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Implementation of the Flipped Classroom Learning Model to Improve Students' Self-Regulated Learning

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Abstract: This study aims to determine the effectiveness of the Flipped Classroom learning model in terms of self-regulated learning on student learning outcomes. This study used a quasi-experimental design in SMP Muhammadiyah 1 Gamping with the subject of the study being the experimental group totaling 32 students and the control group totaling 32 students. Based on the result of data analysis shows that the application of the Flipped Classroom learning model is more effective than application of the direct learning model and has a significant interaction between the learning model and the self-regulated learning. This can be strengthened by the result of interactions with the learning model and the self-regulated learning of Sig=0,044<0,05 so that the learning model affects the self-regulated learning of students. The Flipped Classroom learning model can be used in mathematics as an alternative learning model, especially in flat face three dimensional objects.

Keywords: effectiveness, flipped classroom learning model, self-regulated learning, learning outcomes

Abstrak: *Penelitian ini bertujuan untuk mengetahui efektivitas model pembelajaran Flipped Classroom ditinjau dari kemandirian belajar terhadap hasil belajar siswa. Penelitian ini menggunakan desain quasi eksperimen dilaksanakan di SMP Muhammadiyah 1 Gamping dengan subjek penelitian yaitu kelompok eksperimen berjumlah 32 siswa dan kelompok kontrol berjumlah 32 siswa. Berdasarkan hasil analisis data menunjukkan bahwa penerapan model pembelajaran Flipped Classroom lebih efektif dibanding dengan penerapan model pembelajaran langsung dan memiliki interaksi yang signifikan antara model pembelajaran dengan kemandirian belajar. Hal ini dapat diperkuat dengan hasil dari interaksi terhadap model pembelajaran dan kemandirian belajar Sig=0,037<0,05 sehingga model pembelajaran berpengaruh terhadap kemandirian belajar siswa. Model pembelajaran Flipped Classroom dapat digunakan pada mata pelajaran matematika sebagai model pembelajaran alernatif terutama pada materi bangun ruang sisi datar.*

Kata kunci: *efektivitas, model pembelajaran flipped classroom, kemandirian belajar, hasil belajar.*

▪ INTRODUCTION

The era of the industrial revolution 4.0 is an era where information technology is growing rapidly and affecting every human life (Lee et al., 2018; Rahmatullah et al., 2022; Tien & Minh, 2019). This era was marked by the development of the "internet of things" which penetrated various fields of people's lives, one of which was the field of education (Atzori et al., 2017; Li et al., 2015; Rose et al., 2015). Education in Indonesia is currently entering the 4.0 era, where the trend is online learning that uses the internet as a liaison between teachers and students (Irfan et al., 2020; Kusumaningrum & WIjayanto, 2020).

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The development of technology causes the learning process in the era of the industrial revolution 4.0 to change (Rachmadtullah et al., 2020; Shahroom & Hussin, 2018). The internet, smartphones, and computers are tools that will facilitate the teaching and learning process (Gikas & Grant, 2013; Gunuç & Babacan, 2017; Wijayanto & Kusumaningrum, 2020). The learning process that used to have to be done face-to-face directly between teachers and students, now in the industrial revolution 4.0 era learning can be done with online classes through social media or other media that support the online learning process (Setiana et al., 2021).

The learning process in the industrial revolution 4.0 era is a student-centered learning process (student center), the teacher is no longer the main actor in the class, but students are given the opportunity to actively express their opinions (Cahyati et al., 2022; Jalinus et al., 2021; Sudibjo et al., 2019). But in reality, there are still many schools that use teacher-centered teaching methods (teacher center). One of them is SMP Muhammadiyah 1 Gamping which is located in Gamping, Sleman, Yogyakarta.

Based on the results of observations made at SMP Muhammadiyah 1 Gamping, where the learning process that takes place using Face-to-Face Learning (PTM) policies is limited, namely 50% online and 50% offline. In the implementation of learning, it shows that the teacher uses a direct learning model, namely learning using the lecture method which is teacher-centered learning (teacher center) and has not optimized technological developments (Wijayanto et al., 2022). The teacher conveys material to students using the blackboard when learning is offline and sends material in the form of chat to the Whatsapp Group when learning online. This makes students play a passive role during the learning process, students tend to only listen to explanations from the teacher.

