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The Effect of Problem Posing, CUPs and Critical Thinking on HOTS-Based Learning Achievement

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ABSTRACT

This study aimed to determine the effect of the learning model, which consists of problem posing and conceptual understanding procedures (CUPs) and critical thinking on learning outcomes-oriented (HOTS) on the content of mathematics lessons. The research was conducted at a state elementary school in Jakarta, with a sample of 68 students. The independent variables are learning models and critical thinking, while the dependent variable is HOTS-oriented learning outcomes on the content of mathematics lessons. The method is an experimental method with a 2 x 2 research design. Data were analyzed using normality, homogeneity and Anova tests; Tukey's test was also used as a follow-up test. The results showed: 1) there were differences in the learning outcomes of HOTS-oriented mathematics between students who used the problem-posing learning model and students who used the CUPs learning model; 2) there are differences in HOTS-oriented mathematics learning outcomes between students who have high critical thinking skills and those who have low critical thinking skills; 3) there is an interaction effect between learning models and critical thinking on HOTS-oriented mathematics learning outcomes; 4) there are differences in HOTS-oriented mathematics learning outcomes for students who have high critical thinking skills between those using the problem-posing learning model and the CUPs model; 5) there is no difference in the learning outcomes of HOTS-oriented mathematics students who have low critical thinking skills between those using the problem-posing learning model and the CUPS model. The conclusion of the research is the problem posing learning model and critical thinking skills affect the HOTS-oriented learning outcomes of mathematics lessons. This implies that problem posing and CUPs are effective learning models in improving learning outcomes, so they can be taken into consideration and as new alternatives for teachers.

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1. INTRODUCTION

The development of an increasingly modern era demands quality human resources to survive in the 21st century. Increasing quality human resources is one of the requirements so that development goals in Indonesia can be carried out properly and the life of the Indonesian nation goes in a better direction. The younger generation has a role as heirs, builders, and developers of society, nation and state life. The existing development needs to be continued, improved and adapted to the needs of the times. A quality generation of a nation can be realized with a quality education system. Curriculum development determines the quality of students to be achieved in accordance with the times. Currently, Indonesia implements the 2013 Curriculum. The 2013 curriculum in Permendikbud 67 of 2013 aims to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the life of society, nation, state, and society. Changes in mindset in the 2013 curriculum make teachers have to make students subjects in learning. Students are required to be active during the learning process so that they can form their own knowledge based on the experience obtained.

Implementing the 2013 Curriculum is one of the government's efforts to further improve the quality of graduates. It is in accordance with educational goals and to prepare competent human resources by the international market. The countries with quality standards of education that meet the needs of the international market can be seen from the assessments issued by PISA. The Program for International Student Assessment (PISA) is an examination system initiated by the Organization for Economic Cooperation and Development (OECD), to evaluate the system. Education from 72 countries around the world. PISA measures three basic competencies, namely reading, math and science. Based on the results of the 2015 PISA shows that, in general, the ability of Indonesian students is still below other countries, Indonesia's position is in the order of 64 out of 72 countries (OECD, 2019). PISA results show that students in Indonesia are still low in understanding complex information and formulating and solving problems. Head of the Center for Educational Development (Puspendik) Abduh (Astuti, 2018) said that several factors cause Indonesia's position to be still below other countries, one of which is that teachers in Indonesia lack training to work on questions that can be answered. Encourage, stimulate, and analyze a problem using Higher Order Thinking Skills (HOTS).

The success of education is closely related to the quality and professionalism of teachers because teachers have a role in carrying out activities that will be carried out by students in order to achieve learning objectives. According to Gange (Syah, 2017), teachers have functions including 1) Designer of instruction, namely the teacher has a role as a designer in the learning process, such as selecting and determining teaching materials, formulating goals, choosing methods, models and learning techniques; 2) Manager of instruction, namely the teacher has a role in managing learning into meaningful learning, and there is educative interaction; 3) Evaluator of student learning, the teacher plays a role in evaluating the learning process, in determining the development of students. This is a challenge for elementary school teachers so that students get truly meaningful knowledge. It is necessary to determine a learning model that can improve HOTS abilities, not just lower-order thinking skills (LOTS).

