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THE EFFECT OF FLIPPED CLASSROOM LEARNING MODEL WITH POWTOON ANIMATION MEDIA TOWARDS MATHEMATICS CONCEPTUAL UNDERSTANDING AND LEARNING INDEPENDENCE OF CLASS VII STUDENTS OF SMP NEGERI 2 KUTA SELATAN

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ABSTRACT

This study aims to determine: (1) whether the mathematics conceptual understanding of students who take learning with the flipped classroom model assisted by the Powtoon animation media is better than mathematics conceptual understanding of students who take conventional learning method, (2) whether the learning independence of students who take learning with the flipped classroom model assisted by the Powtoon animation media is better than students' learning independence following conventional learning method, and (3) is mathematics conceptual understanding and learning independence of students who take learning with the flipped model with Powtoon animation media is better than understanding math concepts and students' learning independence with conventional learning method. The population of this study was all students of class VII SMP Negeri 2 Kuta Selatan in the academic year 2019/2020. The sample in this study was determined by cluster random sampling technique, which found as many as 2 classes who were divided into the experimental class and the control class. This research is a quasi-experimental study with a post-test only control group design. The students' mathematics conceptual understanding data was collected using essay tests to understand mathematical concepts, a set of students' learning independence data was obtained with a student learning independence questionnaire. Data were analyzed using the Manova test with a significance level of 5%. The experimental results show that: (1) the ability to understand mathematical concepts of students who take learning with the flipped classroom model assisted by Powtoon animation media is better than students who take conventional learning method, (2) the independence of learning of students who take learning with the flipped classroom model assisted by the Powtoon animation media than students who follow conventional learning method, and (3) the ability to understand mathematical concepts and the learning independence of students who take lessons with the flipped classroom model assisted by Powtoon animation media is better than students who follow conventional learning method. This is because students who take part in learning with the flipped classroom model assisted by the Powtoon animation media are more enthusiastic about learning in class because they have previously studied the material with the videos in their homes. Students are also trained to re-express their understanding with group discussions.

KEYWORDS: Flipped Classroom, Powtoon, Mathematics Conceptual Understanding, Learning Independency.

1. INTRODUCTION

Mathematics being one of the basic sciences plays an important role which is closely related to daily life. Ibrahim and Suparni (2008: 35) revealed that, mathematics is a universal science that underlies the development of modern technology, has an important role in various scientific disciplines and advancing human thought power. According to Hudojo (2003: 103), mathematics as a science that examines abstract forms or structures and the relationship between these things. Based on the explanation above, the understanding of mathematics is a field of study that develops from the human thought process which plays an important role in shaping quality students. Therefore, all students who take education are required to study mathematics. The National Council of Teachers of Mathematics (2000) formulates 5 general objectives of mathematics learning, namely (1) Learning to solve problems (Problem Solving); (2) Learn to reason and prove (Reasoning and Proof); (3) Learning to communicate (Communication); (4) Learn to associate ideas (Connections); and (5) Learn to represent ideas (Representation). Relevant to the formulation of the National Council of Teachers of Mathematics (NCTM), specifically mentioned

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Impact Factor: 5.164
CODEN: IJESS7

in the current curriculum that applies in Indonesia that the purpose of learning mathematics in schools, namely so that students have the ability to (1) Understand mathematical concepts, explain the relationship between concepts and apply the concepts or the algorithm in a flexible, accurate, efficient way, and persistent in solving problems;

2) Using reasoning on patterns and traits, doing mathematical manipulation in making generalizations, compiling evidence, or explaining mathematical ideas and statements; (3) Solve problems that include the ability to understand problems, design mathematical models, solve models and interpret the solutions obtained; and (4) Communicate ideas with symbols, tables, diagrams, or other media to explain the situation or problem, and have an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention, and interest in learning mathematics, as well as being tenacious and confident in problem solving (Sugiharni, 2014).

From the description above, it can be seen that understanding students' mathematical concepts is the basis for students to understand the material being studied. If students' lack of understanding of the concept, students will find it difficult to solve problems related to the material being studied. Thus, one of the abilities that needs to be developed optimally in order to achieve the goals of mathematics learning is understanding mathematical concepts.

Understanding mathematical concepts is the most fundamental thing in mathematics learning as stated by Hudojo (2003: 123), "Learning mathematics means learning about the concepts and structures contained in the subject being studied and looking for the relationship between concepts and structures". According to Kilpatrick, Swafford, and Findell (2001: 5), "Conceptual understanding is a comprehension of mathematical concepts, operations, and relations". Understanding the concept will help students in the process of remembering and make it more efficient, so students can avoid mistakes in solving problems. A concept can be formed through direct experience with objects or events in daily life, through visual images, and so on. NCTM (Principles and Standards for School Mathematics) 2000 states, "Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge."

