

The improving mathematical reasoning ability of Junior High School Students using the Constructivism Approach assisted by animation videos

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ABSTRACT

The purpose of this study was to determine the increase in mathematical reasoning abilities of junior high school students using a constructivism approach assisted by animated videos on the comparison material of class VII MTsS Jabal Nur. The approach used in this research is a quantitative research approach with a quasi-experimental type of approach. The population in this study were all students of class VII consisting of 10 classes and the sample used was class VII-5 as the experimental class as many as 25 students and class VII-6 as the control class as many as 26 students. The experimental class students were taught using a constructivism approach assisted by animated videos, while the control class was taught using a scientific approach. The data was collected by giving a pretest-posttest and the data were analyzed using the t-test and obtained a result of 0.00. In accordance with the test criteria, the value in the sig column < 0.05 then H_0 is rejected. From the statistical significance of the t-test is 0.00 less than 0.05. Then H_0 is rejected, H_a is accepted. The results of the analysis of student responses to constructivism approach learning assisted by animated videos show that the overall average is in the very good category. This shows students that using a constructivism approach assisted by animated videos gets a positive response from students. The learning process using this approach can improve students' abilities in learning mathematics and can increase students' desire to learn and student activity.

INTRODUCTION

Mathematics is a science that studies calculations, studies and uses reason or one's thinking ability logically and with a clear mind. Mathematics is also called the queen because, in its development, mathematics has never depended on other sciences. However, mathematics provides services to branches of science to develop themselves, both in the form of theory and in the form of applications. Many applications in various disciplines, using mathematics, especially in the aspect of mathematical reasoning. The purpose of learning mathematics in the current curriculum states that students have the ability to use reasoning.

The reasoning ability in question is the ability of students to think logically according to their mathematical knowledge through the process of identifying, proposing conjectures, determining, connecting and identifying all information carried out in problem solving (Isnurani, 2018: 21). The Ministry of National Education stated that the asp-

ects of mathematics assessment in report cards are grouped into three aspects, namely conceptual understanding, reasoning and communication, and problem solving. Therefore, mathematical reasoning ability is an important thing that must be possessed by students because reasoning ability is the basis of learning mathematics. An active mathematical process is called the systematic use of mathematical tools to find patterns, problem frameworks, and apply the reasoning process.

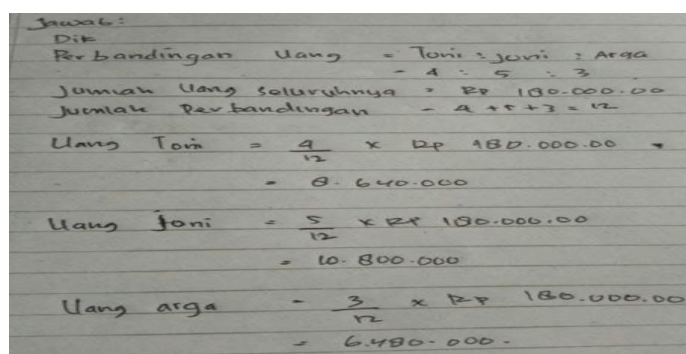
According to Sukmasari (2016:2) reasoning is a thinking activity that relies on the theory of cognitive development. Thus, mathematics teachers should develop students' reasoning abilities in the mathematics learning process, but the reality in the field based on the results of research on reasoning abilities is still very lacking, as stated by a research report Riyanto (2011:113) found that the quality of students' reasoning abilities and understanding of mathematics was not satisfactory, namely approximately

49% and 50% of the ideal score, respectively. Especially for comparative material, the results of the study show that students' reasoning in comparison ideas is still very lacking.

However, based on the results of interviews with mathematics teachers at the Jabal Nur MTsS school on September 18, 2020 the teacher said that only 50% to 55% of class VII students were able to solve reasoning problems in the form of stories correctly. In addition, it was also stated that students' reasoning abilities on all materials were still relatively low, including comparison materials, the cause of the lack of students' mathematical reasoning abilities in the learning process was because students were not able to provide explanations using models, facts, traits and relationships and students also not able to do mathematical manipulation and not only that but students are also not able to draw logical conclusions, especially on comparative materials.

