Implementation of Cooperative Learning Model Type Group Investigation Assisted by Augumented Reality on Human Excretory System Material for Critical Thinking Skills of Smpit Bina Insan Mulia Students

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Abstract: *Education is the main key to the success of a nation and plays an important role in creating quality human resources. Through education, it is expected that there will be a human achievement in improving the resources and quality of himself. One of the efforts that can be made in education is to improve the quality, effectiveness, and efficiency of learning. The research design used in this study is a non-equivalent control group design. The non-equivalent control group design consists of two groups, namely the control and experimental groups. In this design, the control and experimental groups are not randomly selected. This design is carried out on two groups, namely the control and experimental groups selected based on certain considerations. The pretest and posttest results of the experimental class and control class on the sub-indicator concluded that everything had increased. In the sub-indicator of giving induction, the experimental class experienced an increase of 38%, while the control class experienced an increase of 20%. Thus, the application of cooperative learning assisted by augumented reality can be a solution to the lack of learning media that can improve students' critical thinking skills. However, there are shortcomings, namely that there are not many augmented reality simulations that are more contextualized based on existing phenomena. The application of cooperative learning type group investigation assisted by augumented reality shows good results by increasing students' critical thinking skills as evidenced by the results of the posttest data statistical hypothesis test which gives a Sig. (2-tailed) (0.001) < the significance level (0.05).*

INTRODUCTION

Education is the main key to the success of a nation and plays an important role in creating quality human resources. Through education, it is expected that there will be a human achievement in improving the resources and quality of himself. One of the efforts that can be made in education is to improve the quality, effectiveness and efficiency of learning. Learning itself in Law No. 20 of 2003 concerning the National Education System Article 1 Paragraph 20 states that learning is the process of interacting students with educators and learning resources in a learning environment. Pratama, et al (2020) 21st century skills. states that through education it can influence a person to adapt to their environment in social life and can also optimize the quality of human resources. Through the availability of improvements in the quality of education in Indonesia, it will direct students to achieve 21st century skills. According to Sugiyarti, et al (2018: 440) the demands of the 21st century in the world of education, namely activities in the learning process are required to be technology-based which is useful in adjusting the progress of the millennial era. Technology is used so that students adapt to life skills in the 21st century. In the 21st century, information is widely spread and technology is increasingly developing. Students living in the 21st century must master the 4C skills, namely critical thinking, communication, collaboration, and creativity. In the 21st century critical thinking is very important to develop in order to have high competitiveness so that it can compete in global competition. In addition, critical thinking is central to the learning process because this potential facilitates students in learning by discovery. The ability to think critically can stimulate thinking in cognitive students while getting an education. Critical thinking is also important and needed so that during the process of learning activities students can construct their ideas according to learning problems (Rustaman, 2011).

According to Sharan and Sharan (2019), group investigation is a learning model that involves students since planning, both in determining the topic and how to learn it through investigation. This learning model teaches students to have good abilities in communication and group process skills. Group investigation learning provides opportunities for students to think independently, be active in finding learning resources, find their own concepts of subject matter through investigation, interact with friends, and work together in groups, while the teacher only acts as a guide, facilitator, and provider of constructive criticism. Augmented Reality (AR) is a technology that combines two-dimensional and or three-dimensional virtual objects into a three-dimensional real environment and then projects these virtual objects in real time. In general, AR is the combination of virtual objects with real objects. For example, when a television anchor presents the news, there is an animation or virtual object that comes with him, so it is as if he is in the virtual world, but in fact it is a technique of combining the virtual world with the real world called augmented reality. Effective learning requires good planning, in addition to the right method, media selection is also very influential. Thus, knowing the application of cooperative learning model type group investigation assisted by augumented reality to the critical thinking skills of students on the material of the human excretory system.

METHODS

The research design used in this study is a non-equivalent control group design. The non-equivalent control group design consists of two groups, namely the control and experimental groups. In this design, the control and experimental groups are not randomly selected. This design is carried out on two groups, namely the control and experimental groups selected based on certain considerations.