In addition, the learning process is only carried out in the classroom with a limited duration of time. Students have not optimally explored other sources that can enrich knowledge about mathematics either from google, youtube, or other learning applications or websites, this is because the school does not allow students to use smartphones while in the school environment. Students tend to only passively listen to the teacher explain. This causes students to get bored easily during the learning process so that many students talk or play alone and do not pay attention to the material being explained by the teacher (Wijayanto, 2022). Students also have difficulty doing homework because they do not understand the material explained by the teacher in class.

The use of teacher-centered lecture methods in learning mathematics results in student self-regulated learning is still low and cannot be developed. Teacher-centered learning makes students less independent and less confident in themselves because students depend on teachers. In accordance with the results of interviews with mathematics teachers at SMP Muhammadiyah 1 Gamping, students' self-regulated learning has decreased since the implementation of limited PTM. This causes student learning outcomes to decline. To overcome this problem, a technology-based learning model is needed that can help students be more interested in participating in learning and help students explore information independently, not limited by time and place.

Flipped Classroom is one of the technology-based learning model solutions that are relevant to the development of learning in the era of the industrial revolution 4.0 (Prasetyo et al., 2020; Rahmadani et al., 2020). Flipped Classroom is also one of the

student-centered learning models (Custodio et al., 2019). The Flipped Classroom learning model is one of the learning models that can increase the effectiveness of learning because it is student-centered.

The Flipped Classroom learning model is a flipped learning model. The concept of the flipped classroom learning model is the opposite of the usual routine, when learning as usual in class is done by students at home, and homework that is usually done at home is completed at school (Go´mez et al., 2016). By applying the Flipped Classroom learning model, it will build student learning habits that will continue after the teaching and learning process in the classroom ends. The Flipped Classroom learning model focuses on increasing student activity and independence in class. The teacher only acts as a facilitator and discussion partner. The goal is to improve the quality of student learning by utilizing technology. The application of Flipped Classroom motivates students to be more independent (Thuy et al., 2017). Broadly speaking, the implementation of the Flipped Classroom learning model begins with learning at home by watching videos online. This causes students to have high self-regulated learning so that the application of the Flipped Classroom learning model can be maximized.

Self-regulated learning is one of the important things in a learning process (Boekaerts, 1999). This is because students who are independent in learning have responsibility for themselves in all things, both in achieving goals or the willingness to complete the given task. Students who are used to being independent in learning when faced with a problem will tend to be calm when doing the task because they have high self-confidence so they are not easily influenced by the opinions of others. Students who have independent learning will know how they learn and know what learning strategies are appropriate for effective learning.

▪ METHOD

Participants

The population of this research is all students of class VII SMP Muhammadiyah 1 Gamping in the academic year 2021/2022 as many as 150 students. The sample used in this study was class VIII B and VIII E which were selected by purposive sampling technique. The reason for using this technique is because not all samples have criteria that match the phenomenon under study. Therefore, the researcher chose a purposive sampling technique which determined certain considerations that must be met by the samples to be used in this study.

In this study, class VIII B was used as an experimental group whose learning was using the Flipped Classroom learning model. The reason the researcher chose class VIII B as the experimental group was because the class had its own characteristics in the learning process, such as happy to talk during the learning process, happy to play alone during learning. While class VIII E was used as a control group whose learning was using the direct learning model.

Research Design and Procedures

This research is a quantitative research with a quasi-experimental method and a 2×3 factorial design. Quantitative research is research that aims to measure variables, determine averages, determine correlations, test hypotheses, and test the effectiveness of

a treatment. A characteristic of quasi-experimental research is that it is used to examine causal relationships, is similar to experimental designs, but without random assignment, often involves comparing the results of pre-existing groups, and is often conducted in a natural environment. In this study there are several variables used, namely the independent variable consists of the learning model (Flipped Classroom learning model and direct learning model) and self-regulated learning, then the dependent variable is student learning outcomes. The stages in this study are presented in Figure 1.