In the learning process in the classroom, in addition to understanding mathematical concepts, teachers must also pay attention to students' psychology. If students have a good attitude or psychology, then students will be easy to accept lessons and apply the ideas they have to solve problems experienced during learning and problems given by the teacher. In addition to intellectual abilities, psychological aspects also contribute to students' success in learning mathematics well. One of the psychological aspects is the independence of student learning.

Learning independence is closely related to study habits. Study habits are a matter for every student. Students have different study habits for each individual according to the interests and conditions of each individual. Independence is not a mental ability or academic performance skill, but a process of self-directive where the learner transforms mental abilities (attitudes) into academic abilities (Zimmerman, 2002). Independence learning involves motivational decisions about the purpose of an activity, feelings of inability and valuing tasks, self-perception of the ability to complete tasks, and potential benefits from success or accountability for failure. Awareness and reflection can lead to various actions, depending on student motivation (Nur, 2016).

The independence of student learning is a very important thing and needs to be cultivated in students. According to Yamin (2008: 128), the independence of student learning is very important because it can bring positive changes to students' intellect. Lack of independence of student learning is associated with unfavorable study habits, namely students quickly feel bored and just learn after approaching the exam, ditching, cheating, and looking for leaked exam questions. Students who have good learning independence will try to learn because they are aware of their abilities and limitations, and have their own set of learning goals.

From this explanation, mathematics conceptual understanding and students' learning independence needs to be optimized. Mathematics conceptual understanding and student learning independence can be optimized by planning and compiling both planning, media, and teaching materials to be realized in learning activities. The planning can be integrated in the form of learning models. The learning model that is thought to be able to have a positive influence on understanding mathematical concepts and student learning independence is the flipped classroom learning model.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

According to Bergmann & Sams (2012), mentioned that the concept of the flipped classroom learning model is learning that is usually done entirely in school or in the classroom, now it can be done at home, and homework which is usually done at home, now is being done in class. Learning in the flipped classroom model provides opportunities for students to be able to carry out learning that provides a reciprocal situation, both between students and other students and between students and teachers so that it is expected to be able to optimize students' understanding of concepts.

Learning with the flipped classroom model requires students to learn the material that will be discussed in advance independently at home. In its implementation, students need to be helped to understand the mathematical material that they want to learn. Therefore the implementation of learning with the flipped classroom model will be more effective if the application is assisted with a learning video, where students can understand the material better, play back if there is material that is not yet understood, and watch it again so that the understanding obtained is better. From this, the students will understand the material that being studied better and also students will be independent in their learning. The learning video that will be used is a Powtoon animated video. With the Powtoon animated video students will be more interested in learning because the video presented is more animate. The explanation given by the teacher in the video is also concise and clear, but not as a whole so that students are also able to explore their own understanding.

Implementation of the flipped-classroom-model-mathematics learning in the classroom, namely the teacher and students start each class with a few minutes of discussion about the video that has been uploaded by the teacher and watched by students in their respective homes. In traditional learning done by the teacher explaining the material in front of the class, students who do not understand are reluctant or ashamed to ask or ask the teacher to repeat the explanation. However, with this flipped classroom model, students can freely reverse the explanation from the teacher if there are materials or concepts that are not yet understood. While watching a learning video that contains an explanation from the teacher, students can make notes for each question they have and summarize the learning according to the concepts they understand themselves. Some questions made by students will be discussed together in class and look for answers or completion of these questions. Questions from students can also be used to evaluate the effectiveness of teacher videos. After the questions are answered, students are given assignments for the day. The task can be in the form of investigation activities, directed problem solving activities, or tests that will be discussed by students in the form of discussion groups. After that the teacher gives an assessment of the tasks that have been completed by students. But the role of the teacher in the class has changed dramatically. The teacher is no longer a presenter of information, but the teacher takes on more of the role of the tutorial.

The flipped classroom learning model will enable students to study wherever and whenever they want. After watching and learning the instructional video that is supported by the teacher, students will get preliminary knowledge from a particular material. From this initial knowledge, students then try to solve some problems or ask questions about parts they have not yet understood in the video. Then when learning in class, students will discuss with the teacher and other students to jointly answer questions or correct if there is a mistake until finally students can understand the concept of a material well, coupled with the exercises given by the teacher after discussion done.

