THE EFFECT OF USING CABRI 3DV2PLUS SOFTWARE WITH COOPERATIVE INTERACTION SETTING LEARNING MODEL ON STUDENTS' MATHEMATICAL UNDERSTANDING IN TRANSFORMATION MATERIALS

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Abstract: This study is aimed at identifying the effect of using Cabri 3DV2Plus software with a learning model of cooperative interaction settings of students who get conventional learning seen from the level of students' abilities (high, medium, or low). The research uses a quasi-experimental method. The population in this study were students of class XI. The sampling technique was done by random sampling, and a sample of 182 students was obtained. The instrument used in this study was a test of mathematical understanding. The data collection techniques for mathematical understanding were carried out by giving a pretest and a posttest. The statistical analysis carried out was a normality test and a homogeneity test as a condition for taking the treatments, and a t-test to see the average difference in each class. From the t-test, the t_{count} and t_{table} values were obtained respectively. $t_{count1} = 11.20 \geq t_{table} = 2.042$, $t_{count2} = 9.819 \geq t_{table} = 2.042$, and $t_{count3} = 4.861 \geq t_{table} = 2.042$ then overall H_0 is rejected; meaning that there is influence of using Cabri 3DV2Plus software with the learning model of cooperative interaction settings of students who get conventional learning in terms of the level of students' ability (high, medium, or low).

Keywords: *Cabri 3DV2Plus Software, Cooperative Interaction Setting Learning, Students' Mathematical Understanding*

INTRODUCTION

The role of technology today can be felt in various fields of science. In the field of education, especially in the learning process, the use of information technology in learning has a great impact and is very helpful for teachers in delivering teaching materials. The increasingly advanced use of information technology requires teachers to understand and master pedagogical competencies including information technology as an effort to achieve contemporary learning goals (Sudarsana, 2018). Contemporary learning is a learning process that helps facilitate the ability of students to access structured, effective, efficient and systematic information needed in learning in accordance with the applicable curriculum (M. Salman A.N., 2017). One example of contemporary learning is the use of information technology in the form of computer devices, software, internet networks as a medium to assist teachers and students in achieving learning goals. The teacher designs learning effectively, creatively and innovatively. The design starts with learning plans, preparation of learning instruments, implementation of the learning process until the assessment of students' activity results. The design is useful so students can learn more meaningfully.

Computers have provided great benefits for human life, especially in the field of education. The use of computer media that has developed is not only a means that can help with administrative matters, but also can be used as an alternative means of learning media especially in mathematics learning. The use of computers in the form of multimedia that can display the design of images, graphics, and texts that are motionless and moving, and sound - should now be used as an alternative choice of effective and efficient learning media to achieve learning goals (Alan, 2017). Teachers need to respond to this positively so that computers can be one of the instruments that help them in developing the lesson and facilitate the process of delivering materials to students.

In learning, learning experiences can help students shape and improve their understanding when supported by IT-based media. The software used is part of a computer that can support students' mathematical understanding to convert abstract mathematical objects into concrete ones. Learning media that are used to convey material will function well if the media can provide meaningful and acceptable experiences for students, thus giving a pleasant impression to students and making students more active.

The researchers conducted an analysis on the learning outcomes of 32 students given the subject matter of transformation in conventional learning. The results of the analysis showed that only 10.62% of students were able to identify and analyze, 15.62% of students could understand the meaning and concept of the material. The ability to determine problems and express ideas was only owned by 16.67% of students, while the ability to determine solutions to problems was only owned by 15.63%. The findings above show that the ability of mathematical understanding of students who study with conventional methods is still low. The conventional method is still considered lacking to make students understand in learning mathematics. In addition, the conventional method does not make students active in understanding the problems presented in a subject matter. Meanwhile, learning geometry is not enough if done by conventional methods. There needs to be tools to help students visualize abstract geometric objects to be more concrete.

This is in line with BNSP which states that the low absorption of students about 38.88% is due to students lacking of new media or methods when studying mathematics (BSNP, 2017). Moreover, in transformation materials, students still have difficulty in learning and understanding the concepts of transformation (Putra 2015).

Several studies that shows the effectiveness of computer use in improving students' mathematical understanding include the researches conducted by Bitter & Hatfield, Hambree & Deasart, Kuli, and Liao that found strong evidence that technological empowerment in mathematics learning can improve the quality of learning (Erman Suherman, 2001). According to Roza (2017) mathematics should be seen as a cultural product that is developed through various activities, such as counting, placing, measuring, designing, playing and explaining that require students' own understanding.