The cause is the model used by the teacher, namely the lecture model. So that student responses tend to be less active, only part of which responds to learning due to obstacles such as students falling asleep in class on the grounds of being tired and not getting enough sleep so that the factors that occur are that students are unable to answer questions and there are still students who do not understand so that it must be explained repeatedly. By the teacher. Based on the results of observations with students at MTsS Jabal Nur, it was found that students' reasoning abilities were still relatively low in solving problems in the form of stories. Students are able to understand the questions but are not able to answer the questions correctly.

For example, in the task of questioning: the amount of money Toni, Joni, Arga is IDR 180,000. If the ratio of Toni, Joni, and Arga's money is 4:5:3 respectively. Determine how much money each of them?



Jawab:
 Dik
 Perbandingan Uang = Toni : Joni : Arga
 = 4 : 5 : 3
 Jumlah Uang seluruhnya = Rp 180.000.00
 Jumlah Perbandingan = 4 + 5 + 3 = 12
 Uang Toni = $\frac{4}{12} \times \text{Rp } 180.000.00$
 = 8.400.000
 Uang Joni = $\frac{5}{12} \times \text{Rp } 180.000.00$
 = 10.800.000
 Uang Arga = $\frac{3}{12} \times \text{Rp } 180.000.00$
 = 6.480.000

Figure 1. Results of student answers

In Figure 1 above, it can be seen that students are able to imagine what is known and what is developed from the problem, meaning that students can understand the problem, but students are not able to solve the problem correctly. This is because students tend to be wrong in answering questions when doing comparisons and the

results of the answers are stated. It can be said that students are able to use models, facts, properties and relationships but students are not very able to manipulate and draw logistical conclusions.

Based on the test results above, it can be stated that the students' mathematical reasoning ability is still relatively low. One of the factors that can improve students' mathematical reasoning abilities is using a constructivism approach assisted by animated videos. According to Mulyati (2020: 5) the constructivism approach is an approach that views individuals who actively build their own knowledge by entering and working on it, in the learning process to the real world continuously, so that facts and skills are holistic and there is a connection process of knowledge and skills. New skills into previously owned knowledge and skills.

According to Sugrah (2019:121) the constructivism approach is a theory that gives freedom to humans who want to learn or seek their needs with the ability to find their desires or needs with the help of others, so this approach provides activity for humans to learn to find their own competencies, knowledge, and skills. Or technology and other things needed to develop itself. According to Novia (2013:1094) constructivism approach is an approach to improve students' mathematical reasoning abilities in learning mathematics with a constructivist approach, students construct their own knowledge in their minds both individually and with friends (discussion) in an effort to develop reasoning abilities, for the development of reasoning abilities. Should be in the form of group discussions.

From the results above, it can be concluded that the lack of reasoning abilities of students at school occurs because the majority of teachers in the class when teaching still use the lecture model which makes students tend to be passive and fall asleep during the learning process so that it will make teaching ineffective. From this, researchers are interested in developing interactive learning media, namely animated videos. Animated video is a medium that provides a moving image display in the learning process which can later attract the attention of students in the learning process, where in its use it is assisted by a guide or teacher (Pranesti, 2016: 3).

Based on research conducted by Sudiarta (2016: 56) regarding the development of animated video media with blended learning assisted by animated videos on students' problem-solving abilities and conceptual understanding. It is found that the understanding of mathematical concepts and problem-solving abilities of students who follow the video-assisted blended learning model is better than the understanding of mathematical concepts and problem-solving abilities of students who take conventional learning. In addition, because the video-assisted blended learning model has a positive effect and the presence of

animated videos, students are more active, have higher curiosity, are more motivated, and enthusiastic in learning mathematics compared to students who take conventional learning. Therefore, the same thing happened with the research conducted by Putra (2018: 78) which said that the development of macromedia flash-based animation learning media on trigonometry material got very interesting response results. Therefore, researchers will use animated videos as a medium that makes students love learning mathematics. Based on the problems above, it is necessary to conduct a study entitled “The improving students’ mathematical reasoning ability using a Constructivism Approach assisted by animation videos on comparative materials for Class VII MTsS Jabal Nur students”.