The population in this study were all students of SMP-IT Bina Insan Mulia which amounted

to 891 students. The sample in this study amounted to two classes, namely the control and experimental classes. The sample determination in this study was determined by purposive sampling technique, which is a sampling technique that prioritizes research objectives rather than population characteristics in determining the research sample. The samples in this study were two classes from class VIII, namely VIII A and VIII B which totaled 52 students, with the same number of students in each class, namely 26. Determination of control and experimental classes is based on the results of pretests conducted in classes VIII A and VIII B. The class that gets lower pretest results is the class that gets lower pretest results. Classes that get lower pretest results are used as experimental classes, and higher ones as control classes. As the provision, VIII A class was determined as the control class and VIII B as the experimental class. In this study, there are two research variables, namely the independent and dependent variables. Independent variables are variables that affect or cause changes or the emergence of dependent variables. Meanwhile, the dependent variable is the variable that is influenced or that becomes the result because of the independent variable.

Data collection techniques in this study were carried out through tests and non-tests. Tests in the form of pretests and posttests were used with the aim of measuring students' critical thinking skills. The pretest was given before the sample received treatment, while the posttest was given after the sample received treatment. Non-tests were used with the aim of measuring students' responses to the application of the group investigation type cooperative learning model assisted by augumented reality. The non-test was given after the sample received treatment.

Data analysis of non-test instruments in this study used data analysis techniques with a Likert scale. The statements in the questionnaire are divided into two, namely: positive statements and negative statements. In analyzing the data from the graded questionnaire, the researcher can conclude the meaning of each level accordingly.

RESULTS AND DISCUSSION

The results of the pretest and posttest of the experimental and control classes on the sub-indicators concluded that everything had increased. In the sub-indicator of giving induction, the experimental class experienced an increase of 38%, while the control class experienced an increase of 20%. The critical thinking ability of students in the indicator of the ability to provide further explanation has a sub-indicator, namely assessing the definition. The results of critical thinking skills in each sub-building basic ability all increased. In the sub indicator of assessing the credibility of the source, the experimental class experienced an increase of 31.5%, while the control class experienced an increase of 21.5%. In the sub-indicator answering assessing observation reports, the experimental class experienced an increase of 32%, while the control class experienced an increase of 20%. The pretest and posttest results of the experimental and control classes on the sub-indicator of giving simple explanations all increased. In the sub-indicator of analyzing the argument, the experimental class experienced an increase of 27%, and the control class experienced an increase of 27%. In the sub-indicator of answering clarifying questions, the experimental class experienced an increase of 37%, while the control class experienced an increase of 25%.

Table 1. Recapitulation of *Prestest* and *Posttest* results of Experimental and Control classes

Data Centralization and Dissemination	Pretest		Posttest	
	Experiment Class	Control Class	Experiment Class	Control Class
Lowest Score	**20**	**24**	**54**	**46**

Highest Score	**62**	**64**	**90**	**80**
Average	**39,30**	**45,77**	**74,46**	**65,69**
Mode	**34**	**44**	**70 and 80**	**64**
Median	**36**	**45**	**75**	**65,5**
Standard Deviation	**11,33**	**9,79**	**7,80**	**8,10**

The mean value of the experimental class pretest (39.30) was lower than the mean value of the control class pretest (45.77). Both experimental and control classes experienced an increase in the average score on the posttest score. The average posttest score of the experimental class was 74.46 or increased by 35.16. Meanwhile, the average value of the control class posttest was 65.69 or increased by 19.92. Based on this data, it is known that the experimental class which was given treatment in the form of a cooperative learning model of group investigation assisted by augmented reality had a higher increase in critical thinking skills than the control class which was given treatment in the form of conventional learning.

Based on the Hypothesis Test, the Sig. (2-tailed) value of the posttest data hypothesis test is 0.000. The Sig.(2-tailed) value is smaller than the significance level value, so it can be concluded that the application of the group investigation cooperative learning model assisted by augumented reality can improve students' critical thinking skills. Based on the average posttest score, the experimental class has a higher average score than the control class with a difference of 8.77. This happened because of the different treatment of experimental and control classes. The experimental class applied learning by using a cooperative learning model of group investigation assisted by augumented reality, while the control class applied conventional learning. Based on the N-Gain test results, an increase in critical thinking skills occurred in both classes, both experimental and control classes. The increase in critical thinking skills occurred in all indicators, namely indicators of providing simple explanations, building basic skills, concluding, providing further explanations and organizing strategies and tactics.

