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Research Article

Comparative Skills to Communicate Science Students Using Group Investigation Learning Model Genuine Object and Non Genuine Objects in Science Subject

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ABSTRACT

Along with the times, humans are required to master the skills of communication, collaboration, critical thinking, and creativity. Communication skills become one of the important skills that must be mastered by someone. In this case the world of education plays a role in being able to train students to have communication skills. One of them is by applying the Group Investigation learning model assisted by Genuine Object, because with direct learning supported by real object media, students will easily make observations, and communicate everything they get. The objectives of this study are: 1) Knowing the difference in students' science communication skills with the Genuine Object and Non-Genuine Group Investigation learning models. The sample used was one of class in Ponorogo district. Data used collected descriptive analysis were analyzed through descriptively quantitative and inferential statistics. The results showed that students 'science communication skills using Genuine Object Assisted Group Investigation learning models had an average value of 65.7 while students' communication communication skills using Group Investigation Non Genuine Objects had average values an average of 41.6. Communication skills of students using the Group Investigation learning model assisted by Genuine Object are better than Non Genuine Object. Based on the one tailed t test, the value obtained is - 3,27748. Based on the results of the study it can be concluded that the learning model of Group Investigation assisted by Genuine Object can improve students' science communication skills.

INTRODUCTION

Along with the development of the times, humans are required to have superior and quality resources to be able to compete with the progress of the times, especially in the 21st

century. There are four skills that are needed to answer the challenges of the 21st century, namely, communication, collaboration, critical thinking, and creativity (Ika, 2018). In this case, the world of education has a very important role to create superior, knowledgeable, quality human resources who are able to think critically, solve problems, be creative, can convey ideas or ideas that they have, and can work together and competent. Not only competent in cognitive abilities, but also must have supportive skills. Therefore the Government implements an education system that is guided by the philosophy of Indonesian education,

The implementation of the 2013 curriculum explained that to meet the needs of future competencies, the ability of students needed is to think critically and creatively to be able to live in a global society, have a broad interest in life, be ready to engage in the world of work, have good intelligence, have a caring attitude on the environment and communication skills. Communication skills according to the 21st century are the delivery of ideas or information either verbally, in writing, or non-verbally, which is used to achieve goals (Muharromah et al., 2019). Communication in science means the process of communicating information in the form of knowledge or a theory obtained from research activities carried out by a researcher to others, which are conveyed in various ways, for example through seminars, presentations and so forth. Research results can also be delivered in a non-verbal way, namely with facial expressions, body movements, and other sign language to help clarify the message and information conveyed (Romdon, 2019). Science communication skills include the ability to make tables, graphs, charts, essay, report and communicate an idea both verbally and in writing (Muharromah et al., 2019). In science learning students must master the skills in communicating science, because by having good science communication skills a person can express ideas, opinions and information obtained through scientific activities both verbally and in writing correctly, and information can be well received by listeners. presentations and so on. Research results can also be delivered in a non-verbal way, namely with facial expressions, body movements, and other sign language to help clarify the message and information conveyed (Romdon, 2019). Science communication skills include the ability to make tables, graphs, charts, essay, report and communicate an idea both verbally and in writing (Muharromah et al., 2019). In science learning students must master the skills in communicating science, because by having good science communication skills a person can express ideas, opinions and information obtained through scientific activities both verbally and in writing correctly, and information can be well received by listeners. presentations and so on. Research results can also be conveyed in a non-verbal way, namely with facial expressions, body movements, and other sign language to help clarify the message and information conveyed (Romdon, 2019). Science communication skills include the ability to make tables, graphs, charts, essay, report and communicate an idea both verbally and in writing (Muharromah et al., 2019). In science learning students must master the skills in communicating science, because by having good science communication skills a person can express ideas, opinions and information obtained through scientific activities both verbally and in writing correctly, and information can be well received by listeners.

