Improving Mathematical Representation Ability of Student's Senior High School by Inquiry Training Model with Google Classroom

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Improving Mathematical Representation Ability of Student's Senior High School by Inquiry Training Model with Google Classroom

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Abstract: This study aims to find the improvement students' mathematical representation ability after being given treatment of the inquiry training learning model with the google classroom. This research is quasi-experimental. Research variables include the independent variable in the form of inquiry training learning model with google classroom assistances and the dependent variable in the form of mathematical representation ability. The research sample is class of XI MIA 1 SMA Negeri 1 Banguntapan in the academic year 2017/2018 which amounted to 29. The sample is determined by lottery. Data collection techniques in the form of tests with data collection instruments in the form of pretest-posttest questions. Data analysis techniques used descriptive statistics and Normalized Gain (N-Gain). The results of the data analysis show the learning model of inquiry training with google classroom can improve the mathematical representation ability of students in the medium category.

Keywords: Inquiry training; Google classroom; Mathematical representation ability.

1. Introduction

Learning about science is like finding out about nature. This process of finding out is done through a series of scientific processes/ scientific work. The result is a scientific product which includes concepts, principles and theories. Physics is one of the science clusters. Aside from being a product, physics is also seen as a process. When studying physics students must be actively involved in the scientific work process so that they can find their own understanding [1]. But the paradigm that has been going on for a long time emphasizes the role of the teacher in the process of knowledge transfer to students [2]. One model that can be applied in physics learning so students can be actively involved in scientific/ experimental work activities is inquiry training [3].

Teachers rarely involve students in investigative/ experimental activities [3], [4]. This finding is in line with the preliminary study in the form of interviews. The teacher maximizes the time available to deliver the material, because the time available is very limited while the material load is too much. If the teacher invites students to experiment, fear that the material cannot be conveyed all. The teacher has never tried to overcome this problem by applying online learning.

The use of technology in learning physics is one of the keys to the success of learning [5], [6]. Teachers can do this by applying online learning. Online learning can facilitate limited space and time. Online learning not only focuses on online contexts, but includes a variety of computer-based delivery methods, simulations, games, and use cell phone [7].

Online learning can be done through google classroom which is an educational service provided by Google [8]. Google classroom is highly recommended, because it can be accessed via a smartphone so that it can be used anytime and anywhere. At present, smartphones are no stranger to students. Most of them already have it, so the application of google classroom is very likely to produce effective and innovative learning [9].

Based on the description above, it is necessary to have an innovation to get a solution to the existing problems. Researchers carry out a learning innovation by applying the inquiry learning model assisted by google classroom to overcome the problems that have been described. Through this model, students can still conduct experiments/ investigations. The teacher does not need to worry about the material cannot be delivered because the teacher can deliver it through online learning using google classroom which is carried out outside of class hours. Teachers can deliver material that has not been delivered during face-to-face learning in class and hold discussions and question and answer with students. The teacher can also make assignments to check the level of understanding of students.

A number of basic natural laws can be used to explain processes in physics. However, to do this, it requires theoretical abstraction and reasoning about the process in question so that it can be formulated and processed. Quantitative formulation in the form of mathematical models is also needed [10]. Mathematical representation is important, because it can make it easier for students to solve mathematical problems that are abstract [11]. When studying physics, students are often faced with a problem that must be solved quantitatively using mathematical equations, so it is important for students to master mathematical representation abilities.

The researcher measures the mathematical representation ability that students have in solving physics problems to find out the improvement after being given treatment using the inquiry training learning model assisted by google classroom. The purpose of writing this paper is to explain the results of the study.

The rest of this paper is organized as follow: Section 2 describes redimentary on characteristic of inquiry training with google classroom. Section 3 describes proposed research method. Section 4 presents the obtained results and following by discussion. Finally Section 5 concludes this work.

