learning model is done by reversing the learning in the class into home study by viewing the learning video and learning at home becomes learning in the classroom with exercise questions is a model called flipped classroom learning [11]. Flipped classroom is an inverted learning model. The flipped classroom -based learning model is one of the student-centered learning models to improve learning effectiveness [12]. This learning model is conducted by minimizing the number of direct instructions but maximizing one-on-one interaction [5]. There are two techniques in the flipped classroom model, which are: interactive group learning activities in the classroom and individual instruction based on computer outside the classroom. Based on the explanation of the flipped classroom model, the steps of the flipped classroom learning model can be summed up. First, the introduction to this activity in which the students are given learning videos to be learned at home and record the learning materials in the book as a discussion material to be conducted in the classroom. Second, the students' core activities in which they look at home learning videos with parental monitoring. Then, the students take notes and answer some of the questions given at the end of the video. It is continued in the classroom by doing problem exercises and discussing unfamiliar material. Thirdly, the closing of the learning activities must have confirmation and draw conclusions.

The advantages of the flipped classroom model are that the students are capable of learning by themselves, doing assignments in class which provide greater insight to the teachers about the learning difficulties and learning styles of the students. Other advantages are that the teacher can adjust easily, can be used effectively and creatively in the classroom, the teacher may see increased interest and involvement of the students, support new approach to learning theory, flexible use of total technology at the 21st century learning, to increase student interest in mathematics [13]. Thus, by applying the flipped classroom learning model, the students' mathematics learning outcomes can be better. It can be viewed based on the result of a case study, what cannot be obtained can be possible by using flipped classroom learning model. . The teacher's and student's responses were so good that they can increase the students' independence and students' interest in mathematics learning [13]. The flipped classroom model applied to grade XI can also enhance the students' creative attitudes, responsibilities, and skills [12]. Apart from that, conducting the flipped classroom model also has some obstacles, in which the students become confused with homework, producing video enough learning it and the necessary prudence, tools and adequate infrastructure such as mobile phones and laptops [13].

Based on the things that have been described, it can be seen that there are the influences of the flipped classroom learning model on students' mathematics learning outcomes. In addition, the students are also trained independently and maximally in learning and there is a responsibility in completing tasks and practice questions. Teachers and friends play a role in this learning process by providing input during classroom discussions. The existence of monitoring from parents also provides motivation to the students in carrying out learning at home. This shows the role of parents to the cognitive development of the students.

4. Conclusion
Based on the purpose and result of the research, it can be concluded that the flipped classroom learning model has an effect on the students' mathematics learning outcomes.

5. Acknowledgments

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