Based on a survey conducted by the National Association of Colleges and Employers (NACE) in 2002 in the United States it can be seen that the quality of communication skills, integrity, ability to work together, work ethic, ability to adapt and organize, and the ability to lead is considered less important still in the category low. Based on the results of the survey, it is necessary to have a fundamental correction in the world of education, one of which is education in Indonesia. During this time education in Indonesia prioritizes cognitive development. Students' communication skills in scientific activities are often not trained in learning. This is a challenge for a teacher to apply an appropriate learning model to develop students' communication skills in learning science. This is consistent with a survey conducted

by Yoshida et al. in 2002 in Washington quoted in Putri who said that learning is needed to be able to achieve good communication skills. A good learning process is proven to improve communication skills (Putri et al., Tt).

Based on preliminary observations made by researchers through interviews with science teachers at one of the state junior high schools in Ponorogo, it can be seen that in science learning activities teachers often apply discussion learning methods. This can also be known from the existing learning implementation plan, where teachers have not used varied learning models. The teacher also has not evaluated the students' communication skills. In learning activities sometimes the teacher gives the opportunity to group representatives to present the results of the discussion, the presentation activities are adjusted to the available time. In the presentation activities students still tend to read notes, and focus not on the notes to the recipient of the message. As for communication skills in writing the teacher has never conducted training and assessments to students. Evaluation activities in the form of written tests are only used to evaluate students' cognitive abilities. From the results of interviews with students in one of the State Junior High Schools in Ponorogo it can also be seen that in one class there are still some students who have not dared to express their ideas and opinions. Based on the analysis of the written test data in the form of problem descriptions that have been done by students, it can be known From the results of interviews with students in one of the State Junior High Schools in Ponorogo it can also be seen that in one class there are still some students who have not dared to express their ideas and opinions. Based on the analysis of the written test data in the form of problem descriptions that have been done by students, it can be known From the results of interviews with students in one of the State Junior High Schools in Ponorogo it can also be seen that in one class there are still some students who have not dared to express their ideas and opinions. Based on the analysis of the written test data in the form of problem descriptions that have been done by students, it can be knownthat science communication skills of students get an average score of 61.5%. Therefore, there needs to be a solution to be able to improve students' science communication skills.According to Yusuf (in Ika, 2018) in teaching communication skills to students, a teacher must create active learning, by involving students can interact actively.

Group Investigationis one of the learning models that can train students to have good communication skills (Ardiana, 2018). That is because in applying this model, students must be active in raising questions, raising opinions, making hypotheses, making observations, processing data and making conclusions from investigative activities that have been carried out. The Group Investigation learning model is one of the cooperative learning models that emphasizes the activity of seeking and finding knowledge on their own. In this learning, students are given the opportunity to be active in learning activities and are directed to discover for themselves various facts, concepts and new values. Students are also trained to think scientifically to be able to solve the problems they face in their lives..Through the Group Investigation learning model students are expected to think critically and creatively, so that they can solve an existing problem. Investigation activities in learning science can help students to develop scientific skills, cognitive abilities, and also scientific attitudes. The Group Investigation learning model provides opportunities for students to conduct an investigation, in addition students must be active in raising questions, raising opinions, making hypotheses, making observations, processing data and making conclusions (Dewi et al., 2017).

Searching and finding knowledge on their own can make the learning experience more meaningful, so students will easily understand the concepts of the material being studied. According to Suherman (in Febriyanto, 2017) if someone has understood a concept correctly, then he will be easy to communicate the concepts he has understood. Someone can be said to master a concept if the person really understands the concepts learned and is able to explain

using their own words in accordance with knowledge it has, but does not reduce the meaning that is in it (Sumaya, 2004). The group investigation learning model has several advantages including making students actively participate in discussions and conveying ideas. The participation of students in learning activities will make social interaction between students increase. In learning activities using the group investigation learning model learning activities will become more informal,

The application of the Group Investigation learning model certainly requires media that can support the implementation of learning. Therefore, we need an interactive media so that it can facilitate students in participating in learning. Some media that can be used are visual media in the form of images, and media in the form of real objects or real objects. Media genuine object or real objects are learning media that are in the form of real or original that can provide direct experience to students, attract students' interest and enthusiasm (Lovita, 2017). While visual media in the form of images are all things that are manifested visually in the form two dimensions as an outpouring of feelings or thoughts. The channel used involves the sense of sight.