2. Characteristic of Inquiry Training with Google Classroom

Inquiry training is one of learning model that can be applied to physics learning. This model is a modification of the inquiry model. Inquiry learning gives students the opportunity to have more personal experience from the scientific process [12]. The purpose of the inquiry training model itself is to train students' abilities in researching, explaining phenomena, and solving problems scientifically [3]. There are 5 phases in this model, namely (1) encounter with the problem, (2) data gathering-verification, (3) data gathering-experimentation, (4) processing, formulating an explanation, and (5) analysis of scientific process [13]. Based on these phases, it can be seen that students are required to learn independently in order to find their own understanding related to the phenomena presented.

Physics learning can be done online, one of which is through google classroom. Google classroom is one of the facilities provided by Google, which is on Google Apps For Education (GAFE) [14], [15]. Google classroom provides important opportunities to promote integrated learning and professional development [16]. Google classroom can facilitate teachers in carrying out learning. Teachers can organize and distribute tasks quickly and can discuss with students anywhere without being bound by time limits or class hours. [9], [15].

Integrating/ combining learning (face-to-face and online) is a way to overcome the challenges of growth, costs, and improve student learning [17]. Google classroom can be used as a tool to help change class focus from teacher-centered to student-centered classes and open to questions, dialogue, and creative thinking for students as active participants [15]. Furthermore, online learning can be used by teachers to maximize incidental learning and improve student performance [7].

Based on the description above it can be concluded that physics learning use inquiry training model with Google classroom is a learning model that is carried out in two ways, namely face-to-face learning in class and online learning through google classroom. The face-to-face learning process is

carried out during class hours by conducting experiments on an event/ problem. The online learning is done outside of class hours to discuss subject matter, distribute tasks, collect tasks and other activities related to learning.

Phenomena that are studied in physics are usually very complex, so to understand them, an ability is needed to represent them. Representation is a process of forming, abstraction and demonstrating knowledge in physics. The application of the representation strategy can simplify problems that are considered complex and complex [18]. Representations can be used to describe an object or process. Through representation, students' physics learning outcomes can be known [19].

Representation consists of verbal, mathematical, graph and image representations [20], [21]. Mathematical representation plays a role in improving understanding of mathematical concepts and solving students' mathematical problems. Mathematical representation allows students to solve abstract mathematical problems that become real [11]. Based on this description it can be concluded that mathematical representation is the ability of students to express mathematical ideas in the form of mathematical symbols used to solve a problem in physics.

There are already several studies that are almost the same as the research in this article, including research on the effects of inquiry learning training models using macromedia flash on the ability of science processes and students' logical thinking abilities [22], research on the effect of the application of google classroom on project based learning models of student learning outcomes [9], and research on the effectiveness of project based learning and inquiry based learning in terms of learning achievement, mathematical representation ability, and learning motivation of students [23]. In contrast to previous research, this study combines inquiry training model with google classroom to determine the effect on students' mathematical representation abilities

3. Research Method

This research is a quasi-experimental study. This research was carried out at SMA Negeri 1 Banguntapan, Yogyakarta, Indonesia. The execution time is the even semester of 2017/2018 school year. The research sample referred to in this study were students of grade XI MIA 1 SMA Negeri 1 Banguntapan as many as 29 students. The sampling technique used saturated samples (*sampel jenuh*). Data collection was carried out through tests using pretest-posttest questions in the form of 5 items. The data obtained is used to determine the mathematical representation ability of students. Data analysis was performed with descriptive statistics and N-Gain

4. Results and Discussion

Learning using inquiry training model assisted google classroom is done in two ways, namely face to face and online through google classroom. During face-to-face learning in class, students are trained to conduct investigations on a problem presented by the teacher. The online learning is done for discussion, question and answer, quizzes, and exercises to do the questions. Google classroom can be used as a tool to help change class focus from teacher-centered to student-centered classes and open to questions, dialogue, and creative thinking in students as active participants [15]. Examples of learning activities through the google classroom are presented in Figure 1.