2. MATERIALS AND METHODS

a. Materials

A. Flipped Classroom Learning Model

The flipped classroom learning model was first introduced by Bergmann & Sams (2012) in his book entitled Flip Your Classroom Reach Every Student in Every Class Every Day. In the book mentioned that basically the concept of the flipped classroom learning model is learning that is usually done entirely in school or in the classroom, now it can be done at home and homework, which is usually done at home, now done in class. The flipped classroom learning model is a learning model that appears as a unique approach where students learn subject material at home through watching learning videos, making summaries, taking notes on important points, making questions, discussing with friends online, or reading resources that are needed, then do assignments for reinforcement in

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

class. In the flipped classroom learning model, material is first provided through a learning video that students must watch in their homes.

As for the implementation of the flipped-classroom-model-mathematics learning in the classroom, namely the teacher and students start each class with a few minutes of discussion about the video that has been uploaded by the teacher and watched by students in their respective homes. In traditional learning done by the teacher explaining the material in front of the class, students who do not understand are reluctant or ashamed to ask or ask the teacher to repeat the explanation. However, with this flipped classroom model, students can freely reverse the explanation from the teacher if there are materials or concepts that are not yet understood. While watching a learning video that contains an explanation from the teacher, students can make notes for each question they have and summarize the learning according to the concepts they understand themselves. Some questions made by students will be discussed together in class and look for answers or completion of these questions. Questions from students can also be used to evaluate the effectiveness of instructional videos from the teacher.

After the questions are answered, students are given assignments for the day. The task can be in the form of investigation activities, directed problem solving activities, or tests. After that the teacher gives an assessment of the tasks that have been completed by students. But the role of the teacher in the class has changed dramatically. The teacher is no longer a presenter of information, but the teacher takes on more of the role of the tutorial. In the traditional model, students usually come to class confused about some homework problems, then the teacher will spend the first 25 minutes doing warm up activities and overcoming problems that students do not understand from the homework that has been given. Then the teacher will present new content for 30 to 45 minutes and spend the rest of the class with practice exercises.

In the flipped classroom learning model, time is fully organized. Students still need to ask about content that has been sent via video, so the teacher usually answers this question during the first few minutes of class. This allows the teacher and students together to clarify misconceptions before being put into practice and applied incorrectly. The remaining time is used for broader direct activities or problem solving provided by the teacher. Comparison of the implementation of traditional learning and the flipped classroom model as follows.

Table 1. Comparison of the implementation of traditional learning and flipped classroom models

Traditional Learning		**Flipped Classroom Learning Model**	
Activity	**Duration**	**Activity**	**Duration**
Warm up	5 minutes	Warm up	5 minutes
Homework discussion	20 minutes	Questions towards video discussion	10 minutes
New material explanation	30-45 minutes	Students‘ discussion towards task given by the teacher	75 minutes
Students’ exercise	20-35 minutes		

A. Powtoon Animation Media

One of the learning media that is believed to have a positive impact in learning is animation media. Animation is a combination of motion, sound, music and color that can attract students' attention and make the learning process more fun. Animation can also make students become more focused on learning so as to make students better understand the material being studied. One software that can make animated media is Powtoon..

According to Julianingrum (in Parwati, 2016) Powtoon is an online service to create an explanation that has interesting animation features and very easy timeline settings. Animation features in Powtoon include handwritten animations, cartoon animations and livelier transition effects. Cartoon characters, animation models and other cartoon objects make this service very suitable for creating learning media that attract students' attention.

The Powtoon animation media in this study is in the form of learning videos that are made as attractive as possible with more features, templates and styles that are already available in the Powtoon software. With

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Powtoon animation media in the form of learning videos, it is expected to create a more pleasant atmosphere. So that motivates students to enjoy and want to know more about mathematics itself.

B Understanding Mathematical Concept

Understanding concepts in mathematics is the ability that is the basis in solving mathematical problems. The National Council of Teachers of Mathematics (NCTM, 2000) states, "The learning Principle; Student must learn mathematics with understanding, actively building new knowledge from and concepts. According to Sardiman (2010), understanding can be interpreted as mastering something with the mind. Understanding is a standard set of educational programs that reflects competence so that it can lead students to become competent in various sciences, while a concept according to Suherman, et al (2003: 33). The mathematical concept is an abstract idea that allows us to classify objects or events and classify whether objects and events are included or not included in the abstract idea (Hudojo, 2003). Based on the explanation above, it can be concluded that, understanding mathematical concepts is an ability that is not just to remember in understanding abstract ideas that are used to classify objects or events in mathematics.