Based on the description above, the purpose of this study is firstknowing the difference between genuine object-assisted group investigation learning model and genuine non-object investigation group learning model on science communication skills of students in natural science subjects in SMP Negeri 2 Ponorogo, secondly, whether the learning model of Investigation assisted by Genuine Object is better than the learning model of Investigationnon genuine object towards students' science communication skills in natural science subjects at SMP Negeri 2 Ponorogo.

METHOD

This research was conducted at SMP Negeri 2 Ponorogo which addressed at Jl. Basuki Rahmat No. 44 Ponorogo.The study was conducted from 24 February 2020 to 11 March 2020. This study uses quasi-experimental methods that aim to determine the comparison of science communication skills of students taught by using the Group Investigation cooperative learning model assisted by Genuine Object and Cooperative Group Investigation NonGenuine Object type. (Ardiana, 2018). The application of the Group Investigation type cooperative learning model assisted by Genuine Object uses the media in the form of real objects in the school environment, while the application of the Group Investigation NonGenuine Object type cooperative learning model uses image media. The design of the experimental method used in this study is the design of the control group initial test - the final randomized test (randomized pre test - post test control group design).The population in this study were all students of class VII in SMP Negeri 2 Ponorogo Academic Year 2019/2020. This research is an experimental study with a research population consisting of 8 classes taken 2 classes as samples. Determination of the sample using cluster random sampling techniques. In this study the class selected as the control class is Class VII C as many as 32, while the experimental class is Class VII D as many as 32 students. Data collection methods in this study, namely the method of observation, tests, and documentation using instruments in the form of observation sheets and test sheets.Data collection techniques with descriptive tests were analyzed in quantitative descriptive, descriptive qualitative and inferential statistics. The qualitative descriptive data analysis technique was used to analyze the feasibility of learning. Quantitative descriptive techniques are used to analyze improvements in science communication skills obtained from N-Gain results, while inferential statistics are used to compare the results of students' science communication skills.

Before data collectedis done, the researcher first validates the research instrument. Validation is carried out on two experts then tested on students who are not sampled in the

study. The valid instrument results are then used to retrieve data. Following are the results of the validity of the questions.

Researchers took preliminary data in the form of pre-tests of students in the control class and the experimental class. Furthermore, the data from the pre-test results were analyzed to find out the homogeneity and normality of the data and to know the value of the average value of students' communication skills before being given treatment. After that students are given treatment to improve science communication skills. Then the researchers conducted a post test to find out the average value of students' science communication skills after being given treatment. From the results that have been obtained, the next stage is to find the value of N-Gain to find out the improvement of science communication skills. After obtaining an N-Gain score, the data processing is then performed with a T test to compare the results of students' science communication skills.

RESULTS AND DISCUSSION

According to Rustaman (in Kristiawati, 2014) the assessment of students' science communication skills is based on 6 indicators. These indicators include changing the form of data presentation, describing empirical data on the results of experiments or observations with graphs or tables, compiling and delivering reports systematically, explaining the results of experiments or observations, reading graphs or tables, and discussing the results of activities of a problem or event. Based on the pre-test and post-test that has been done, it can be obtained the average value presented in Figure 1 below.

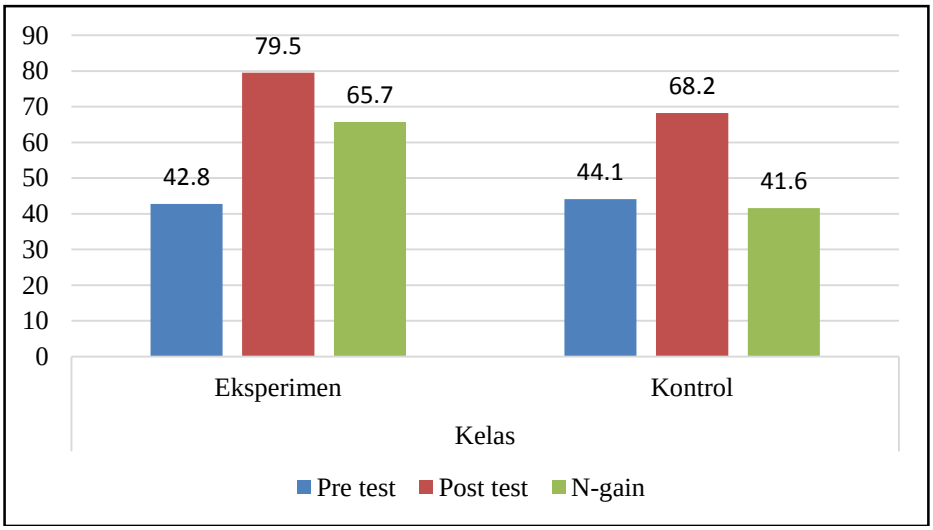

Figure 1. The results of the average value of pre-test, post-test and N-class experiment and control class