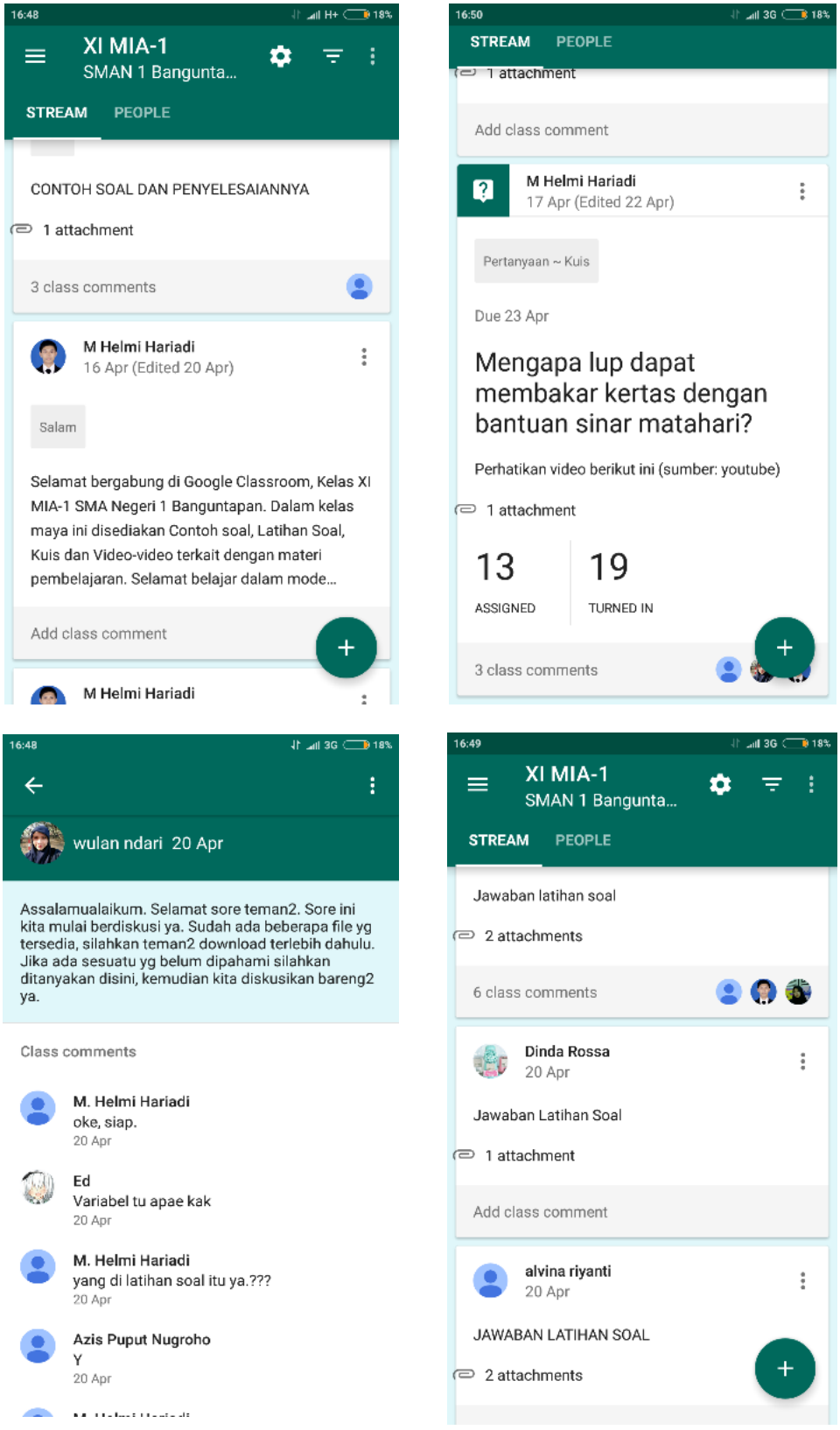

Figure 1. Learning Activities Through the *Google Classroom*

Pretest and posttest data score were analyzed using descriptive statistics by looking for central tendencies (mean, median, mode) and dispersion (range, variance, standard deviation). The results of data analysis are presented in Table 1.