Understanding concepts is the competence shown by students in understanding concepts and procedures in a flexible, accurate, efficient and precise manner. The indicators of understanding mathematical concepts according to NCTM (2000: 11), as follows:

1. Describe concepts in their words
2. Identify or give example an non example of concepts
3. Use concepts correctly in a variety situation

C. Independence Learning

Learning independence is one of the factors that determine students' success in learning, so self-reliance is very important to be owned by anyone who wants to achieve success in his life. Parents have a very important role in shaping the independence of their children, including learning independence. This is because parents are the first and foremost educators. In other words, parents are first and foremost responsible for the education of their children. Self-reliance refers to self-generated thoughts, feelings, and behaviors that are oriented towards achieving goals (Zimmerman, 2002). Students who have independent learning will be proactive in their efforts to learn because they are aware of their strengths and limitations. Students individually monitor their behavior in terms of achieving goals and reflect on themselves to increase their effectiveness. According to Pintrich & Groot (1990), student learning independence is very important in aspects of student learning and academic achievement that includes self-control attitudes, such as students' metacognitive strategies for planning, monitoring, and modifying their cognitive. Therefore, the independence of student learning is needed to support the learning process. This can increase student satisfaction and motivation to continue to improve learning methods or study habits.

According to Desmita (2009: 185) independence is the ability to control and regulate one's own thoughts, feelings and actions freely as well as trying alone to overcome feelings of shame and doubt. In the development of individual independence can be determined when individuals are able or not in solving a problem at hand. Independence is usually characterized by the ability to determine one's own destiny, be creative and initiative, regulate behavior, be responsible, be able to hold back, make your own decisions, and be able to overcome problems without the influence of others. According to Saputra J. (2017), student learning independence includes students' ability to choose cognitive strategies, learning to manage learning techniques and learning throughout the mass, so students can organize themselves in learning. Student learning independence is the process of design and careful monitoring of cognitive and affective processes in completing an academic task (Sumarmo, 2011). Someone who has learning independence can be measured through three indicators, namely (1) having metacognition skills, (2) having motivation, and (3) actively participating in learning.

B. The Flipped Classroom Learning Model with Powtoon Animation Media

The flipped classroom learning model emphasizes the activeness and independence of students in exploring their knowledge. The activeness and independence of students must be optimized by making students motivated,

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

focused and attentive to the material being studied. Powtoon animation media is a way that is thought to be able to make the learning process better. In the flipped classroom learning model, animation media is given when students examine the material independently through the website that has been provided by the teacher, so students will get a real picture of the material they are learning and explore the understanding of each student's concepts. Students are expected to be motivated to learn so that the discussion process carried out both on the website and in the classroom for the better. The Powtoon animation media was created by the teacher to attract students' interest and also the desire to learn students with the animated features in it.

There are 4 phases in implementing the flipped classroom learning model, namely (1) Phase before class begins. The activity carried out in the first phase of course the teacher will prepare learning material that will be uploaded to the Powtoon animation media website; (2) The initial phase of class. In the second phase, the teacher explains how to watch or download Powtoon animated videos and create class groups so students can discuss online; (3) Phase when learning takes place. In the third phase, the teacher organizes students into several learning groups with the aim that all students can watch or download the learning videos that have been prepared by the teacher; and (4) Closing. In this phase, the teacher reminds and directs students to learn at home by watching the animated video Powtoon prepared by the teacher. All phases are carried out during the first meeting in the learning process.

Before entering core learning in class, students conduct online discussions in their respective homes. The teacher will upload a learning video with Powtoon animation media that can be accessed by students anywhere. Students are required to watch or download the learning video on the website provided by the teacher before the face-to-face meeting is held. In the online discussion students must actively participate, both by expressing questions, suggestions and things that are not understood. If there is something that is not understood, then students can make some questions and upload the questions on the website provided or will be discussed later when learning in class.