Based on the figure 1 above, it can be seen that the average value of the pre-test control class is 44.1 then after treatment is given by applying the Group Investigation Non Genuine Object learning model (picture media) to 68.2 with an N-value Gain of 41.6. While the average value of the experimental class pre-test of 42.8 then increased to 79.5 with an N-Gain value of 65.7 after being given treatment, namely the application of the Group Investigation-assisted learning model assisted by Genuine Object. Based on the results of data analysis that has been done, the average value in classes using real objects or objects is better than classes using visual media in the form of images. This proves that media in the form of real objects or objects is more effective in improving students' communication skills. This is because through the use of media in the form of tangible objects or objects students can use all the sensory devices they have to utilize the media (Rizky & Hendratno, 2014). Besides that, the

existence of real objects will make it easier for students to find and find data more objectively and accurately (Permatasari & Hendratno, 2014). The use of supporting media in the form of real objects supports the implementation of learning by investigation. Through the use of tangible objects, especially tangible objects in the school environment will make students feel happy and interested and can maximize the use of all the senses that they have to investigate existing objects, by way of seeing, hearing, feel, feel directly and can even feel the object that is there. This can make it easier for students to remember and understand what is experienced and found so that learning will be more meaningful and students can communicate everything that is obtained easily. In addition, in investigative activities students are trained to make investigative reports, read graphs presented in LKPD, and describe data in tabular form. This gives students the experience to communicate data, so that the post test scores obtained increase. Unlike the class that uses visual media in the form of images that only rely on the use of sensory devices in the form of vision, so this is less able to help students find data accurately and concretely. Students also find it difficult to analyze the pictures provided by the teacher.

Students are also trained to make investigative reports reading graphs presented in LKPD, as well as describing data in tabular form, but in working on the description given by the teacher, students are still lacking in changing data and cannot compile words in clear and precise language. This causes the average value in the class that uses visual media in the form of images is lower than the class using real objects or genuine objects. According to Florez (in Nurmala & Priantari, 2017) the skill to communicate information clearly is indicated by the ability to use grammar correctly, choose vocabulary that is easy to understand and right on target. Students are also trained to make investigative reports reading graphs presented in LKPD, as well as describing data in tabular form, but in working on the description given by the teacher, students are still lacking in changing data and cannot compile words in clear and precise language. This causes the average value in the class that uses visual media in the form of images is lower than the class using real objects or genuine objects. According to Florez (in Nurmala & Priantari, 2017) the skill to communicate information clearly is indicated by the ability to use grammar correctly, choose vocabulary that is easy to understand and right on target.

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According to Florez (in Nurmala & Priantari, 2017) the skill to communicate information clearly is indicated by the ability to use grammar correctly, choose vocabulary that is easy to understand and right on target.Furthermore, the results of the pre-test and post-

test scores from the average of several indicators of science communication skills in natural science subjects are as follows.