Learning outcomes can be known after students carry out the learning process that the teacher has planned. The form of behaviour change must be comprehensive comprehensively so that it shows changes in behavior in cognitive, affective and psychomotor aspects. Dimyati and Mudhjiono (Mudjiono, 2015) "Learning outcomes are an interaction of acts of learning and teaching". Learning outcomes exist because students have followed a two-way learning process between teachers and students. Learning outcomes are an evaluation of learning activities.

Mathematics is a subject studied at all education levels in Indonesia. Starting from elementary school because mathematics is very useful in everyday life. However, symbols in mathematics sometimes make students less able to understand and apply it in everyday life. National Council of Teachers of Mathematics (Walle, 2007) "Students must learn mathematics with understanding,

actively and build new knowledge from experience gained and the knowledge possessed". Learning mathematics is better when students are involved than just knowing some facts to doing some calculations. According to Lange & Romberg (Falach, 2016) there are 8 competencies that students need to master during the mathematics learning process, namely 1) thinking mathematically, 2) arguing mathematically, 3) reasoning mathematically, 4) modelling, 5) compiling and solving problems, 6) representing, 7) symbolizing, and 8) mastering tools and technology. So the purpose of mathematics lessons is not just to be able to do addition, subtraction, multiplication and division but using their skills to solve problems.

Higher-order thinking skills require an answer that is not easily found in books/texts just by remembering them. Bloom (Anderson, L.W., &Kratwohl, 2010) classifies the cognitive domain into (1) Remembering (C1). This cognitive goal is related to the ability to remember information that has been learned. The knowledge required can be in the form of factual, conceptual, procedural or metacognitive knowledge; (2) Understanding (C2) is a higher aspect of remembering. Understanding with regard to the ability to explain, interpret, capture meaning, and construct meaning from the subject matter that has been conveyed in the form of oral, written or graphic; (3) applying (C3) is the ability to apply a lesson material that has been studied to solve practice questions; (4) analyzing (C4) is the ability to describe a lesson material into parts or elements and determine the relationship between these parts and the overall structure or purpose. This ability can only be understood and mastered by students who have mastered the ability to understand and apply. Analyzing includes cognitive processes of distinguishing, organizing, and attributing; (5) evaluating (C5), namely making judgments based on criteria or standards; (6) Creating (C6) puts elements together to form a coherent or functional whole, rearranges elements into new patterns or to plan, create, and develop an original product. The stages included in the LOST are remembering, understanding, and applying, while the HOTS stages are analyzing, evaluating and creating.

One of the learning models that can construct students in higher-order thinking is the Problem Posing learning model or problem-posing, which is outlined in the form of questions which are then searched for answers both individually and in groups. The problem-posing learning model is a step taken by students to formulate the problem back into simpler parts so that it can be easily understood. The syntax includes understanding, solutions, identifying errors, minimizing writing, looking for alternatives, and compiling questions/problems (Ngalimun, 2015) . The teacher through the problem-posing learning model, does not formulate a problem, but the teacher creates a learning situation and students will formulate problems according to the situation that has been created (Suarsana et al., 2019). Students must have reasoning to analyze and formulate their own problems (problems). Formulating the existing questions into questions that will support students in solving the problems they face. Problem posing is “The process by which, on the basis of mathematical experience, students construct personal interpretations of concrete mathematical situations and formulate them as meaningful problems”. (Stoyanova, 2005) This means that problem posing is a process based on mathematical experience. Students build their own interpretations of concrete situations and formulate them as meaningful mathematical problems. While the strategy used in this study is changing the numbers. Changing the numbers, namely, students formulate new problems by changing numbers but still maintain the same arithmetic operations in situations that have been determined by the teacher (Stoyanova, 2005).

Stoyanova (Pittalis et al., 2004) identifies three categories of situations that can increase problem posing, including 1) Free situations, students in this situation will formulate problems freely, without any provisions that need to be made. Problems can be made based on the lives that students have experienced; 2) Semi-structured situations, referring to the situation of students who formulate problems, similar to the problems given by the teacher based on predetermined pictures/diagrams/situations; 3) A structured problem-solving situation, in this situation students pose a problem by reformulating a problem that has been solved or by varying the questions from the given problem. The situation in this study is a semi-structured situation.

The advantages of the problem-posing learning model include: 1) Helping students become more active and critical; 2) Can stimulate the development of creative thinking skills because students can pose their own problems by applying their knowledge; 3) Train students in analyzing problems so as to strengthen conceptual abilities; 4) Train students in organizing problems and evaluating and determining answers; 5) Stimulate curiosity and motivation of students.