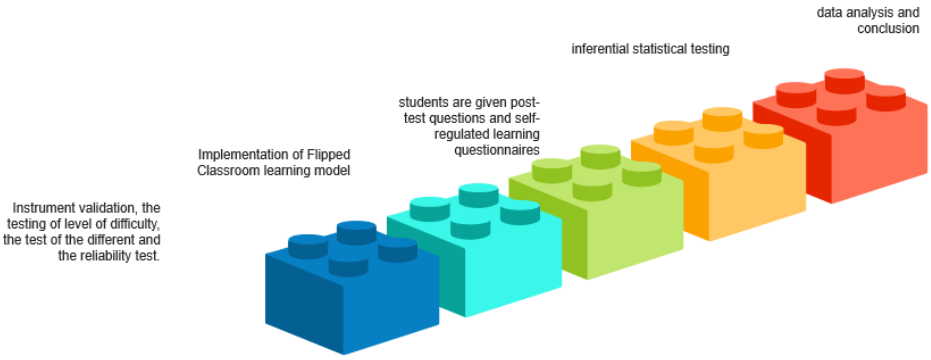


Figure 1. Research procedures

Instruments

The instruments that will be used in this research are learning instruments in the form of lesson plans and LKPD, and research instruments in the form of post-test questions and self-regulated learning questionnaires. The instrument testing was conducted by testing the validity of the items, the level of difficulty test, the different power test, and the reliability test.

Data Analysis

Test the validity of items on post-test questions and questionnaires using Pearson Correlation, the instrument is said to be valid if the value of Sig.<α=0,05. Based on the output of SPSS 20.0, it shows that from 6 post-test items and 23 questionnaire statements, the value of Sig < 0.05 means that the post-test questions and questionnaires are valid. The difficulty level of the post-test items using the difficulty index formula showed that there were four items included in the easy difficulty category and two items in the medium difficulty category. The discriminatory power test of post-test items calculated using the discrimination index formula showed that items numbered 1,2,6 were included in the category of moderate discriminating power and numbers 3,4,5 were included in the good category. While the test of differentiating power on the questionnaire using the product moment correlation shows that the questionnaire has a distinguishing power of more than or equal to 0.3, meaning that the questionnaire is feasible to use. The reliability test of this instrument uses the Cronbach Alpha technique. The results of calculations using SPSS 20.0 show that the post-test questions and questionnaires have a Cronbach's Alpha value >r_tabel where >r_tabel is 0.246 respectively at 0.687> 0.246 and 0.752> 0.246, so the questions and questionnaires are

reliable and belong to the high reliable category.

In addition, in this study also used inferential statistical testing methods, namely statistical techniques used to analyze sample data and the results are applied to the population. Before testing the research hypothesis, normality and homogeneity tests must be carried out. For normality and homogeneity tests using a significance level of 5% or 0.05. The data is said to be normally distributed if the P_value≥ 0,05 and the data is said to be the same or homogeneous if the $P_{\_value} \geq 0{,}05$.

▪ RESULT AND DISSCUSSION

The flipped classroom learning model is basically the opposite of the usual routine, when learning as usual in class is done by students at home, and homework that is usually done at home is completed at school. According to Johnson (2013:14) flipped classroom is a way for educators to minimize direct instruction in their teaching practice while maximizing interaction with one another. In addition, the Flipped Classroom learning model is one of the learning models that can increase the effectiveness of learning because it is student-centered.

The Flipped Classroom learning process is learning begins with watching learning videos independently at home equipped with Student Worksheets (LKPD) as a companion to ensure students watch videos, then continued face-to-face learning in class in the form of questions and answers about the questions in the LKPD video companion and continued discussions with other LKPDs containing experimental activities, observations, and practice questions.