The critical thinking skills of the experimental class were higher than the control class in all indicators. In the indicator of giving simple explanations, the increase in critical thinking ability of the experimental class was higher than the control class. This happened because in the learning process students were asked to discuss by making and answering questions from the experimental simulation video given. This discussion and question and answer activity according to Lesy Luzyawati's research will improve critical thinking skills on indicators of giving simple explanations. In both sub-indicators, namely analyzing arguments and answering clarifying questions, the experimental class had a higher value of increasing critical thinking skills than the control class. A significant increase occurred in the sub-indicator of answering clarifying questions. This happens because in cooperative learning assisted by augumented reality there is a simulation that provides information on events or phenomena related to the description of the human excretory system. This is in accordance with the research of Zalpita Agustia, et al, which states that providing information about the concept of lessons in everyday life can improve students' critical thinking skills on indicators of asking and answering questions. In the indicator of building basic skills, the experimental class had better results than the control class. In both sub-indicators, namely assessing the credibility of sources and assessing observation reports, the experimental class had an increase in results that was also better than the control class.

The highest increase occurred in the sub-indicator of assessing observation reports. This happens because in the learning process students are asked to observe the simulation of experiments in cooperative learning assisted by augumented reality, then the teacher asks to ask questions

related to the simulation of experiments that students have observed. This makes students able to observe the problems given. In the conclusion indicator which has a sub-indicator of induction ability, the experimental class has a better improvement than the control class. This happened because in the learning process the teacher directed students to try to make conclusions and express them from several experimental simulations in cooperative learning assisted by augumented reality.

In the indicator of giving further explanation which has a sub-indicator of assessing the definition, the experimental class results have improved better than the control class. This happens because in the learning process, the teacher guides students to look for lesson concepts independently as a result of observing the simulation of experiments, and activities to reason about the concepts in cooperative learning assisted by augumented reality. According to Zalpita Agustia's research, the stage to train the ability to assess the definition is to design activities where appropriate. This is in accordance with the opinion of Shan Duta Sukma Pradana, et al, who stated that the ability to determine actions can be improved by solving the problem of students finding their own learning concepts through experiments, demonstrations, and discussions. In the indicator of organizing strategies and tactics that have indicators of determining actions, the improvement in experimental class results is better than the control class. This happened because students were trained to determine actions through observing simulated experiments in cooperative learning assisted by augumented reality. At the end of each experiment simulation, the teacher asked reflective questions about the experiment process. In addition, in cooperative learning assisted by augumented reality there are practice questions with answers and explanations. The activities in the augmented reality media attempt to guide students to answer questions by being able to determine the correct action.

The application of cooperative learning assisted by augumented reality in addition to improving students' critical thinking skills in all indicators, also received a positive response from students. This is evidenced by the results of the student response questionnaire to the application of cooperative learning assisted by augumented reality which received a very good category (85%). Thus, the application of cooperative learning assisted by augumented reality can be a solution to the lack of learning media that can improve students' critical thinking skills. However, there are shortcomings, namely that there are not many augmented reality simulations that are more contextualized based on existing phenomena.

CONCLUSIONS

Based on the results of research and discussion regarding the cooperative learning model of group investigation type assisted by augumented reality on the material of the human excretory system on critical thinking skills of class VIII students of SMP-IT Bina Insan Mulia Cirebon, it can be concluded that:

1. The application of cooperative learning type group investigation assisted by augumented reality shows good results with increasing students' critical thinking skills as evidenced by the results of the posttest data statistical hypothesis test which gives a Sig. (2-tailed) (0.001) < the significance level (0.05).
2. The N-Gain results show information that learning with the cooperative group investigation model assisted by augumented reality has increased. The increase was seen in all indicators, namely indicators of providing simple explanations, building basic skills, concluding, providing further explanations and organizing strategies and tactics. The high category in 5 indicators is the indicator of giving simple explanations.

3. Student responses to the group investigation type learning model assisted by augumented reality showed good and positive results of (85%) with a very good category.

Based on the results of the study, the researcher would like to make the following suggestions:

1. For Teachers Through the experiment of applying the cooperative learning model of group investigation type assisted by augumented reality that has been done, the researcher sees that students become more active and critical in learning. Thus, it is expected that this cooperative learning model of group investigation type assisted by augumented reality can be used as a new alternative that can contribute thoughts and information, especially for science teachers in improving students' critical thinking skills.
2. For Students The application of cooperative learning model type group investigation assisted by augumented reality makes students more critical and makes students more responsible for the tasks given. Thus, students must better understand the discipline in group investigation type learning assisted by augumented reality, where students can actively interact with their peers to solve a problem.
3. For Schools For schools, they should provide socialization and facilitate teachers on the importance of learning models that lead to the application of active, creative, innovative and fun learning such as one of them, namely the cooperative learning model of group investigation type assisted by augumented reality so that the learning process does not feel boring and makes students more accomplished by increasing students' critical thinking skills.

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