One constructive and cooperative learning model that can be applied in learning mathematics in addition to problem posing is the conceptual understanding procedures (CUPs) learning model. Over time, CUPs can also be developed and designed for other learning, such as chemistry, biology, and mathematics. The CUPs learning procedure helps develop students' conceptual understanding. CUPs use cooperative learning strategies, which are designed to attract and modify the concepts to be learned. CUPS is an alternative learning model that can be used to improve student achievement, activity and learning outcomes (Mills et al., 2003). Through CUPS, students are more enthusiastic about participating in the learning process, increasing students' self-confidence, and providing opportunities to discuss and develop existing knowledge, students are more aware of the values of mastery of concepts and can explore the implications of existing concepts. There are phases in CUPs that can require students to develop a pre-existing understanding. The CUPs model is built on three phases (Mills et al., 2003), namely 1) individual phase, where each student solves a problem which the teacher has given. Students provide answers on A4 paper that has been given by the teacher; 2) The group work phase (triplet phase), at this stage, each student expresses ideas, and exchanges opinions and thoughts, to reach group agreement. The objectives of the results of the discussion are written on A3 paper; 3) Whole class interpretive discussion phase, the completed A3 sheets of paper are collected and displayed on the wall/board so that the whole class can see them. The teacher facilitates a whole class discussion when each group presents the results of their discussion, defends their answers, and provides responses to other groups. The teacher ensures the confidence of the students, that everyone has a different understanding and will find results if each member discusses with each other.

The advantages of the CUPS learning model include: 1.) Students are more confident to participate; 2) Motivating students to express their opinions; 3) CUPs recognize individual and group ideas/ideas; 4) Make students more active when participating in learning (Kurniawati, 2013).

Critical thinking is "Critical thinking is that mode of thinking about any subject, content, or problem in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them." (Paul, R.W., & Elder, 2002). Critical thinking is a way of thinking about any subject, content or problem in which the thinker improves the quality of his thinking by skillfully taking over the structures inherent in thinking and raising the intellectual standards on them. Critical thinking indicators, according to Swart and Perkins (Parwines, 2018), include: 1) analytical skills, which is a skill that describes a structure into parts in order to be able to organize the structure; 2) synthesizing skills are skills that link the relationship between parts into a new form or arrangement; 3) recognizing and problem-solving skills, these skills require the reader to understand the reading critically so that after the reading activity is complete students can catch some of the main ideas of the reading; 4) the ability to conclude is obtained from the human mind based on the understanding it has to move to reach new knowledge; 5) evaluating skills, namely skills that emphasize mature thinking in determining existing criteria.

The characteristics of mathematics learning in elementary schools, according to Suwangsih and Tiurlina (Parwines, 2018), are as follows. 1) Learning mathematics using the spiral method. Through problem-posing learning models and CUPs, patterns and concepts will be interrelated between topics and materials that have been studied with those to be studied; 2) Gradual mathematics learning, through problem-posing learning models and CUPs learning is carried out from easy then gradual to difficult, from concrete concepts then gradually to abstract. The material is delivered using concrete objects and ends with abstract symbols; 3) The use of inductive methods, through problem-posing

learning models and CUPs will be explained about standard mathematical concepts by inviting students to think concrete things and learning is done by presenting examples first; 4) Mathematics learning uses consistency truth, through problem posing learning models and CUPs so that students do not misunderstand mathematical concepts, so the material presented has consistent truth because it is done in collaboration and ends with an agreement; 5) Mathematics learning should be carried out meaningfully, through problem posing learning models and CUPs learning is carried out not only about concepts, formulas, formulas. However, students can learn mathematics starting from the process of forming a concept and then applying it in everyday life. Given that higher-order thinking skills are part of the learning outcomes of higher-order cognitive domains. The use of these two learning models can be applied according to the characteristics of high-level learning that students can be guided by using learning that seeks, finds, classifies, composes, performs, studies and make conclusions on their own or in groups about the substance they are studying.

Based on these problems, it is necessary to have appropriate problem-solving so that students' HOTS-oriented learning outcomes are more optimal, one of which is through the Problem posing learning model and Conceptual Understanding Procedures (CUPs). The two learning models are able to foster a creative, collaborative spirit, think metacognitively, develop higher-order thinking skills, increase understanding of meaning, increase independence, facilitate problem-solving, and build teamwork.