METHODS

This study uses a quasi-experimental design, because the researcher applies an action in the form of applying a constructivism approach in a mathematics lesson where the object of research, namely students, cannot be controlled by the researcher. In this study, what is needed is data that describes the ability of students without giving treatment and data obtained after teaching by giving treatment. The research approach used in this study is a quantitative approach. Quantitative research is one type of research activity whose specifications are systematic, well-planned, and clearly structured from the beginning to the making of research designs, both regarding research objectives, research subjects, research objects, data samples, data sources, and methodologies. As the name

implies quantitative research involves itself in calculations or numbers or quantities. In this research design, the non-equivalent control group design was used. According to Sugiyono (2017: 79) in this study there will be two groups that are not chosen randomly. Both were then given a pretest to determine the initial state and the difference between the experimental group and the control group. A good pretest result is when the value of the experimental group in the control group is not significantly different.

Table 1. Non-equivalent control group design.

Groups	Pretest	Treatment	Posttest
Experiment	O ₁	X	O ₂
Control	O ₃		O ₄

(Source: modification from Sugiyono, 2017: 79).

Informations:

X = Treatment in the experimental class in the form of learning by using

Animated video-assisted constructivism approach

O₁ = Pretest experimental class

O₂ = Posttest experimental class

O₃ = Pretest control class

O₄ = Posttest control class

The place of this research was conducted at MTs Jabal Nur. Jl Mesjid BTN Arun, Dewantara, Uteun Geulinggang, Dewantara, North Aceh Regency. And when the research was carried out in the odd semester of the 2020/2021 school years.

Table 1. Research Implementation Schedule

Aspect	Month																
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
Observation	■																
Submission of proposals	■																
Proposal seminar		■															
Proposal revision			■	■	■	■	■	■	■	■	■	■					
Making learning instruments												■	■				
Question test validation													■	■			
Study														■	■	■	
Processing data																■	■
Scripting																	■
Thesis Defence																	■

Population is all individuals who become a sampling, either in the form of people, goods, or events. Arikunto (2006:130) states that the population is the entire research subject. While the population according to Sugiyono (2017: 80) is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined

by researchers to study and then draw conclusions based on interests in research. So, the population in this study were all seventh grades students in even semesters at MTsS. The sample is part of the total population selected for the data source. Meanwhile, according to Sugiyono (2016:81) the sample is part of the number and

characteristics possessed by the population. The sampling technique chosen by the researcher is a non-probability sampling technique. The conclusion is that the samples that the researchers chose in this study were students of class VII-5 and class VII-6 with class VII-5 students as experiments who received treatment by being taught using a constructivism approach assisted by animation videos, and class VII-6 students as the control class. Which did not receive treatment and were not taught using a constructivism approach assisted by comparison videos.

Research is a tool used to collect data in a study. The research instrument according to Sugiyono (2016:102) is “a tool used to measure the observed natural and social phenomena”. The data in this study were obtained using three kinds of research instruments, namely: tests and questionnaires. Further explanation of the instruments in this study are as follows: Mathematical reasoning ability test and the scoring of students’ mathematical reasoning abilities used the rubric of mathematical reasoning ability assessment.

Table 2. Criteria for Assessment of Mathematical Reasoning Ability

Indicators of Mathematical Reasoning Reaction to Problems Score Question number	Indicators of Mathematical Reasoning Reaction to Pro	Score	Question number
Provide an explanation using models, facts, properties and relationships	No answer	0	Question 1
	Does not provide an explanation using models, facts, properties and relationships and performs calculations but is wrong	1	
	Does not provide explanations using models, facts, properties and relationships and performs calculations correctly	2	
	Give an explanation using models, facts, properties and relationships and perform calculations but are wrong	3	
	Provide an explanation using models, facts, properties and relationships and perform calculations correctly	4	
2. Perform mathematical manipulation	No answer	0	Question 2 and 3
	Unable to write down what is known from the problem and relate what is asked	1	
	Can write down what is known and asked, but cannot solve the problem	2	
	Can write down what is known and what is asked, but it is not appropriate in solving problems	3	
	Can write down what is known and what is asked, and can solve questions correctly	4	
Draw logical conclusions	No answer	0	Question 4 and 5
	Not Draw logical conclusions and do calculations but wrong	1	
	Do not draw logical conclusions and do calculations correctly	2	
	Draws logical conclusions and performs calculations but is wrong.	3	
	Draw logical conclusions and perform calculations correctly	4	

Source: (Modification of Thomson, 2006).