b. Methods

This study was a quasi-experimental research (quasi experiment). The population in this research is class VII SMP Negeri 2 Kuta Selatan in academic year 2019/2020. Class VII SMP Negeri 2 Kuta Selatan consisted of 10 classes and two classes were randomly selected as samples. The steps that have been done in the sampling of this research are: first, to test the equality of all classes. The equivalence test was conducted by using F-test (ANOVA test). Before determining the sample for this study, the equality of whole classes were tested by giving the students initial test on numeral material to get their score. The score then tested by using test ANOVA test. Based on calculations using the one-way ANAVA test, Fcount is 1.27. For a significance level of 5%, the degree of freedom for the numerator is 9, and the degree of freedom for the denominator is 307, obtained Ftable is 1.91, so Fcount is less than Ftable. This means that H0 is accepted so that groups in the population can be said to have an equivalent average. After obtaining 10 equivalent sample groups, a random sample was taken as a research sample using cluster random sampling technique. From the draw obtained class VII A and VII D. Of the two selected classes are drawn again to determine the experimental group and the control group. Based on the draw results, class VII A was selected as the experimental class and class VII D as the control group. In this study, the independent variable was Flipped Classroom learning model with Powtoon animation media; meanwhile the dependent variable was students' mathematics conceptual understanding and independence of learning.

The instruments were used in data collection of students' mathematics conceptual understanding were a test description (essay), and the data on students' independence of learning using a questionnaire. Conceptual understanding test was used a test of learning materials for junior high math class VII. The material included in these test was Number. Total item of mathematical problem solving test was 8 items. The scoring test of the ability of students' mathematics conceptual understanding was done by scoring in accordance with aspects: (1) describe concepts in their words, (2) identify or give example an non example of concepts, (3) Use concepts correctly in variety situations. Source: (NCTM, 2000). Students' independence of learning questionnaire used is based upon dimensions: (1) metacognition skills, (2) motivation and (3) active participation in learning, with the total items on defense motivation questionnaire was 30 items. Each item contained five answer choices were Always (SL), Frequently (SR), sometimes (KK), Rare (JR), and Never (TP).

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

3. RESULTS AND DISCUSSION

a. Prerequisites Test

The assumption test is does to aim to examine the distribution of the data, the variance between groups, variance-covariance matrix between groups, and the collinearity bound variable. The first assumption test that was done was the normality distribution test of data, the second one was the homogeneity test of variance between groups, and homogeneity matrix test between the variance and the third one was collinearity test.

A. Bivariate Normality Test

The normality distribution test data using the Kolmogorov-Smirnov statistic. The criteria of the data are data have a normal distribution if a significant number that is greater than 0.05, and in other cases the data are not normally distributed. Mechanical analyzes were performed with SPSS 23.0 for window. There was the result summary of the analysis of normality test distribution of students' mathematics conceptual understanding and independence of learning data were presented in Table 2.

Table 2. The Results Summary of the Analysis of Normality Test of Students' Mathematics Conceptual Understanding Ability and Independence of Learning Data

Treatment		Kolmogorov-Smirnova		
		statistics	df	Sig.
Mathematics conceptual Understanding	Flipped Classroom learning model with Powtoon animation media	.127	32	.200
	Conventional learning	.121	32	.200
Independence of learning	Flipped Classroom learning model with Powtoon animation media	.089	32	.200
	Conventional learning	.097	32	.200

Based on Table 2. It was apparent that all Kolmogorov-Smirnov statistic variables was greater than 0.05.

Thus, all the data were normally distributed with the following explanation.

a. For data mathematics conceptual learning in the experimental class of Kolmogorov-Smirnov had a value of 0.127 with 0.200 significance value. The Statistics showed the number of significance greater than 0.05, so it can be stated that the data of mathematics conceptual learning of experimental class was normal distribution.
b. For data of mathematics conceptual learning in the control class Kolmogorov-Smirnov had a value of 0.121 with 0.200 significance value. The Statistics showed the number of significance greater than 0.05, so it can be concluded that the data of mathematics conceptual learning of control class was normal distribution.
c. The independence of learning in experimental class Kolmogorov-Smirnov had a value of 0.089 with 0.200 significance value. The Statistics showed the number of significance greater than 0.05, so it can be concluded that the data of independence of learning in experimental class was normal distribution.
d. For data of independence of learning of control class Kolmogorov-Smirnov had a value of 0.097 with a significance value of 0.200. The Statistics showed the number of significance greater than 0.05, so it can be stated that the data of independence of learning in control class was normal distribution.

B. Homogeneity of Variance Test

Homogeneity test of variance between groups can be done by using statistical Levene. The testing criteria uses the data that has the same variance (homogeneous) if the numbers generated significance greater than 0.05. This homogeneity test using statistical values using Levene test, homogeneity test results based approach applied learning models can be presented in Table 3.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

	F	DF 1	DF2	Sig.
Mathematics Conceptual Understanding	.135	1	62	.715
Independence of Learning	1,107	1	62	.297

Homogeneity test results as shown in Table 3. It was seemed that significant value to the data of students' mathematics conceptual understanding and independence of learning had the significance greater than 0.05, thus the research data above was homogeneous.