The novelty of this study is to use the problem-posing learning model and the CUPs learning model, researchers have not found other researchers who use these two learning models and think critically about HOTS-oriented learning outcomes in the context of mathematics lessons in elementary schools.

2. METHODS

The research used is an experimental method with a quasi-experimental research design with a 2x2 factorial design. The research design aims to test whether there is an effect of treatment between the three variables tested. This study examines whether there is an influence of learning models and critical thinking on HOTS-oriented mathematics learning outcomes. This research was conducted with two different classes with different treatments. The experimental class was treated by providing problem-posing learning, while the control class was treated by giving the CUPs learning model.

The population in this study were all fourth-grade students in Region IV Pulogadung District, and the sample taken was SDN Jati 06. SDN Jati 06 is located on Jalan Perangkut Raya RT 1/7 Jati Pulogadung, East Jakarta. The number of samples in this study was 68 students consisting of of 34 students of class IV A and 34 students of control. Class IV A is the control class and class IV B is the control class.

Data collection techniques were carried out through multiple choice tests to obtain data on the results of students' critical thinking. Meanwhile, for data collection of HOTS-oriented mathematics learning outcomes using a description test. Data analysis used two-way analysis of variance (ANOVA), namely the method designed with 2x2 treatment. The instrument analysis technique uses: 1) Validity Test, 2) a Reality, 3) a Normality Test, 4) a Homogeneity Test 5) ANOVA Test. The stages of the research procedure include: 1) preliminary study, 2) development and validation, 3) conducting critical thinking tests, 4) selecting and grouping research subjects, 5) experimental activities, 6) posttest, 7) data analysis, and 8) compiling the report.

3. FINDINGS AND DISCUSSION

The difference in learning outcomes of HOTS-oriented mathematics for fourth-grade elementary school students between those using the problem posing learning model and the Conceptual Understanding Procedures learning model.

Based on the study results, the average score of HOTS-oriented learning outcomes on the content of Mathematics lessons using the problem-posing learning model was higher, namely 81.82 compared to students taught with the CUPs learning model, which was 70.65.

The problem-posing learning model and the CUPs learning model are two of the many models that can involve students' activities in the learning process. The similarities between the two models include: 1) making students think critically, creatively and interactively so that the information obtained does not only come from the teacher; 2) carried out to solve problems in groups that require students to work together to reconstruct the new knowledge obtained by themselves with the information or knowledge they already have; 3) arouse the curiosity of students; 4) examine the problem contextually; 5) giving freedom to students to express their ideas, elaborate and think divergently. While the difference between the two is in the problem posing learning model, the problem posed comes from the students, while in the CUPs learning model the problem posed comes from the teacher. The next difference is in the problem posing learning model that students' activities in addition to formulating problems also answer problems that have been made by other groups, while in the CUPs learning model students' activities only solve problems given by the teacher.

The problem posing learning model has stages in learning, namely reviewing material, forming problems, checking solutions and reviewing. From this stage, students are able to change their way of thinking, increase self-confidence and easily understand concepts well. The problem posing learning model can increase students' learning motivation so that active learning will be created and not boring because students are more responsive (Shoimin, 2014). That way it will affect student learning outcomes for the better. Students who are taught with the problem posing learning model require higher cognitive processes when compared to students who are taught with the CUPs learning model. This is because students are not only active in solving problems given by the teacher. However, students are also active in formulating problems by observing, reasoning and trying to change the numbers in the questions that have been given. In these activities, students are more active, independent, and disciplined and have increased curiosity.

The CUPs learning model, in principle is not much different from the problem posing learning model, because both are done in groups and solve problems together. The CUPs learning model requires students to solve problems in three stages, namely individually, then discussed in groups (triplets) and finally completed together by all students in the class. Although these two learning models both have an influence on student learning outcomes, based on the results of research, problem posing learning models provide better results in the learning activities carried out. Learning mathematics does not only require counting skills but also requires the ability to think and reason mathematically in order to be able to solve new problems and learn new ideas that will be faced by students.