After the test scoring guidelines rubric, then the questionnaire sheet is a data collection technique carried out by giving a set of questions or written statements to respondents to answer (Sugiyono, 2016:142). Observation is a systematic observation and recording of the symptoms that appear on the object of research. Observation is a data collection method that uses observations of research objects that can be carried out directly or indirectly (Sugiyono, 2016:144).

N-Gain Test

The advantages of using the model in improving mathematical reasoning abilities are reviewed based on the comparison of the normalized gain value (N-gain), between the experimental group and the control group (Besti, 2017:43-44).

$$N-Gain = \frac{\text{Score posttest} - \text{Score pretest}}{\text{Score ideal} - \text{Score pretest}}$$

Table 3. N-Gain Test Criteria

Skor Gain	Interpretation
$g \geq 0,7$	Tall
$0,3 \leq g < 0,7$	Currently
$g > 0,3$	Low

Source: (Jannah,2018:50).

Normality test

Normality test is used to determine whether the data used is normally distributed or not. The data obtained will be analyzed using the SPSS Statistics 18 program.

If the significant value is < 0.05 then H_0 is Rejected

If the significant value is 0.05 , then H_0 is accepted

The method of data acquisition is that students are given a test (posttest). The data obtained from the test results are then analyzed to determine whether the results are in accordance with the expected hypothesis.

The operational hypothesis is:

$H_0 : \mu_1 \neq \mu_2$ The average increase in the mathematical reasoning ability of junior high school students using a constructivism approach assisted by animation video is not significantly different from the mathematical reasoning ability of junior high school students who use a scientific approach.

$H_0 : \mu_1 = \mu_2$ The average increase in the mathematical reasoning ability of junior high school students using a constructivism approach assisted by animation video was significantly better with the mathematical reasoning ability of junior high school students using a scientific approach.

conducted in the even semester of 2021 on January 10 to January 31, 2021 in class VII MTsS Jabar Nur Aceh Utara. The study involved two classes, namely VII-5 as the experimental class and class VII-6 as the control class, where the two classes were treated differently. Meanwhile, the experimental class was treated by applying a constructivism approach with the aid of animation video, while the control class applied a scientific approach. The instruments used in this study were tests and non-tests. The test instruments in the form of pretest and posttest were given to students in the experimental class and the control class. Meanwhile, the non-test instrument was in the form of a questionnaire that the researchers compiled and gave tests to the experimental class students after the learning process took place with a constructivism approach assisted by animated videos which aimed to determine student learning outcomes during the mathematics learning process.

RESULTS

This study aims to find out the improvement of students' mathematical reasoning abilities using a constructivism approach assisted by animated videos. This research was

Table 4. Results of the Analysis of Students' Mathematical Reasoning Ability Test Items

No. questions	Validity	Reliability	Difficulty Level	Distinguishing Power	Descriptions
1	Valid	Very high	Currently	Enough	Used
2	Valid		Currently	bad	No used
3	Valid		Currently	Good	Used
4	Valid		Currently	Enough	Used
5	Valid		Hard	Enough	Used
6	valid		Currently	Good	Used

Furthermore, data processing analysis will be carried out on the results of students' mathematical reasoning ability tests using the SPSS statistics 21 application. The first thing to do is to analyze descriptive statistics which aims to see an overview of the achievement of mathematical reasoning ability test results consisting of the average and standard deviation. Then a differential

statistical analysis was carried out on the achievement of these results with homogeneity tests and hypothesis testing. The following table describes descriptive data of pre-test, post-test and normalized N-gain for the mathematical reasoning ability test. The results of the pretest and posttest scores as well as the N-Gain data can be seen in table 5.

Table 5. Descriptive Statistical Data of Students' Mathematical Reasoning Ability

Variable	Class Experimental			Class control		
	Pretest	Posttest	Ngain	Pretest	Posttest	Ngain
N	25	25	25	26	26	26
X Min	0	12	-,01	0	11	-,01
X Maks	14	20	0,20	0	19	0,20
X Bar average	8,44	18,80	0,1123	5,46	10,62	0,0544
S	3,343	2,160	0,06107	2,420	4,657	0,06107
Maximum Score 20						

Based on the from table 5 above, a diagram that compares the average pretest and posttest scores can be made as shown in figure 2.