This research was conducted for 2 weeks. This research was conducted for 3 meetings in each class. The next stage is to test the balance of the two classes using the independent samples t-test, but before the test is carried out it is necessary to test the normality and homogeneity of the variance of the data. The prerequisite test shows that the results of the normality test of the two data are said to be normal. This is based on the results of statistical testing assisted by the SPSS 20.0 application using a non-parametric normality test with Kolmogorov-Smirnov obtained a significance value of 0.216 which is more than the significance value of = 5%. While the homogeneity test uses the Levene Statistic test with the help of the SPSS 20.0 application which shows that the two data groups are said to be homogeneous, because the obtained significance value of 0.317 is more than the significance value of = 5%. After the prerequisite test, the balance test was then carried out, from the balance test of the two classes, it can be concluded that the data from the experimental class and the control class have a Sig value of more than with = 0.05, namely 0.108 > 0.05. Thus, the two classes are said to be balanced. After the balance test is fulfilled, research is carried out to obtain the desired data. The experimental group, class VIII E, was treated using the Flipped Classroom learning model and the group, class VIII D, was treated using the direct learning model.

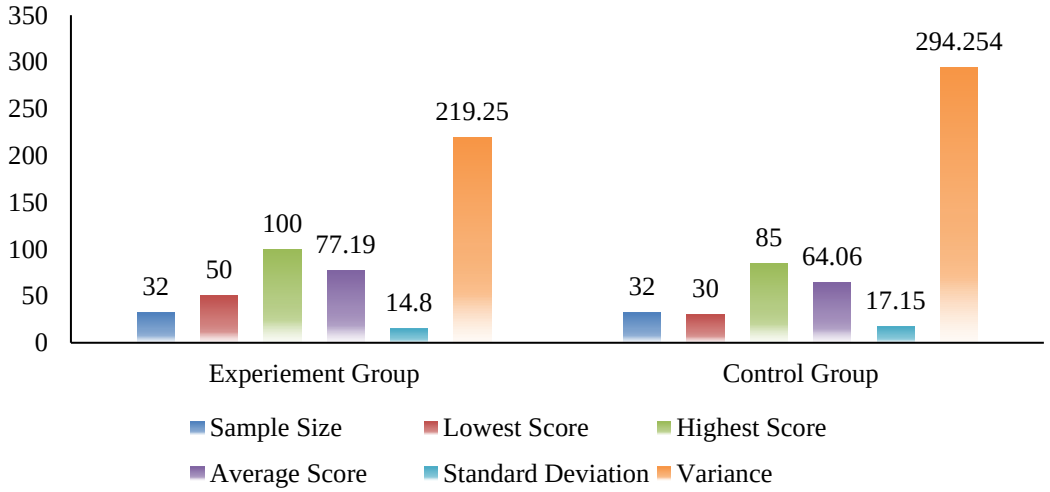
In the experimental group the learning process begins with the provision of teaching materials in the form of videos. The researcher shared the YouTube link and the companion LKPD through the WhatApp Group one day before the meeting. Students are asked to listen and understand the material provided and ask students to work on the accompanying LKPD as evidence that students have listened to the video. These materials will be discussed together at the next meeting. After that at the meeting

in the class the students were divided into several groups. The division of discussion groups consists of students who have high and low academic scores based on students' Final Semester Assessment scores. It is intended that the discussion process in groups can run. High academic students can help other students who have low academics. After that, the teacher gives some problems to be discussed and worked on by students in groups or individually. Each group is given the opportunity to present the results of the discussion and other students can respond. So that in the classroom all students can be active in the learning process takes place.

In the control group, in the control class, the learning process is carried out using a direct learning model. This learning model tends to be teacher-centered as a teacher. The learning process includes three stages, namely opening activities, core activities and closing activities. In the opening activity, the teacher opens the lesson by praying and attending. In the core activity, students were asked to pay attention to the teacher's explanation and re-record the material written on the blackboard. At the closing stage, the teacher provides reflections and conclusions from the material discussed.

Data collection in this study was carried out using the posttest implementation at the end of the subject matter. The research was conducted for three meetings and the third meeting was carried out by taking posttest data. The results of the students' posttest scores can be seen in Fig 2.