Differences in HOTS-oriented mathematics learning outcomes for fourth-grade elementary school students between students who have high critical thinking skills and those who have low critical thinking skills

From the ANAVA test the difference in learning outcomes of HOTS-oriented mathematics for fourth grade elementary school students between students who have high critical thinking skills and those who have low critical thinking skills, the result is that F count 25.93 is greater than F table = 3.99 at a significant level = 0.05. The results of this study showed that the group of students who had high

thinking skills obtained a higher average learning outcome, which was 83.82 than the group of students who had low thinking skills, which was 68.65.

Students who have high critical thinking skills tend to use cognitive strategies to increase the desired results. Critical thinking is needed in solving problems, and making decisions. Students reasoning when answering questions and linking concepts that have been previously owned. Students who have a high tendency to think critically will quickly adjust to the following learning. His critical thinking skills are able to explore learning to find knowledge with the guidance of the teacher, provide reasonable reasons, provide alternative answers and process the information obtained so that student learning outcomes can be maximized.

Meanwhile, according to Ruggier (Sani, 2019), the characteristics of low critical thinking skills include: 1) having few views; 2) accepting the existing approach; 3) determining considerations quickly; 4) be a passive listener; 5) always have the best ideas; 6) resist change; 7) likes to deceive himself; 8) his thinking is difficult to change. Students who have low critical thinking skills tend to be less able to analyze the problems they face, resulting in low levels of students mastering understanding and getting learning outcomes that are not optimal.

Based on the findings obtained from the results of this study, it can be concluded that in the group of students who have high thinking skills, the average learning outcomes are higher than the group of students who have low thinking skills.

The effect of the interaction between problem-posing learning models and critical thinking skills on HOTS-oriented mathematics learning outcomes.

Based on the results of the two-way analysis of variance between columns and rows, it shows that the calculated F is 5.611, which is greater than F table 3.99 at a significant level of = 0.05. This proves that there is an interaction between the problem-posing learning model and critical thinking on the HOTS-oriented mathematics learning outcomes of fourth grade elementary school students. Interaction is meaningful because of the cooperation between the two independent variables in influencing the dependent variable.

Critical thinking skills and learning models used in learning are factors that are thought to affect student learning outcomes. Learning outcomes can be influenced by several factors (Purwanto, 2013), among others, namely 1) internal factors of students consisting of physiological factors (physical conditions and sensory conditions of students), and psychological factors (students' intelligence, interests, motivation, thinking,critical of students), and 2) external factors, namely environmental factors (family, friends, school and community and instrumental factors (teachers, curriculum, learning resources, learning models, learning methods, etc.).The learning model used by researchers is a learner-centered learning model, because students can construct their knowledge to solve problems given in groups.

If a lesson is delivered by the teacher using an appropriate and not monotonous learning model, it will make learning active, innovative, creative and fun. Teachers carry out learning activities for students, not just what students learn, but how students learn the material provided. The selection of problem-posing learning models makes learning objectives achieved effectively and efficiently and will improve student learning outcomes even though students' critical thinking skills are low. The ability to think critically in mathematics is a directed and clear process that can be used in mental activities, namely solving problems, analyzing assumptions, making decisions and conducting scientific research. Students who have high critical thinking skills will be able to solve problems or formulate problems that exist in the problem posing learning model. A teacher who uses the right learning model will provide pleasure and satisfaction to students, which is a factor in motivating students to be able to use their knowledge to solve the problems given (Thobroni, 2015).

Based on the findings obtained from the results of this study, it can be concluded that there is an interaction between the problem-posing learning model and critical thinking on the HOTS-oriented mathematics learning outcomes of fourth-grade elementary school students.

Differences in HOTS-oriented mathematics learning outcomes for fourth-grade elementary school students who have high critical thinking skills between those using the problem-posing learning model and the CUPs model.

The results of the Tuckey test on the score of students' mathematics learning outcomes and having high critical thinking skills obtained a calculated Q value of 6.12 which is greater than Q table 3.63. There are differences in the learning outcomes of students who use the problem posing learning model (an average of 92.94) and the CUPs learning model (an average of 74.71) for groups of students who have high critical thinking skills.

The critical thinking ability of students is different. Some have low critical thinking skills and high critical thinking abilities. Critical thinking is related to the level of thinking of students, to convey what has been obtained in the learning process. Students who have high critical thinking skills will have a high curiosity and desire to find the truth and find solutions to the problems given.