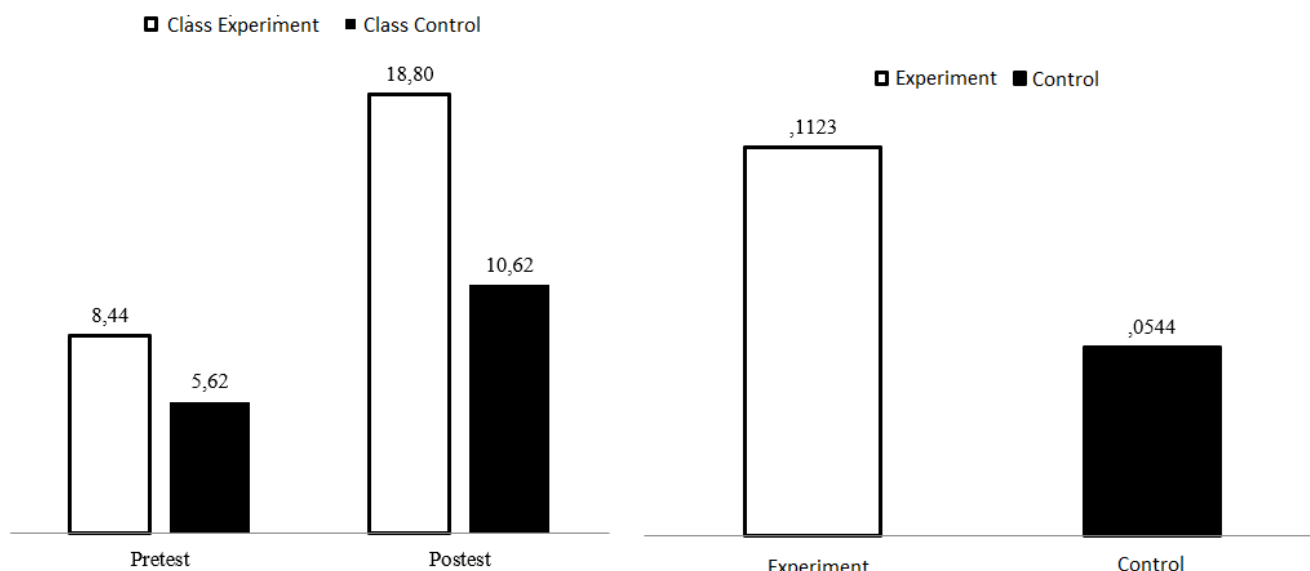


Figure 2. Mean Scores of Pretest, Posttest and N-Gain of Mathematical Reasoning Ability

Based on table 3 above, it can be seen that the average pretest mathematical reasoning ability of the experimental class and the control class got a value of 8.44 and 5.46 from the ideal maximum score of 20. The average pretest of the two classes is not too much different, this shows that the students' mathematical reasoning ability at the two classes before learning were relatively the same. The calculation results can be seen from table 6.

The normality test of the N-Gain score in this study was calculated by the Shapiro-Wilk test. From table 6 above, it can be seen that the N-Gain score of students' mathematical reasoning abilities in the experimental class and control class has a value of Sig ($\alpha = 0.05$) so that H_0 is accepted. This shows that the n-gain score data for mathematical

reasoning abilities of experimental and control class students are normally distributed. The results of the normality test when presented in graphical form are as follows:

Table 6. Normality Test Data Score N-Gain Mathematical Reasoning Ability

	Shapiro-Wilk			Conclusion
	Statistic	df	Sig.	
Experiment	0,971	25	0,664	H_0
Control	0,957	26	0,335	Accepted

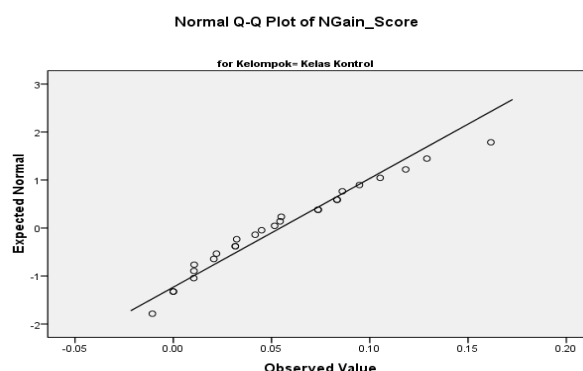
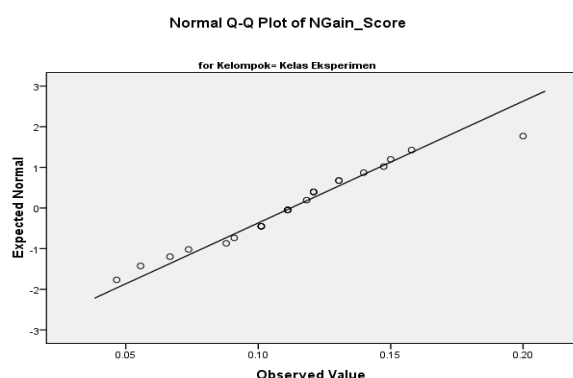