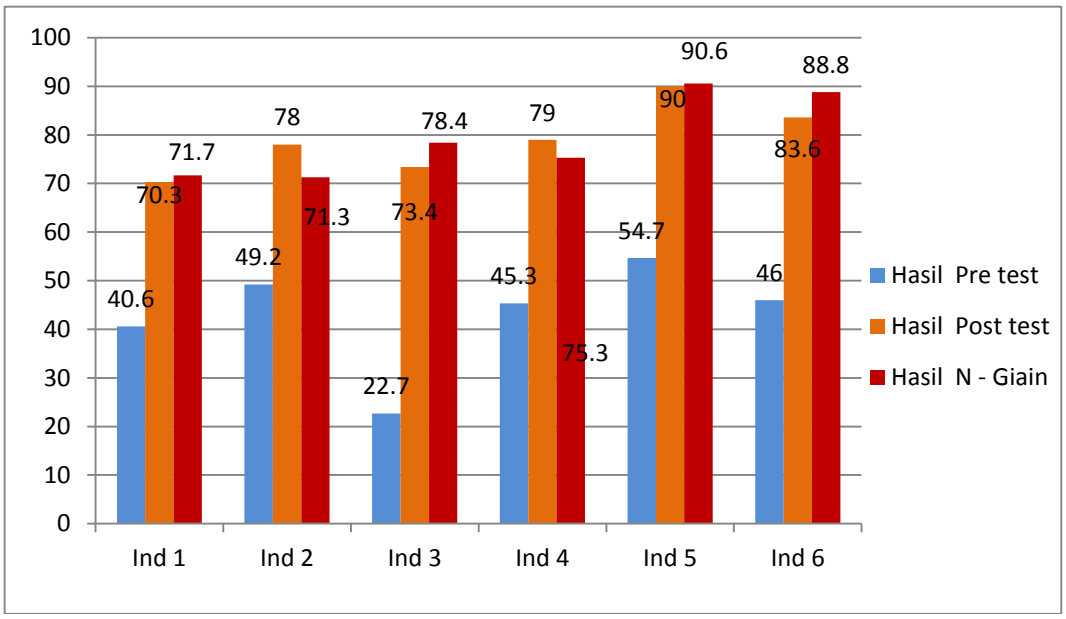

Figure 2. Bar charts average pre test, post test and N-Gain indicators of science communication skills

Based on the figure 2 above, it can be seen that there are differences in each indicator of students' science communication skills. Indicators change the form of data presentation has an average value of 40.6, after being given treatment it increases to 70.3 with an N-Gain of 71.7 and high category. Indicators change the form of data presentation is the ability of students to present data in the form of tables or graphs in the form of a description, or vice versa. The ability of students to change the form of presentation is in the good category. In this case, the teacher gives the opportunity for students to practice changing the data that has been provided in the form of tables into descriptions. In describing the data, there are criteria that must be met, including the suitability between the data described in the form of a description or writing with the data in the table or graph. In addition, the use of grammar must be clear, correct and simple. In changing the presentation of data no errors should occur, so the data displayed must match the actual data.

The teacher also guides students to change the presentation of data in the form of images about the interaction patterns of living things into tabular form. However, in this case, students have not been able to classify data in tabular form, and have not been able to perform data analysis presented in the form of images of living creature interaction patterns evidenced by the presence of incomplete data in the tables created. This is a factor that causes the indicator to change the data presentation in the good category, with the lowest average value compared to other indicators. In changing the presentation of data no errors should occur, so the data displayed must match the actual data. The teacher also guides students to change the presentation of data in the form of images about the interaction patterns of living things into tabular form. However, in this case, students have not been able to classify data in tabular form, and have not been able to do data analysis presented in the form of images of living creature interaction patterns evidenced by the incomplete data in the table created. This is a factor that causes the indicator to change the data presentation in the good category, with the lowest average value compared to other indicators. In changing the presentation of data no errors should occur, so the data displayed must match the actual data. The teacher also guides students to change the presentation of data in the form of images about the interaction patterns of living things into tabular form. However, in this case, students have not been able

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The second indicator is to describe empirical data from experimental results in the form of tables or graphs which have an initial average value of 49.2 then increase to 78 with an N-Gain value of 71.3. The skill of describing empirical data on the results of experiments in the form of tables or graphs is the student's skill in describing findings or data obtained when students conduct investigations. Koentjaraningrat quoted in Iing Mustain said that graphs or tables can present data in a more compact, clear, concise and simple manner than delivering information in the description. Graphs can also highlight the unique nature of the data more clearly than through written descriptions (Mustain, 2015). Based on the tests that have been done, proven if students are careful enough in describing empirical data on the results of experiments with the form of tables or graphs, but there are some students who do not use a ruler in making tables and do not provide titles in the table, so the results are less than the maximum. In general, each student has their own creativity in making tables, and most students make complete tables, so this indicator can be categorized well.