Students who have high critical thinking skills will be more enthusiastic in obtaining information, because they not only get information passively, but also evaluate the truth first. Through the problem-posing model, students can explore their abilities so that when the learning process occurs, students are able to develop their abilities optimally. Students are also faced with situations and asked to formulate questions. So that students get the opportunity to explore the widest possible information about the situation together with their group members. This activity makes students accustomed to being able to think critically and be able to express their ideas. Thus, learning will be more meaningful if it involves students as a whole. Another factor that causes problem posing learning to show better results for students who think highly critically is because through the problem posing learning model there are two stages, namely accepting and challenging students to accept the given situation and feel challenged to formulate problems. At this stage, students will better understand the material presented so that learning outcomes can be maximized. Compared to students who have high critical thinking skills and who use the CUPs learning model.

Based on the findings obtained from this study, it can be concluded that the learning outcomes of HOTS-oriented mathematics for fourth-grade elementary school students with high critical thinking skills who use the problem posing learning model are better than the CUPs learning model.

Differences in learning outcomes of HOTS-oriented mathematics for fourth grade elementary school students who have low critical thinking skills between those using the problem-posing learning model and the CUPs model.

From the calculation results, Q count is 1.38 lower than Q table 3.63. There are differences in the learning outcomes of students using the problem posing learning model (average 70.71) and the CUPs learning model (average 66.59) for groups of students who have low critical thinking skills. This is because students who have low critical thinking skills who use the CUPs learning model at the individual stage lack a strong curiosity in solving mathematical problems and solving problems as best they can. There are some students who get help or guidance from the teacher. Meanwhile, at the triplet stage, they are less active, and less able to maintain work results at the individual stage, so they only follow the decisions of their group members. Proofing the hypothesis based on empirical studies conducted by researchers is supported by the theory put forward by experts that the characteristics of low critical thinking include: 1) Gathering facts and information, seeing all the information submitted is important; 2) less able to see information to solve problems or think about core problems; 3) Without realizing it is easy to be fooled and become a staunch supporter of egocentrism, sociocentrism of untested assumptions; 4) Tend to just follow what the group or society says; 5) It's easy to get caught up in details and hard to grasp the essence of someone else's idea or opinion.

Meanwhile, students who have low thinking skills in the experimental class who use problem posing are motivated to ask questions. Formulation of questions can improve learning abilities because it can stimulate students' critical thinking skills. When students make questions, students

need to read, dig up information given and communicate questions verbally and in writing with group members (Thobroni, 2015). When students write down the information, it will cause students' memory to be much better. When asking questions, students will be given the opportunity to investigate and analyze information so that they can strengthen their learning abilities. The level of understanding and mastery of students on the subject matter can be seen through the questions that have been made. Creativity and activeness of students in formulating questions will make students become people who have critical thinking skills because they can analyze a cause and effect matter without receiving all the information.

Based on the findings obtained from the results of this study, it can be concluded that the learning outcomes of HOTS-oriented mathematics for fourth grade elementary school students who have low critical thinking skills using the problem posing learning model are better than the CUPs learning model.

4. CONCLUSION

Based on the results of the data analysis, the results of testing the analytical requirements, and the results of hypothesis testing, it can be concluded that: 1) There are differences in the learning outcomes of HOTS-oriented mathematics for fourth grade elementary school students between those using the problem-posing learning model and the CUPS learning model; 2) There are differences in HOTS-oriented mathematics learning outcomes for fourth grade elementary school students between students who have high critical thinking skills and those who have low critical thinking skills; 3) There is an interaction effect between the problem posing learning model and critical thinking on the HOTS-oriented mathematics learning outcomes of fourth grade elementary school students; 4) There are differences in HOTS-oriented mathematics learning outcomes for fourth grade elementary school students who have high critical thinking skills between those using the problem-posing learning model and the CUPs model; 5) There is no difference in HOTS-oriented mathematics learning outcomes for fourth grade elementary school students who have low critical thinking skills between those using the problem-posing learning model and the CUPs model.

This research has implications for the learning process that encourages students' active and critical thinking skills to formulate problems and solve problems to achieve mastery of 21st-century competencies. However, there are still some research limitations that affect the results of the study, namely that students and teachers have never used these two learning models. The researcher recommends for further researchers to carry out a learning innovation to improve student learning outcomes as well as when conducting socialization and simulations are carried out at different times to the two teachers who use the two learning models.

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