The Effect of Using the Make A Match Learning Model on Students' Critical Mathematical Thinking Skills

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Abstract: This research aims to determine the effect of the use of making a match learning model on students' critical mathematical thinking abilities. This study used a quasi-experimental method non-equivalent pretest-posttest control design with a population of grade V students in SD Plus Al Aitaam selected two classes consisting of experimental classes with a total of 24 students and control classes with a total of 24 students. The research began with the giving of tests in the form of a pretest, then given treatment, and ended with a posttest. The results study shows that students' mathematical critical thinking skills using the Make a match type cooperative is better than those studied using conventional models. This is evidenced by the average posttest score obtained by the experiment class = 85.96 while the control class= 79.92. That way the average experiment class is higher than the control class. Supported with t-test results showing t_{count}= 5.54 and, t_{table}= 2.06 Because the value t_{count}> is then t_{table} accepted Ha, So, there is a difference in mathematical thinking skills between students who learn using a cooperative learning model of type make a match with students who get learning using conventional models.

Keywords: Make a match, Critical thinking, fractional numbers.

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INTRODUCTION

Mathematics is one of the important subjects learned by each individual and always related to daily life. The importance of collecting mathematics can make it easier to solve mathematical problems in daily life. In line with Karim (2011) stated that mathematics is a subject taught from elementary school (elementary school) to higher education (PT). Elementary school is the most important part of learning that every student has to go well. Success at the elementary school level will determine success at the next stage (Lubis, et al., 2019). This highlights how important the role of mathematics is in education and technological development today. By following per under Permendiknas No. 22 of 2006 states that Mathematics subjects need to be given to all students ranging from elementary schools to equip students with logical, analytical, systematic, critical, and creative skills, as well as the ability to cooperate. Such competencies are necessary so that students can have the ability to obtain, manage, and utilize information to survive in ever-changing, uncertain, and competitive circumstances.

Karso, et al. (2014) suggested that Mathematics learning in elementary school is one of the studies that are always interesting to be advanced because of the difference in characteristics, especially between the nature of the child and the nature of mathematics. Sundayana (2014) states that mathematics is one component of a series of subjects that have an important role in education. A. E., et al. (2018) concluded that mathematics learning is a planned and systematically structured stimulus process so that students can respond to educators about the math learning that is being studied.

Based on Piaget's theory of cognitive development, children between the ages of 7 and 11 (elementary school children) are at a concrete operational stage. At that age, children generally have difficulty understanding abstract things including mathematics that are relatively

incomprehensible. But at that age, the child has begun to be able to apply a mindset that can lead him to understand and solve problems.

If the learning of mathematics is highly emphasized by the student's thinking process, according to one elementary school teacher stated that there needs to coaching that should be done by the teacher towards the student so that the ability to think students especially critical thinking can overcome the problem of learning mathematics whose material tends to be abstract. Critical thinking skills are indispensable in math learning because with these ability children can filter information, choose the feasibility of information against their needs, question truths that are sometimes covered by lies, and anything that could endanger their lives. With the critical thinking skills of low students, it will have an impact on the problem of mathematical problems so that learning difficulties arise.

Kurino (2015) states that the abstract nature of mathematics causes many students to have various difficulties in learning mathematics especially in understanding and solving mathematical problems. According to Taufik, et al (2012) states that the term "difficulty" usually refers to a particular condition characterized by obstacles in achieving a goal. Those obstacles may be realized, maybe not. This will also have an impact on learning outcomes. Based on the results of research conducted by Mujiani (2016) it is known that the average absorption of elementary school students for math subjects is only 42%. The low learning results are due to several factors including, the maturity of age, low level of intelligence, low interest in learning, application of teacher-centered learning methods, application of conventional learning models, classroom settings, less dynamic learning, limited learning media, facilities, and infrastructure. besides, the results of research conducted by Hestuaji (2012) suggest that, Mathematics is the most difficult lesson learned by students at SDN [D]abin Ki Hajar Dewantara Karangtengah Sub-District, one aspect of the material that is considered difficult is the number of fractions. These difficulties resulted in low student math learning outcomes.

Learning difficulties in students' math subjects are largely down to barriers to fractional material so students get low learning outcomes. Low student learning outcomes can occur due to various aspects, including learning that is less interesting and interested students, lack of use of learning media, lack of precise use of learning methods and strategies. Thus, overcoming learning difficulties can be solved in various ways namely, the use of learning media, learning strategies, learning methods, or learning models. There is no denying that learning difficulties occur in many math subjects taught in elementary schools, such as fractional materials. Fractions are one of the materials considered the most elusive by students. In line with research conducted by Hestuaji Y, et al (2013) suggesting that mathematics is the most difficult lesson for students, one of the most difficult aspects of the material is fractional numbers. These difficulties resulted in low student math learning outcomes. Another source stated in the process of learning fractional calculations in students and mathematics grade V Elementary found difficulties in the delivery of materials and aroused students' interest in following the learning process (Dwiastuti, 2014) Based on Sukri research (2014) that have difficulty in solving the story of the summation operation and fraction reduction.