The third indicator is to compile and submit reports systematically. Before being given treatment the indicators compile and submit reports systematically have an average value of 22.7 then after being given treatment increase to 73.4 including the good category, with an N-Gain value of 78.4 including the high category. Indicators compile and submit reports systematically including the ability of students to pay attention to the relationship between the objectives of the investigation and the results of the investigation, as well as their ability to prepare reports clearly, completely and systematically starting from the title of the investigation, the purpose of the investigation, hypotheses, tools and materials, work procedures, analysis investigation results, and conclusions (Rayana, 2018). Students must use handwriting in making this report using polite, clear and good language. The Phanerogamae

Botany lecturer team was quoted in Y. Astuti (2017) that there are several things that must be considered in preparing the practicum or observation report, including the systematic report must meet the requirements as scientific writing, completeness and accuracy of the observational data, the ability to process and analyze data critically in discussions or discussion of observations and accuracy in submitting reports (Astuti, 2017). In the investigation group activities one of the most important syntax is reporting activities. In this activity students are accustomed to make a report on investigative activities in groups. This causes students to become accustomed to making reports so that this indicator has a good category.

The next indicator is to explain the results of the experiment or observation. This indicator has an average value of 45.3 then increased to 79 including the good category, with an N-Gain value of 75.3 with a high category. Indicators explain the results of experiments and observations classified in either category. This indicator includes the ability of students to speak or communicate observational data both verbally and in writing. This indicator relates to the presentation activities in the application of the group investigation model, where in this activity students are given the opportunity to submit their reports directly in a language that is clear and easy to understand. In addition students are also given the opportunity to explain the results of investigations in written form. One of the factors that can improve students' ability to explain the results of experiments and observations is direct learning in the form of investigative activities. In this case, students are given the opportunity to find theories or prove themselves a theory, and do their own activities so that learning becomes more meaningful and students are also easier to understand and explain what he has gained (Suryaningsih, 2017). Wahidin cited in Kartini on science learning emphasizes the provision of hands-on experience, and that experience can make students easy to understand concepts and also convey concepts found (Kartini, 2014).

Indicators reading charts or tables are indicators that have the highest value compared to other indicators. From the original 54.7 to 90 and it is in the very good category, with an N-Gain value of 90.6 in the high category. Chart and table reading indicators are in the excellent category. Indicators of reading graphs or tables are shown by students' activities in translating the results of experiments and observations in the form of tables into written form (description) that is accurate and in accordance with the data presented in the table. Based on the data analysis that has been done, the students' ability to read graphs or tables is in the very good category, and has the highest average value compared to other indicators. This is because students are able to explain the data in a complete table and in accordance with the actual data. In addition students are also able to arrange words in the form of descriptions in accordance with the data in the table.

The sixth indicator is discussing the results of the activity of a problem or event. Before being given treatment this indicator has an average value of 46 and after being given treatment increased to 83.6 with a very good category. The N-Gain value on the indicator discusses the results of the activities of a problem or event of 88.8 including the high category. Discussion is part of communication activities. In discussing students are required to get used to conveying their ideas or ideas, this will improve communication skills. When discussing students must be involved in work and each student has the same responsibility, both in conducting investigations to find data, prepare reports, and present reports (Qodry, 2017). In this activity students are quite cohesive in their groups and are serious in conducting investigations with their groups, although there are still some students who are difficult to discuss and sometimes busy themselves. In discussion activities students are given the opportunity to express their opinions and ideas to solve existing problems.

CONCLUSION

From the results of research conducted by researchers regarding the comparison of science communication skills of students using Group Investigation learning models assisted by Genuine Object and Non Genuine Object in Natural Sciences subjects at SMP Negeri 2 Ponorogo, it can be concluded that: 1) There is a difference between students' science communication skills using the Genuine Object Assisted Group Investigation learning model and the Group Investigation Non Genuine Object learning model in Natural Sciences in SMP Negeri 2 Ponorogo. The science communication skills of students using the Group Investigation learning model assisted by Genuine Object have an average value of 65.7 while the science communication skills of students using Group Investigation Non Genuine Object have an average value of 41.6; 2) The Group Investigation Assisted Genuine Object learning model has a better effectiveness to improve students' science communication skills than with the Non Investigated Group Investigation learning model.

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