Figure 3. Graph of Normality Test Results of Mathematical Reasoning Ability in Experiment Class and Control Class

From graph 3, you can see a straight line from the bottom left to the top right. From the graph above, it can be seen that the data is spread around a straight line. So it can be concluded that the data of the pretest, posttest and mathematical reasoning ability data of the experimental class and control class came from a normally distributed population.

Table 7. Data of Homogeneity Test Results N-Gain Score Mathematical Reasoning Ability

	Levene Statistic	df1	df2	Sig.
Based on Mean	3,064	1	49	0,086

From table 7 above, it can be seen that the N-Gain score of students' mathematical reasoning abilities has a value of Sig = 0.05 so that is H_0 accepted. This shows that the data score of the N-Gain score of students' mathematical reasoning abilities between the experimental class and the control class is homogeneous.

The average n-gain comparison test in this study uses a t-test which aims to see whether there is an increase in mathematical reasoning abilities between students who get a constructivism approach assisted by animation videos better than those who get a scientific approach.

To test the research hypothesis proposed above, the statistical hypothesis is formulated as follows:

$H_0: \mu_1 = \mu_2$: The average increase in mathematical reasoning abilities of junior high school students who are taught using a constructivism approach assisted by animated videos on comparative material is not significantly different from the mathematical reasoning ability of junior high school students who are taught using a scientific approach.

$H_a: \mu_1 > \mu_2$: The average increase in mathematical reasoning ability of junior high school students who are taught using a constructivism approach assisted by animated videos on comparative material is significantly better with the mathematical reasoning ability of junior high school students who are taught using a scientific approach

Descriptions : μ_1 = the average of the N-Gain data on the mathematical reasoning ability of the experimental class students

μ_2 = average N-Gain of control class students' mathematical reasoning ability

The test criteria:

If the value of Sig (p-value) $< (\alpha = 0.05)$, then H_0 is rejected

If the value of Sig (p-value) $(\alpha = 0.05)$, then H_0 is accepted

Table 8. Data on the results of the comparison of the average n-gain mathematical reasoning ability

	T	Df	1-Tailed	Conclusion
Equal variances assumed	5,262	49	,000	H_0 accepted

Based on the results of the comparison test for the average N-Gain above, it was found that Sig (1 tailed) got a score of $0.00 < \alpha = 0.05$. This shows that H_0 is rejected, meaning that the increase in the mathematical reasoning ability of junior high school students who receive animation-assisted constructivism approach learning is better than those who receive scientific approach learning, thus it is proven that the hypothesis which states that the increase in students' mathematical reasoning ability who

gets the assisted constructivism approach animated videos are better than students who get a scientific approach.

DISCUSSIONS

This study was conducted to determine the mathematical reasoning ability of junior high school students who received a constructivism approach assisted by animated videos was better than students who received a scientific approach, the improvement of mathematical reasoning abilities of junior high school students who received a constructivism approach assisted by animated videos was better than students who received a scientific approach and knowing the results of the student response questionnaire during mathematics learning by using a constructivism approach assisted by animated videos. The increase in students' mathematical reasoning ability results from the normalized N-Gain score. While the normalized N-Gain scores were obtained from the pretest and posttest scores of each experimental class and control class. The N-Gain of experimental students or students who take lessons using a constructivism approach assisted by animated videos with a score of 0.1123 is higher than students who receive scientific learning with a score of 0.544. The results of the calculation of the results of the t-test or the comparison of the average n-gain above, it was found that Sig (1 tailed) got a score of $0.00 < \alpha = 0.05$. This shows that H_0 is rejected, meaning that the increase in mathematical reasoning abilities of junior high school students who receive an animation-assisted constructivism approach is better than those who receive a scientific approach, thus it is proven that the hypothesis which states that an increase in the mathematical reasoning ability of students who receive a video-assisted constructivism approach animation is better than students who get a scientific approach learning.