Astika and Ngurah (2012) suggested that the use of inappropriate learning models can lead to boredom, poor understanding, and monotony so that students are less motivated. Teachers should be able to choose an effective cooperative learning model for specific content. This may encourage teachers to seek information about types of cooperative learning models (Fauzi., et al., 2017).

According to Suprijono (2012), the learning model is a conceptual framework that describes systematic procedures in organizing the learning experience to achieve learning goals. According to Rusman (2016), cooperative learning is a form of learning using students learning and working together in small groups collaboratively whose members consist of four to six people with group structures.

Some of the learning models that have been developed by education experts include cooperative learning, problem-based learning, direct instruction, and soon. All learning models developed by experts aim to improve the understanding of students, so the quality of national education will improve. Cooperative models have various types of learning including jigsaw, make a match, take and give, and others. Artawa and Suwatra (2012) stated that a cooperative learning model of Make A-Match type or looking for a partner will be able to help students in developing favor enthusiasm for learning. Make a match learning model is a student activity to find a pair of cards that are questions or answered within a certain time. The steps of using the Cooperative Learning model of Make a Match type according to Rahman (2019) are as follows: 1) The teacher prepares several cards containing several concepts or topics suitable for the review session, one part of the question card, and the other part of the answer card, 2) Each student gets a card that says a question or answer, 3) Each student thinks of the answer or question of each card he holds. 4) Each student is looking for a pair of cards that match his or her card. Any student who can match his or her card before the deadline is given a grade, 5) If the student is unable to match his or her card with his or her friend (unable to find a question card or answer card) will get a mutually agreed penalty, 6) After one round, the card is echoed again so that each student gets a different card than before, so on, 7) The teacher together with the student makes a conclusion to the subject matter.

Another source states that there is one level all know what it means to "think critically"-meaning good yang thought, almost the opposite of illogical, irrational, thinking (Facione, 2011). Critical thinking in learning mathematics is a person's cognitive process to gain knowledge based on mathematical reasoning (Shahbana, 2012). Critical thinking is a process that aims to make rational decisions directed at deciding whether to believe or do something (Haryani, 2011). A person's critical thinking ability can be recognized from the behavior shown during critical thought processes.

Related to these critical thinking abilities, the researchers will conduct a study titled "Use of Match Type Cooperative Model against Critical Thinking Ability of Grade V Students". The formulation of the problem in this study is "Is there an influence on the use of making a match learning model on students' critical thinking abilities in math learning?". Referring to the formulation of the problem, this research was conducted aimed at knowing whether or not the influence of the use of cooperative learning models of type makes a match on students' critical thinking skills on math learning.

METHOD

The method used in the study is the experimental method. Sugioyono (2016) states that experimental research methods can be interpreted as research methods used to look for certain influences on others under controlled conditions. This study uses the experimental *quasi method* with the *form of nonequivalent pretest-posttest control group design,* as follows. (Sugiyono, 2017)

O_1	X	O_2
O_1		O_2

Description:

X: Treatment (Use of cooperative learning model type make a match)

O_1: Measurement results before the pretest

O_2: Measurement results after treatment (posttest)

This research group consists of two classes. Class A is an experimental class that is treated using *a make a match* type cooperative learning model, while class B is a control class that is given learning with conventional learning models. The population in this study is the entire class V SD Plus Al–Aitaam Bandung Year of Study 2019/2020 with a sample of 48 students. The sample can be viewed in Table 1 below.

Table 1. Research sample data

No	Class	Male	Women	Amount
1	V Ibn	11	13	24
2	V Abdullah	10	14	24
	Total			48

This study used two classes as research samples. Because the number of populations studied is large and has been formed group (class), then sampling in this *study using cluster sampling so* that two classes will be selected with category A (V Ibn) as the class of experiment and class B (V Abdullah) as control class.

Data collection techniques on this research is a technical test, in the form of pretest and posttest critical thinking ability. The test is given to determine the initial and final abilities of the student. Thus, the pretest results are used to determine the ability of initial understanding of the summation and subtraction of fractions subtraction and decimals before being treated while posttest results are used to determine the increased ability to understand the summation and subtraction of fractions and decimals after being given treatment.

The data collected from the research results are quantitative. The data is processed using statistical calculations. Data processing is done to answer the formulation of problems and test hypotheses in this study. So that hypothetical testing can be done t-test. Instrument trials are conducted using the Anates V4 app to find out the validity, power difference, and difficulty level while to find out the validity of the question item using the MS. Excel 2013 application. involving two public elementary schools in Bandung, West Java. The total participants consisted of 38 students. 17 students with the control class. Students in the first experimental class were given a light sentence of 18 students, the second experimental class, and a written punishment of 20 students. Research instruments include tests, attitude scales, observations, daily journals, interviews, and documentation. Based on the results of the punishment scale instrument test, the 20 statements can be used further for research. All statements have sufficient validity (rxy = 0.54) and high reliability (r_{11} = 0.85). Data analysis was performed using descriptive and inferential analysis. Besides, to determine the relationship between variables used the one-way ANOVA test.