Figure 2. Description of student mathematics posttest score



Based on Fig.2, it can be seen that the average value of student learning outcomes in the experimental group was given the Flipped Classroom learning model and the control group was given the direct learning model. It can be seen that the posttest scores in the experimental group for the lowest and highest scores were 50 and 100, while in the control group for the lowest and highest scores were 30 and 85. When viewed from the class average value for the experimental group, the class average was 77. ,19 while the control group obtained a class average of 64.06. This can happen because in the experimental group students are given the opportunity to be active in learning so that students are more interested in learning. In addition, the learning process is carried out by discussing and listening to videos at the previous meeting so that students have more

time at home to study the material provided. This can be seen from the results of student work on the worksheets that are provided as discussion material. They are faster in solving a given problem. While in the control group, the role of students only listens and pays attention to the teacher's explanation, so students tend to feel bored and less active in learning. This can result in students' understanding of the material presented is less than optimal. To clarify the acquisition of student learning outcomes, the researcher categorizes student scores into five categories. The results can be seen in Table 1.

Table 1. Distribution and percentage of students' mathematics learning outcomes

No.	Score	Category	Experimental Group		Control Group	
			Frequency	Percentage	Frequency	Percentage
1.	00 – 25	Very low	0	0	0	0
2.	26 – 42	Low	0	0	4	12.5 %
3.	43 – 58	Medium	3	9.375 %	6	18.75 %
4.	59 – 75	High	13	40.625 %	14	43.75 %
5.	76 – 100	Very high	16	50 %	8	25 %
Total			32	100 %	32	100 %

Table 1 shows that of the 32 students in the experimental group, there were 3 students who scored in the interval from 43 to 58 with a percentage of 9.375%; student scores in the interval 59 – 75 in the high category as many as 13 students with a percentage of 40.625%; and student scores in the interval 76 – 100 in the very high category as many as 16 students with a percentage of 50%. Based on Table 1, it can be illustrated that the experimental class group generally has a very high level of mathematics learning outcomes in the very high category with an average value of 77.19 from the ideal value of 100.

While in the control group, it can be categorized that the students' scores in the interval 26-42 in the low category are 4 students with a percentage of 12.5%; student scores in the 43-58 interval in the medium category as many as 6 students with a percentage of 18.75%; student scores in the interval 59-75 in the high category as many as 14 students with a percentage of 43.75%; and student scores in the interval 76 – 100 in the very high category as many as 8 students with a percentage of 25%. Based on Table 1, it can be illustrated that the control class group generally has a high level of mathematics learning outcomes in the high category with an average value of 64.06 from the ideal value of 100.

This can be influenced by the ability of a student to work independently in digging learning information from learning sources other than educators or also called self-regulated learning. Self-regulated learning is one of the important factors in determining the success of students when learning. According to Huda, Mulyono, Rosyida, & Wardono (2019), self-regulated learning combined with the activeness of students to support the learning process is very dependent on current conditions, technological developments change the habits of students who are more accustomed to learning to use smartphone media than textbooks and the like. So that the application of the Flipped Classroom learning model that uses learning video media linked to a

YouTube link is an ingenious solution to build student self-regulated learning so that students are interested and not easily bored to learn the material. Based on the results of research by Anisa Rahmawati and Zuli Nuraeni (2021), the results of students' independent learning through flipped classroom learning on SPLDV class VIII material assisted by animated videos are very good with a percentage of 80.42%.

Meanwhile, the results of the inferential analysis show that there are differences in the mathematics learning outcomes of students who are given the Flipped Classroom learning model and students who are given direct learning, where the learning outcomes of students with the Flipped Classroom learning model have a higher average than students who receive direct learning. Judging from the interaction of the learning model with the students' mathematical disposition towards the two classes, it can also be seen in Table 2.

Table 2. Results of two way analysis of variance with dissimilar cells

Sumber	Df	α	Sig.
Learning model (A)	1	0.05	0.000
Self-regulated learning (B)	2	0.05	0.000
Interaction (AB)	2	0.05	0.037

Table 2 shows that in the main effect of row (A), namely the learning model, the value of Sig. arithmetic = 0.000 <0.05, then H_0A is rejected. As a result, it can be said that there are differences in student learning outcomes based on the learning model. This is because the learning experimental group using the Flipped Classroom learning model is more effective. With the help of digital learning media in the form of learning videos uploaded on You-Tube. Videos can be studied at home, so students have more time to understand the material given compared to the control group using the direct learning model. This is reinforced by the results of research conducted by Sativa and Kusuma (2021) which shows that the characteristics of the flipped classroom learning model can help students learn inside and outside the classroom, enabling students to participate directly in the learning process. With the development of information technology, teachers use technology in learning based on mathematical characteristics, dare to innovate in the applied learning model.