C. Homogeneity of Variance Matrix Test

Homogeneity test variance-covariance matrix between the dependent variable using the Box's Test Equality Covariance Matrices with SPSS 23.0 for Window. Homogeneity test was done to the data of group students' mathematics conceptual understanding and independence in learning using Box's test M together. The summary of the results of homogeneity of variance-covariance matrix was presented in Table 4.

Table 4. The homogeneity of variance-covariance matrix test

Box's M	2,249
F	.724
DF1	3
DF2	6,919E5
Sig.	.538

Based on the test result of Table 4.4 Box's M similarity variance-covariance matrix simultaneously generating significant figure of 0.538 is greater than the value of $\alpha = 0.05$. This means that the matrix of variance on variable students' mathematics conceptual understanding and independence of learning were homogeneous.

D. Colinearity Test

Correlation test between dependent variables was carried out to find out the significant correlation between variables mathematics conceptual understanding and independence of learning. To determine the magnitude of the correlation coefficient used product moment analysis with a significance level of 5%. If the significance value> 0.05, then no correlation between the dependent variable and prerequisites is accepted. The summary of the multikolinieritas result test was presented in Table 5.

Table 5. The Summary of the Resultsof Colinearity Test

No	Correlation Data	*Pearson Correlations*	*Signifikansi*	Explaination
1	Correlation between mathematics conceptual understanding and independence of learning on experimental group	0,279	0,122	Tidak berkorelasi
2	Correlation between mathematics conceptual understanding and independence of learning on control group	0,003	0,989	Tidak berkorelasi

Based on Table above it is known that the significant Pearson correlations results in mathematics conceptual understanding and independence of learning of the experimental group students is 0.112 indicating significance is greater than 0.05. So it can be concluded the results of mathematics conceptual understanding and independence of learning of the experimental group are not correlated. For the results of mathematics conceptual understanding and independence of learning of the control group students obtained significant Pearson correlations of 0.989 indicating significance is more than 0.05. So that it can be concluded the results of mathematics conceptual understanding and independence of learning of the control group are not correlated.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

3.2 Hypothesis Testing

The hypothesis testing in this study was to test three hypotheses already formulated previously. Testing is done with the MANOVA test. MANOVA (multivariate analysis of Variance) is a statistical test that is used to measure the effect of categorical independent variables on several dependent variables as well as the quantitative data scale. Multivariate tests or inter-subject tests were carried out on significant numbers from the F statistic values of Pillai's Trace, Wilks Lamda, Hotelling 'Trace and Roy's Largest Root. Significance value smaller than 0.05 means that H0 is rejected, which means there are differences in the dependent variable between groups according to source.

The result of testing the first and second hypothesis can be seen in the results of analysis test of between-subjects analysis effects. The result for displaying the significance value for each unit of analysis is the data of students' mathematics conceptual understanding and independence of learning. There was the statistical test analysis result for test the second and third hypotheses can be presented in Table 6.

Table 6. The Test of Between Subjects Effects

Source	dependent Variable	Type III Sum of Squares	Df	mean Square	F	Sig.
Corrected Model	Mathematics Conceptual Learning	8362.188[a]	1	8362.188	82.547	.000
	Independence of Learning	306.250[b]	1	306.250	12.345	.001
Intercept	Mathematics Conceptual Learning	356065.808	1	356065.808	3.515E3	.000
	Independence of Learning	362000.772	1	362000.772	1.459E4	.000
Class	Mathematics Conceptual Learning	8362.188	1	8362.188	82.547	.000
	Independence of Learning	306.250	1	306.250	12.345	.001
Error	Mathematics Conceptual Learning	6280.739	62	101.302		
	Independence of Learning	1538.039	62	24.807		
Total	Mathematics Conceptual Learning	370708.735	64			
	Independence of Learning	363845.062	64			
Corrected Total	Mathematics Conceptual Learning	14642.927	63			
	Independence of Learning	1844.289	63			

a. R Squared = .339 (Adjusted R Squared = .332)
b. R Squared = .256 (Adjusted R Squared = .247)

A. First Hypothesis Testing

The first hypothesis put forward in research that there are differences in of students' mathematics conceptual understanding between group of student learning with Flipped Classroom learning model with Powtoon animation media and conventional learning model. In statistical hypothesis as follows:

H0: Mathematics conceptual understanding of students between groups of students learning with Flipped Classroom learning model with Powtoon animation media was not better or the same as the group of students who studied with conventional learning model. This hypothesis can be formulated as follows.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

$$H_0 : \mu_{11} \leq \mu_{12}$$

Against

H1: Mathematics conceptual understanding of students between groups of students learning with Flipped Classroom learning model with Powtoon animation media better than group of student learning with conventional learning model. This hypothesis can be formulated as follows.

$$H_1 : \mu_{11} > \mu_{12}$$

Hypothesis 1 were tested against the test of between-subjects effects that H0, where the criteria stated that Ho is rejected if the significance level of F was smaller than 0.025. Based on figures obtained Table 6. F statistic was equal to 82.547and the number sig. 0.000 <0.025. So the null hypothesis (H0) was rejected and it could be concluded that students' mathematics conceptual understanding among groups of students learning with Flipped Classroom learning model with Powtoon animation media was better than group of student learning with conventional learning model. The average mathematics conceptual understanding of students learning group with conventional learning model.

B. Second Hypothesis Testing

The third hypothesis proposed in the study that there is a difference between students' independence of learning between group of student learning with Flipped Classroom learning model with Powtoon animation media and group learning with conventional learning model. In statistical hypothesis as follows:

H0: Independence in learning between groups of students learning Flipped Classroom learning model with Powtoon animation media was not better or the same as the group of student who studied with conventional learning model. This hypothesis could be formulated as follows.

$$H_0 : \mu_{21} \leq \mu_{22}$$

Against

H1: Independence in learning between groups of students learning Flipped Classroom learning model with Powtoon animation media was better rather than group of student learning with conventional learning model. This hypothesis could be formulated as follows.

$$H_1 : \mu_{21} > \mu_2$$

Hypothesis 3 tested against the test of between-subjects effects that H0, where the criteria states that H0 was rejected if the significance level of F is smaller than 0.025. Based on figures obtained Table 6. F statistic was equal to 12.345 and the number sig. 0.000 <0.025. So the null hypothesis (H0) was rejected and it can be concluded that between students' independence of learning between group of student learning with Flipped Classroom learning model with Powtoon animation media better than group of student learning with conventional learning model. The average *between students' independence of learning between group of student learning with Flipped Classroom learning model with Powtoon animation media was greater that compared with the group of student learning with conventional learning model.*

C. Third Hypothesis Testing

The result of the multivariate analysis of third hypothesis on the data of this study was presented in Table 7.

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Table 7. Summary of Multivariate Testing Multivariate Testsa

Effect		Value	F	Hypothesis Df	Error Df	Sig.
Intercept	Pillai's Trace	.996	8.145E3[a]	2.000	61.000	.000
	Wilks' Lambda	.004	8.145E3[a]	2.000	61.000	.000
	Hotelling's Trace	267.058	8.145E3[a]	2.000	61.000	.000
	Roy's Largest Root	267.058	8.145E3[a]	2.000	61.000	.000
Class	Pillai's Trace	.587	43.396[a]	2.000	61.000	.000
	Wilks' Lambda	.413	43.396[a]	2.000	61.000	.000
	Hotelling's Trace	1.423	43.396[a]	2.000	61.000	.000
	Roy's Largest Root	1.423	43.396[a]	2.000	61.000	.000

a. Design: Intercept + Class
b. Exact statistics

The third hypothesis put forward in the study of students' mathematics conceptual understanding and independence of learning between groups of students learning with the Flipped Classroom learning model with animation media Powtoon better than group learning with conventional model. In statistical hypothesis as follows:

H0: mathematics conceptual understanding and independence of learning between groups of students learning with the Flipped Classroom learning model with animation media Powtoon was not better than a group of students learning with conventional learning model. This hypothesis can be formulated as follows.

$$\pi_1 \begin{bmatrix} \mu_{11} \\ \mu_{21} \end{bmatrix} \sim \begin{bmatrix} \mu_{12} \\ \mu_{22} \end{bmatrix}$$

Against

H1: mathematics conceptual understanding and independence of learning between groups of students learning with the Flipped Classroom learning model with animation media Powtoon was better than group of students learning with conventional learning model. This hypothesis can be formulated as follows.

$$\pi_1 \begin{bmatrix} \mu_{11} \\ \mu_{21} \end{bmatrix} \sim \begin{bmatrix} \mu_{12} \\ \mu_{22} \end{bmatrix}$$

The hypothesis was tested that Ho is rejected criterion states that if the level of significance to Pillai's Trace, Wilk's lambda, Hotelling's Trace, and Roy's Largest Root smaller than 0.025. Based on figures obtained Table 7. F statistic is equal to 8.145 and 0.000 significance figure of less than 0.025 to Pillai's Trace, Wilk's lambda, Hotelling's Trace, and Roy's Largest Root. So the null hypothesis (Ho) is rejected and it can be concluded that students' mathematics conceptual understanding and independence of learning between groups of students learning with the Flipped Classroom learning model with animation media Powtoon better than groups of students learning with conventional learning models.