The results of the analysis of student responses to the constructivism approach assisted by animated videos show that the overall average is in the very good category. This shows students that by using a constructivism approach assisted by animated videos, students get a positive response. The learning process using this approach can improve students' ability to learn mathematics and can increase students' learning desire and student activity. The data from the student response questionnaire results show that 14 aspects are in the very good category and 1 aspect is in the good category. Based on the results of the research, there was an increase between those who studied using a constructivism approach assisted by animated videos and did not use animated videos. The improvement of mathematics learning outcomes in this experimental class uses animated videos during learning so that students' curiosity in learning arises, they are motivated and students' enthusiasm which causes increased pleasure, attention, willingness, and students can develop reasoning abilities in solving existing problems. in students' thinking.

So that there is an increase in the mathematical reasoning ability of junior high school students who get a constructivism approach assisted by animation videos better than students who get a scientific approach.

This finding is in line with the results of research by Riyanto (2011) which states that there is an effect of the learning approach on student achievement, namely student achievement in learning with the constructivism approach is better than the conventional approach and is also in line with the findings of Gusmania (2018) which states that there are differences in effectiveness in the use of learning media with video-based and not using the media in conventional learning to the understanding of mathematical concepts of seventh grade students of SMPN 20 Batam. Learning using video media can be said to be effective than learning without using media seen from the posttest results of understanding mathematical concepts which show that the average of the experimental class is higher than the control class. In this section, several issues related to this research will be described, namely the constructivism approach, video animation, and reasoning abilities. The complete description will be presented in the form of the following discussion.

Constructivism Approach

The constructivism approach is an approach that builds students' knowledge by linking existing knowledge to students with new knowledge in active learning to find their own knowledge, while the teacher only acts as a facilitator. Constructivism approach is an approach that can involve students actively in groups from the beginning of learning activities to the end of learning activities. Activities that involve active students really need communication and reasoning in each group member in the learning process, therefore the constructivism model is very suitable to see students' mathematical reasoning. Like the steps of the constructivism approach model:



Figure 4. Learning Process in Experiment Class

At this stage the teacher conveys material using a constructivist approach by displaying animated videos using laptops and focusing on students in grades VII-5. The teacher comparison material displays animated videos so that students pay attention to the video so that they are

able to answer the questions that will be given at the next stage the teacher gives pretest-posttest questions for each experimental class and each student answered the questions.



Figure 5. Learning Process in Control Class

At this stage the teacher conveys the material using a scientific approach and does not use animated videos to the students of class VII-6 comparative material. The teacher expects students to be able to answer the questions that will be given at a later stage, the teacher gives pretest-posttest questions for each experimental class and each student answers the questions related to comparative material.

CONCLUSIONS

Based on the results of research on seventh grade students of MTsS Jabar Nur in the 2020-2021 lesson, the following conclusions were drawn: (1) The mathematical reasoning ability of junior high school students using a constructivism approach assisted by animation videos was better than the mathematical reasoning ability of junior high school students using a scientific approach on comparative material. In class VII MTsS Jabar Nur. And (2) The results of the recapitulation of student response questionnaires show that from 15 statements there is one question that is dominantly good while the other fourteen questions are dominantly very very good. Based on the analysis using a questionnaire, the overall student response showed very good. This means that students respond very well to learning mathematics using a constructivism approach assisted by animated videos with a constructivism approach assisted by animated videos making students more interested and more active in the learning process.

SUGGESTION

Based on the results of late research, there are several suggestions from the author, namely: (1) The constructivism approach assisted by animated videos has a positive influence on students' mathematical reasoning abilities. Therefore, it is expected that mathematics teachers can apply a constructivism approach assisted by animated videos as an effort to improve students' reasoning abilities at school, especially in mathematics, (2)

It is hoped that students will be more active in learning and improve reasoning abilities in everyday life. (3) It is hoped that there will be further research to determine the level of students' mathematical reasoning abilities using a constructivism approach assisted by animated videos

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Conflict of Interest

The authors declare that they have no competing interests.

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