Table 1. Results of Data Analysis

	Pre-test	*Post-test*
Mean	1,85	4,30
Median	1,67	4,00
Modus	1,33	3,67
Range	5,00	7,00
Variance	1,61	2,99
St. Deviation	1,27	1,73

Table 1 shows the differences in the concentration of the pretest and posttest scores of mathematical representation abilities is relatively high. The mean value of pretest was 1.85 and posttest 4.30. The median value of pretest was 1.67 and posttest 4.00. When pretest, the value that often appears is 1.33 and when the posttest the value that often appears is 3.67. If analyzed by the size of dispersion shows that the distribution of pretest and posttest scores is different. The pretest and posttest terms are 5.00 and 7.00 respectively. The pretest variance value was 1.61 with a standard deviation of 1.27, while the posttest variance is 2.99 with a standard deviation of 1.73. Based on the variance value and standard deviation it can be seen that the distribution of posttest values is more diverse than the pretest value. This shows that the posttest value is more heterogeneous.

Maximum scores and minimum scores obtained when pretest and posttest are presented in Figure 2.

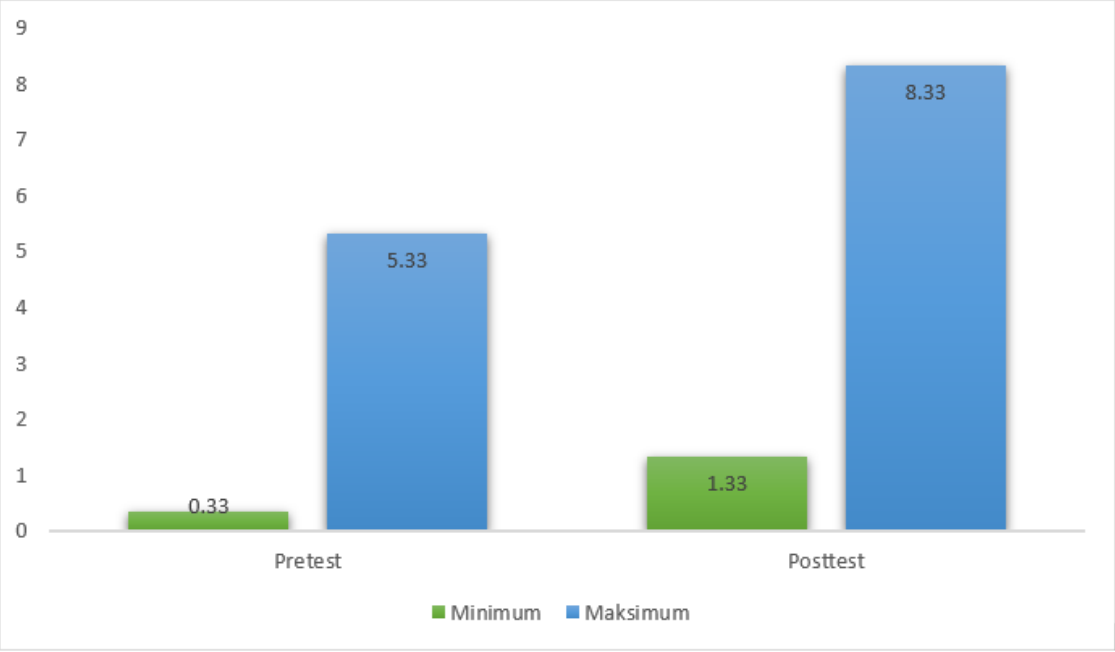

Figure 2. Maximum and Minimum Score

Figure 2 shows that the lowest score when pretest was 0.33 and the highest score was 5.33, while the lowest posttest score was 1.33 and the highest score was 8.33. This value shows that the posttest score is relatively higher than the pretest score.