The low understanding of students in learning transformation is influenced by students' lack of visualization ability that causes the low ability to solve questions and draw geometric shapes. Although some teachers have used PowerPoint-based media, the display on the media is not much different from a whiteboard. While in understanding transformation, it is necessary to have the ability to describe objects and interpret them into two dimensions. This condition has an impact on the need for the development of science and technology that can be used as a tool for learning transformation. Geometry transformation learning helps students to understand changes in the artistic form of mathematics, as well as improve the ability to use logic in order to be able to think rationally in proving allegations that are deemed to have truth values (Niar Nurul Arifin, 2014).

Researches conducted by Usiskin (1982), Fuys et al. (1988), Gutierrez et al. (1991), and Clements & Battista (1992) show that many junior and senior high school students have difficulty in relating the ideas, concepts, or principles contained in the material. Students also have difficulty in answering questions and changing the shape of objects undergoing a transformation. Transformation material is important to learn because this material emphasizes the structure of a deductive pattern so that it is widely applied in everyday life. Transformation material also emphasizes effective geometric techniques and the concept of calculation can help solve problems in other branches of mathematics and can be used to support learning other subjects.

The selection of the right learning model can help make it easier for students to receive learning materials. The learning model used in this study was the learning model of cooperative interaction settings. This learning model was chosen because it can increase the students' activity and ability in mathematical understanding. Besides learning models, learning experiences supported by learning tools can also improve mathematical understanding. Learning tools or can be referred to as learning media are expected to be able to interpret abstract things in mathematics to be concrete. The media will function well if they can provide meaningful experiences, activate and please students. A meaningful experience will support the students' ability of mathematical understanding related to the ability to understand a concept and solutions to problems presented in each question. In general, indicators of mathematical understanding include: knowing, understanding, and applying mathematical concepts, procedures, principles, and ideas (Sumarmo, 2016: 4).

According to Sumarmo (2016), understanding is the absorption of the meaning of a material being studied. Gilbert (Iskandar, 2015) states that mathematical understanding is the ability to understand a situation with different words and can calculate or draw conclusions from tables, data, graphics, and so on. Based on the definition of mathematical understanding, indicators can be measured in this study are: the ability to recognize problems, understand and apply mathematical concepts; problem-solving procedures; and principles and mathematical ideas that can be used to obtain solutions. In short, mathematical understanding is one form of statement of learning outcomes.

In this study, the media used was the Cabri 3DV2Plus software. Cabri 3DV2Plus program is a computer software that can display various forms of three-dimensional construction, providing facilities for exploring and tracing geometric concepts, calculations, interpretations and problem-solving in an interactive and practical manner. The combination of Cabri 3DV2Plus software and cooperative interaction setting learning model with students' mathematical understanding can be applied in mathematics learning related to the problem of calculation, visualization of object objects in material transformation. Cabri 3DV2Plus software is used to attract students 'attention in the learning process and facilitate the students' understanding process so that learning is not boring and influences students 'activities in forming students' mathematical understanding.

The use of media can help students interact directly with computers individually and will provide different experiences based on their exploration results. This different experience can facilitate students with various levels of heterogeneous abilities in creating an effective learning climate individually. Computer-based learning media can be a learning media that displays visuals from concepts that are too broad (Roza et al., 2016). As an attractive, attractive and interactive media, learning using computer-based media can be used as a learning solution on other materials with different constraints.

METHODOLOGY

The method used in this research is the experimental method. This research is aimed at finding the influence of Cabri 3DV2Plus software with a learning model of cooperative interaction settings on students' mathematical understanding. The design used in this study is the pretest-posttest control group design which is one form of quasi-experimental (Sugiyono, 2013).

The population in this study were all students of class XI as many as 357 people. The researcher used a random sampling technique; a random sampling based on levels or strata rather than on an individual basis.

Validity test was carried out to see the validity of the arranged questions. Validity test was also run for the learning devices used in this study; a syllabus, RPP (Lesson Plans), and LKPD (Student Worksheets). After doing the validity test, it continued with the reliability test, the test of the differentiation of the questions, and the test of the difficulty level of the questions. Analysis of preliminary data on the normality test and homogeneity test was carried out as a condition to perform the treatment and test the average difference. The final data analysis was conducted using a one-way ANOVA test to see the influence of Cabri on students' mathematical understanding.

The stage carried out in this study was the data collection conducted by giving a pretest about mathematical understanding. The pretest is in the form of an essay test with five questions. After being given treatments of learning using the Cabri 3DV2Plus software in the experimental class and conventional learning in the control class, the post-test was given to determine the effect of using Cabri 3DV2Plus software on students' mathematical understanding.

FINDINGS AND DISCUSSIONS

This section will discuss the findings of validity, reliability, differentiation and difficulty level of the instrument, description of pretest data and description of posttest data.