RESULTS AND DISCUSSION

This research data is a score of critical thinking ability test results as a result of the use of cooperative learning models *to* making a match type the class experiment and conventional learning models.

After getting the results posttest data continued with the t-test. Recapitulation of test t results in the posttest file can be seen in table 2:

Table 2. T-Test Results

Class	Average	dk	t_{hitung}	t_{tabel}	Interpretation

Experiment	85,96	46	5,54	2,06	H_a Accepted
Control	79,92				

In the table above it is seen that the average of experiment classes and control classes successively is 85.96 and 79.92 with a degree of freedom of 46 as well as a level of significance of 5%. Can also be seen the score of both classes gets t_{hitung}= 5.54 >t_{tabel} 2.06, H_0 rejected, H_a accepted. Thus, it can be concluded that there are significant differences in both classes in the learning of *fractional number* materials with the use of cooperative defense models of making a match type compared to fractional number material learning with conventional learning models.

This research was conducted at SD Plus Al Aitaam in the year 2019/2020. The population in this study was all grade V students who were enrolled with a total of 98 students and divided into four study groups. Samples are taken with technical cluster sampling with the consideration of classes already divided into groups (study group). After the draw for the experiment class and control class, the draw was obtained as class V Ibnu as the experiment class and class V Abdullah as the control class.

The Make a *match* type cooperative learning model is applied in the experiment class while in the control class the learning process is carried out with conventional learning models. Face-to-face meetings are held three times. On the first day, researchers gave a pretest to experiment classes and control classes. On the second day, researchers conducted an experiment class with the use of a make a match type cooperative learning model while in *the* control class with the use of conventional models. On the third day, the researcher posttest on students' critical thinking abilities.

Based on the results of data processing that has been done in this study is known posttest value in math learning fractional number material using cooperative learning model of making a match type in the experiment class as a whole obtained the largest score of 100, The smallest value 68 and *the* average score of 85.96. The results of the math learning fractional number material using conventional learning models in the control class as a whole obtained the largest score of 96, the smallest score of 36, and an average score of 79.92.

In learning using a cooperative learning model of *making a match type starts* by dividing students into two large groups. Each student gets one card containing questions or answers. Each student must think of the answer from the card he holds. In this learning, there is an element of the game that creates a fun atmosphere for students to motivate students to be actively involved in learning. The timing and points system will be able to trigger students to think quickly and precisely and maximize the potential that exists within students. While in control classes, students' activeness in learning involvement is minimal. Students in control classes only receive the material submitted by the teacher, after which sis we get a problem exercise as most teachers used to do. In the use of cooperative learning, models make a match type can foster high motivation of students that affects the improvement of students' abilities so that the average student of the experiment class is higher than the control class.

Jacob (2012) concluded in his study that critical thinking skills when pushed appropriately can result in improved mathematical achievement. Based on research conducted by Amalia (2013), learning with a cooperative model of Make a match type encourages student engagement and teacher creativity. A model cooperative is great for fostering critical thinking skills, cooperation, and helping friends. Through the Make a match learning *model, it* is hoped that students' critical thinking abilities can be improved because this model contains

elements of the *game.* In line with the research conducted by Rohendi, et al (2010) stated that the main feature of CLTPM is that students are asked to look for a pair of cards that answer or question within a certain time. *Make a match* is one of the cooperative learning models that can be applied to improve students' learning outcomes. Also, this model will increase the activities of teachers and students in the classroom (Susanti, & Elvira, 2019).

The results of this study are also in line with several studies that have been conducted including Tarigan (2014) stated that the use of making a matching model can increase the learning activities of students in grade V of SD Negeri 050687 Sawit Seberangin. Mathematics as the subject material changed fraction to percent, decimal. Arifa, et al (2018) that the cooperative defense model of making a match type has *a* positive influence on the competence of science knowledge students SMP in Payakumbuh City. Make a matching learning can improve the mathematical understanding skills of grade IV students at SDN Ciganjur 02 the Year 2017/2018 (Khairunnisa., et al 2018).

CONCLUSION

Based on the results of analysts' data in this study it can be concluded that the use of cooperative learning models of the type the make a match is better than conventional learning models in improving students' critical thinking abilities. Most students show a positive attitude towards math learning with the use of a make a match type cooperative *learning* model. This is evidenced by the average score in a three-class score of 85.96 and the control class scored 79.92. Thus, can conclude that the average score of the experiment class is greater than the control class. Supported with the test result t the show t_{hitung} is 5.54 and t_{tabel} is 2.06 Because the value t_{hitung}= 5.54 > = t_{tabel}2,0606, then accepted. H_a. So, there is a significant difference between the results of critical thinking skills and students who learn using a cooperative learning model of making a match type and students who learn to use conventional models in fractional number materials.

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