With the difference in treatment, it can be concluded that there is a significant difference between the experimental group with the Flipped Classroom learning model and the control group with the direct learning model. This agrees with research conducted by Pratiwi (2022) which shows that students who study with flipped classroom learning provide better learning outcomes than students who study with conventional learning. This proves that flipped classroom learning has a positive influence on junior high school students' mathematics learning outcomes. The results of research conducted by Apriyanah, et al (2018) also show that the Flipped Classroom model is more effectively applied to learning activities compared to the direct instruction model.

In the main effect of column (B), namely on self-regulated learning, the value of Sig.count = 0.000<α=0.05, then H_0B is rejected. As a result, it can be said that there are significant differences in student learning outcomes between groups of students with high self-regulated learning and groups of students with moderate self-regulated

learning. This is reinforced by research conducted by Dewi et al (2020) which shows the results that there is a positive influence of self-regulated learning on mathematics learning outcomes. The contribution of self-regulated learning to mathematics learning outcomes is 245 with each increase of one unit of self-regulated learning will significantly increase learning outcomes of 0.306 units.

On the main effect of the interaction of learning models and student self-regulated learning (AB) obtained the value of Sig.count = 0.037 <0.05, then H_0AB is rejected. As a result, it can be said that there is a significant interaction between the learning model and self-regulated learning. This is reinforced by research conducted by Rahmawati and Nuraeni (2021) which shows the results that there is an interaction between learning models and self-regulated learning. Students' self-regulated learning through flipped classroom learning with animated videos is very good with a percentage of 80.42%. The results of research conducted by Mirlanda et al (2019) also showed that the flipped classroom learning model had a significant effect on increasing students' independent learning abilities compared to students who received scientific learning.

This can happen because in the experimental group students become more interested in participating in the learning process and are active in expressing their opinions. In contrast to students who receive direct learning models, students tend to be passive in class so that student involvement in learning becomes less visible and students seem less interested in learning mathematics. Judging from the independent learning of students in the experimental group is also higher than the control group because of the desire to explore the material independently, students' self-confidence and motivation are more formed during the learning process. Therefore, the Flipped Classroom learning model is very helpful for students in improving their mathematics learning outcomes because it can provide more complex learning, especially for class VIII students at SMP Muhammadiyah 1 Gamping.

▪ CONCLUSION

Based on the results of research and discussion, it can be concluded that the Flipped Classroom learning model is more effective than the direct learning model, seen from the average value of the experimental group which is 77.19 higher than the control group, which is 64.06. Judging from the self-regulated learning of each student there is a significant difference between the group of students with high self-regulated learning, the group of students with moderate self-regulated learning, and the group of students with low self-regulated learning, this can be seen from the calculation results obtained by the value of Sig. count = 0.000 <0.05. In the learning model and student self-regulated learning have a significant interaction. This can be seen from the acquisition of the value of Sig.count = 0.037 <0.05. This means that there is an interaction between the learning model and student self-regulated learning.

The results of this study can be used as a reference for teachers in determining the learning model. The Flipped Classroom learning model is different from other learning models where the process of understanding the concept is carried out at home using video and e-lkpd as learning media, then the consolidation of the concept is carried out at school with the teacher. With a reversed learning model, Flipped Classroom can increase student involvement in learning so as to increase student self-regulation. In applying learning using the Flipped Classroom model there are several notes that were

found where students who are new to this method need adaptation because students must be able to study independently at home, as a consequence they are not ready for active learning in the classroom. One solution that can be offered to overcome this problem is by giving quizzes, one of which is online, in class, giving homework for reference information. In addition, homework (assignments and videos) should be carefully adjusted to prepare them for classroom activities. Finally, making good quality teaching materials is not easy to do.

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