1. Validity and Reliability of the Instrument

The first stage in this study was to validate the instruments used in this study. The following is the validity of the questions of mathematical understanding.

Table 1. The Validity Test Results of Question Items of Mathematical Understanding

Item Number	r_{count} value	r_{table} value	Description
1	0,68		Valid
2	0,80		Valid
3	0,85	**r_{table} = 0,361**	Valid
4	0,66		Valid
5	0,85		Valid

In table 1 above, it can be seen that all questions of mathematical understanding are valid in the range of 0.66 – 0.85. Statistically, it can be written $r_{xy} > r_{table}$, meaning that the question is worthy of being used as an instrument to measure the mathematical understanding of each student.

In the reliability test of mathematical comprehension questions, it was obtained that r_{11} value is greater than r_{table} ($r_{11} = 0{,}85 > r_{tabel} = 0{,}361$), thus it can be concluded that the question items are reliable, meaning that they are trustworthy and consistent for measuring variables in this study.

2. Differentiation and Difficulty Level of the Instrument

The differentiating ability of the questions of mathematical understanding obtained in this study is good and balanced in the range of 0.94-2.14 so that the questions can distinguish groups in aspects that are measured according to the differences in the group. The level of difficulty of the questions is also balanced with good proportions in the range of 1.16-2.26 thus it can reach the knowledge of heterogeneous students.

3. The Description of the Pretest Data

The normality test of the pretest scores in the classes at SMAN 3 Padangsidimpuan on mathematical understanding is in the range of 0.08-0,200 which means the sample is normally distributed with sig > α. Based on these results it can be concluded that the six classes are normally distributed.

This homogeneity test was conducted to find out whether the initial score data of the sample has a homogeneous variance. From the results of the homogeneity test calculations, it was obtained that the pretest scores of mathematical understanding were in the range of 0.059-0.53; meaning that the sample is homogeneous with sig> α, and it can be concluded that the class has the same variance (homogeneous). It should be noted that fulfilling normality and homogeneity is the main requirement for doing the pretest in this study.

Based on the calculation of the average difference test, the t_{count} obtained from the six classes is as follows:

Table 2
The Table of Average Difference of Mathematical Understanding Test

Class	T_{count}	t_{table}	**Description**
Experiment 1 and Control Class 1	0,342	2,042	H_0 is accepted, meaning that there is no average difference of the two classes in this study departing from the same initial conditions.
Experiment 2 and Control Class 2	0,066		H_0 is accepted, meaning that there is no average difference of the two classes in this study departing from the same initial conditions.
Experiment 3 and Control Class 3	0,860		H_0 is accepted, meaning that there is no average difference of the two classes in this study departing from the same initial conditions.

Table 2 shows that the t_{count} values are in the range of 0.066-0.860 which in overall are greater than the t_{table}, so it can be concluded that there is no average difference of the two classes in this study departing from the same initial conditions.

4. The Description of the Research Implementation

Having analyzed each class and found out that the six classes were normal and homogeneous, the researchers were good to give treatments in the form of learning with Cabri software to the three experimental classes and the control class was not given any treatment. The learning in the experimental classes was done with the learning model of cooperative interaction settings.

The first phase began with the teacher delivering the material the students learn about transformation. Then the teacher divided the students into several groups and told them to read and solve the problems found in the LKPD (Student Worksheet). During the learning process, students began to study the material they would learn and determine the problem or activity to be carried out. At this stage, the teacher not only explained the material but also provided a brief explanation of the Cabri 3DV2Plus software that would be used by students in solving the problems.

In the second phase, the students were involved in mathematical thinking through experimental activities to solve a problem on the LKPD and do it with the Cabri

3DV2Plus software. The teacher oversees students during learning activities. Problems presented at LKPD are based on the context of everyday problems. Students must first understand what is being questioned, observe, and make problem-solving manipulations. For example, when understanding problems in translating or shifting objects, students first conduct experiments with Cabri 3DV2Plus software by drawing points with initial positions or objects that are translational. After the point is drawn, students do the translation according to the question instructions with the Cabri 3DV2Plus software. In that process, students begin to observe changes that occur and the process of shifting objects. Cabri 3DV2Plus software helps students directly see the concept of translation clearly. The displacement process is clearly visible so students can understand the concept of translation as a shift. Students' ability to connect concepts and ideas that they have and see in software can help them solve problems that are part of mathematical understanding. When compared to learning in the control class, an increase in mathematical understanding increases only slightly by only about 0.5. The number 0.5 hardly shows any changes.

In the third phase, students reported the results of their problem solving to other groups by presenting them in front of the class and the teacher led the class discussion. After students finished the presentation that contains the results of their problem solving, the students were led to a group discussion where other groups can respond to the results given by the group that was presenting.