Furthermore, to find out the increase in mathematical representation capability, an analysis was carried out using N-Gain. N-Gain calculations are carried out for each student, then grouped according to existing N-Gain categories. The percentage of N-Gain in each category is presented in Figure 3.

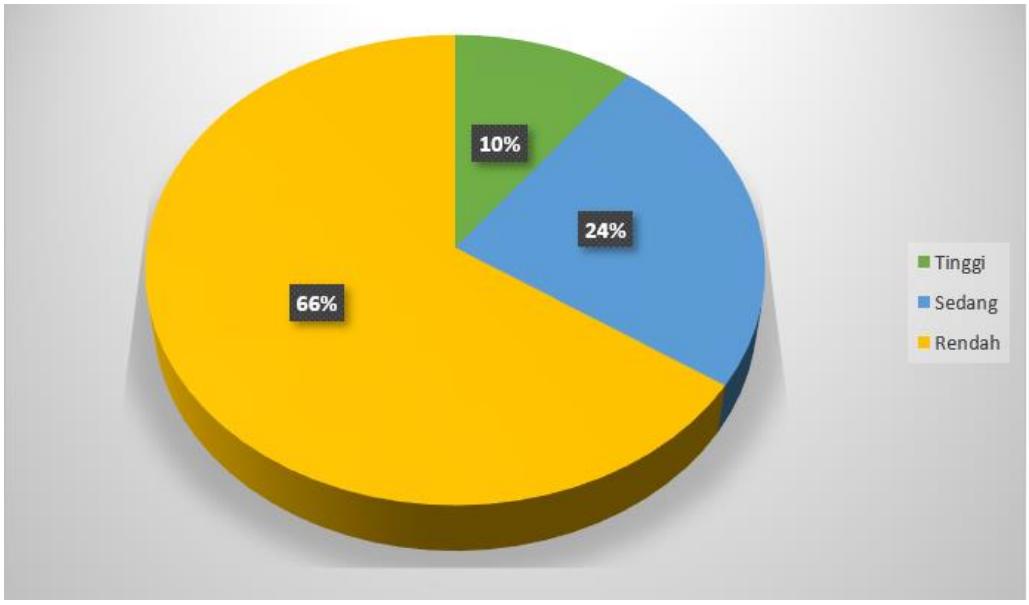

Figure 3. Percentage *N-Gain* in Each Category

Figure 3 shows the percentage of students who received N-Gain scores in the high, medium, and low categories respectively were 10%, 24%, and 66%. This data shows that most students have increased mathematical representation ability in the low category. The average N-Gain obtained from the overall student is 0.30, meaning that the increase in the ability of the mathematical representation of the class is in the medium category.

The results showed that the inquiry training model assisted google classroom was able to improve students' mathematical representation abilities. The increase obtained in the medium category. Students who study physics in an environment that emphasizes the use of multiple representations are more likely to build multiple representations to solve the problem itself [24]. Mathematical ideas can be built and constructed independently by students if the learning is centered on students [23].

When learning through the inquiry training model assisted Google classroom, students can practice conducting investigations in order to find answers to the problems faced. The limited number of hours of study in school is not a problem anymore. Through Google classroom learning can be done online outside of class hours, so learning becomes more effective and efficient. In addition to students being able to conduct investigations through experiments, the material can also be conveyed. The task of sending tasks also becomes easier [8].

5. Conclusion

This paper has presented an improvement of mathematical representation ability of student's senior high school by inquiry training model with google classroom. Based on the results of the study using inquiry training learning model with google classroom assisted training, it can be seen that most of the participants were educated experienced an increase in mathematical representation ability in the low category. However, the increase obtained by the class as a whole is in the medium category. During the study, there were still students who were not active in online learning activities. In the next study, learning through google classroom must be as optimal as possible so that all students are active in learning, so that the results obtained are better.

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