4. CONCLUSION

Based on data analysis and hypothesis testing that has been done, it appeared that, (1) the ability to understand mathematical concepts of students who take learning with the flipped classroom model assisted by Powtoon animation media is better than students who take conventional learning method, (2) the independence of learning of students who take learning with the flipped classroom model assisted by the Powtoon animation media than

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students who follow conventional learning method, and (3) the ability to understand mathematical concepts and the learning independence of students who take lessons with the flipped classroom model assisted by Powtoon animation media is better than students who follow conventional learning method.

This is because students who take part in learning with the flipped classroom model assisted by the Powtoon animation media are more enthusiastic about learning in class because they have previously studied the material with the videos in their homes. Students are also trained to re-express their understanding with group discussions.

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REFERENCES

[1] Bergmann, J., & Sams, A. 2012. Flip Your Classroom Reach Every Student in Every Class Every Day. Eugene, OR: InternationalSociety for Technology in Education.
[2] Desmita. 2009. Psikologi Perkembangan Peserta Didik. Bandung: PT. Remaja Rosdakarya.
[3] Hudojo, H. 2003. Common Textbook: Pengembangan Kurikulum dan Pembelajaran Matematika. Malang: IMSTEP.
[4] Ibrahim dan Suparni. 2008. Strategi Pembelajaran Matematika. Yogyakarta: Bidang Akademik UIN Sunan Kalijaga.
[5] Kilpatrick, Swafford, dan Findell. 2001. Helping Children Learn Mathematics. Tersedia pada http://nap.edu/9822 (diakses pada 13 Juni 2019)
[6] NCTM. 2000. Principle and Standards for School Mathematic. Reston, VA, USA: National Council of Teacher Mathematics.
[7] Nur, I.R.D. 2016. Meningkatkan Kemampuan Berpikir Kreatif Matematis dan Kemandirian Belajar Siswa dengan Menggunakan Model Pembelajaran Brain Based Learning. Jurnal Pendidikan Unsika. Volume 4, Nomor 1, Halaman 26-41.
[8] Parwati. 2016. Studi Kuantitatif dan Kualitatif tentang Pengaruh Model Pembelajaran Quantum Teaching Berbantuan Media Animasi Powtoon terhadap Pemahaman Konsep Matematika Siswa Kelas VIII SMP Negeri 1 Singaraja.
[9] Skripsi (tidak diterbitkan). Jurusan Pendidikan Matematika, Universitas Pendidikan Ganesha.Pintrich, A.G. &Groot, V.D. 1990. Motivational and Self-Regulated Learning Components of Classroom Academic Perfomance. Journal of Education Psychology. 82 (1): 33-40).
[10] Saputra, J. 2017. Model Problem Based Learning Berbantuan E-Learning Terhadap Kemandirian Belajar Mahasiswa Pada Dimensi Tiga. KALAMATIKA; Jurnal Pendidikan Matematika, Volume 2, No. 2, Hal. 117 – 130.
[11] Sardiman. 2010. Interaksi dan Motivasi Belajar Mengajar. Jakarta: PT Rajagrafindo Persada.
[12] Sugiharni, Gusti Ayu. 2015. "Perbedaan Pengaruh Pengaruh Model Creative Problem Solving (Cps) Berbantuan Media Pembelajaran Interaktif Terhadap Kemampuan Pemecahan Masalah Dan Disposisi Matematis Peserta Didik Kelas Viii Smp Pgri 3 Ubud". Tesis Pada Pasca sarjana Universitas Pendidikan Ghanesha: Singaraja.
[13] Suherman, E., dkk. 2003. Strategi Pembelajaran Matematika Kontemporer. Bandung: JICA.
[14] Sumarmo, U. (2011). Kemandirian Belajar: Apa, Mengapa dan Bagaimana Dikembangkan pada Peserta Didik. Makalah FPMIPA UPI.
[14] Yamin, Martinis. 2008. Desain Pembelajaran Berbasis Tingkat Satuan Pendidikan. Jakarta: Gaung Persada Press.
[15] Zimmerman, Barry J. 2002. Becoming a Self-Regulated Learner: An Overview. Jurnal The Ohio State University College of Education Vol. 41 Nomor 2.