The fourth phase, after the discussion session, students reexamined what they had learned about transformation and made written notes about what they had learned. This activity is a series of learning processes that are useful for students to be able to relearn or repeat the lesson later.

The fifth phase, the teacher conducted an assessment during the learning process. The assessment carried out by the teacher is to see the achievement of the students' understanding in terms of the knowledge of the material taught and the results of the group discussions in answering the LKPD.

5. The Description of Post-Test Data

The analysis carried out at the final stage was an analysis of the hypothesis. Look at Table 3 below to see the results of the calculation of hypotheses for each class:

Table 3 The Table of Hypothesis Test (t-Test) of Numerical Intelligence

Class	Class	Average	Deviation Standard	T_{count}	t_{table}	Description
		16,23	1,695	11,20	2,042	

Experiment dan Control	Experiment 1 Control 1	10,97	1,938			H_0 is rejected
	Exeriment 2	14,53	2,285	9,819		
	Control 2	8,26	2,683			
	Experiment 3	10,93	2,363	4,861		
	Control 3	7,45	3,161			

Table 3 shows the value of tcount in the experimental class 1 and control 1 is 11.20. When compared with t_{table}, $t_{count} > t_{table}$ then H_0 is rejected. In experimental class 2 and control class 2, the comparison of t_{count} and t_{table} is obtained: $t_{count} = 9.819 > t_{table} = 2.042$, thus H_0 is rejected. In experimental class 3 and control class 3, the comparison of the t_{count} = 4.861> t_{table} = 2.042 then H_0 is rejected. Hence, it can be concluded that there is an effect of using Cabri 3DV2Plus software with the learning model of cooperative interaction settings of students who get conventional learning in terms of the level of students' ability (high, medium, or low).

Cabri 3DV2Plus software can improve students' mathematical understanding. The so-called mathematical understanding is the ability of students to recognize, understand, and apply mathematical concepts, procedures, principles, and ideas. When there is a construction of objects in the software, students are able to see real changes in the objects. Students are also able to give meaning to any changes that are in accordance with the material concepts that they learn and make an exploration or estimate of the steps to solve the problem presented.

The learning model of cooperative interaction settings also influences students' numerical intelligence and mathematical understanding. The use of the Cabri 3DV2Plus software, combined with the model of cooperative interaction settings, creates a new design that greatly benefits students. Especially in the presentation of LKPD designed in accordance with the learning model of cooperative interaction settings, it makes students actively involved in finding and conveying group ideas to be compared with other groups. The phases in the model of cooperative interaction settings allow teachers and students to influence each other's thinking processes. The teacher presents problems in the LKPD and invites students to engage in experimental activities in constructing concepts and rules used in problem-solving that are part of mathematical understanding.

The findings of this study are in line with the research conducted by Nova C, et al., 2016 which stated that the use of Cabri collaborated with the learning model of cooperative interaction settings gave good results even though it was applied in different materials. In the research by Nova C's, et al., Cabri gave results in the form of increasing students' abilities in constructing clear images of three-dimensional figures. This study also provides findings that if the ability to construct images can be done clearly by students, students are also able to clearly see the shape of each object shift which is the main concept of transformation material. The distance of each object that undergoes transformation looks clearer and students are able to calculate it well.

The research conducted by Wijaya et al. (2018) also states that the students' mathematical understanding ability in understanding problems, planning completion, and re-checking all steps that have been done is classified as moderate with a percentage of 70%. This is because: 1) students are able to express and associate concepts that have been learned; 2) able to classify and identify objects based on whether or not the requirements that form the concept are met; 3) able to connect various mathematical concepts; and 4) able to apply and use concepts in various forms of mathematical representation. Another finding in this study is that student activity dominates both in thinking and arguing in this study. This is because in the learning model of cooperative interaction settings have a phase that requires one group to present what they have been working during the learning process while the other group responds. When the presentation process takes place, students are guided to be able to express concepts and calculate the problems in transformation precisely and be able to understand and prove the calculations.

CONCLUSION

Based on the results of the research obtained, it can be concluded that there is an influence of the use of Cabri 3DV2Plus software with the learning model of cooperative interaction settings on students' mathematical understanding with high, medium and low abilities. Students are expected to be more active in learning especially in those that require seriousness and good understanding and actively use Cabri 3DV2Plus software in learning transformations in order to improve their mathematical understanding. The researchers also suggest to keep using Cabri 3DV2Plus software in learning or doing other research on a broader study, for example on material, population, or other mathematical competencies. Other researchers are suggested to minimize the limitations faced by researchers so that the results are better and continue to use the inter 3DV2Plus software with other research aspects in a broader study, for example on material, population or other mathematical competencies.

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