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The Implementation of Learning Instrument of Soil Forming Material with Cooperative Model Type of Team Assisted Individualization of Elementary School Students

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Abstract

This study has the purpose of improving the science process skills and cognitive learning outcomes of students after the Team Assisted Individualization (TAI) type of cooperative learning model was applied in forming soil material. The method of this study was experimental research. The instrument of this study was tests and non-tests. The results showed that the cooperative learning model of Team Assisted Individualization (TAI) could improve students' science process skills with the value obtained from the N-gain test of 0.72 (high) in the experimental class 1 and 0.76 (high) in the experimental class 2. The cognitive learning outcomes of students have increased by 0.54 (moderate) in the experimental classes 1 and 2 with the classical completeness of 86.1% and 88.89%. This study concluded that the implementation of the Team Assisted Individualization (TAI) learning model has effectively improved students' science process skills.

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INTRODUCTION

Natural Science is a method of finding out about nature systematically to master a collection of knowledge in the form of facts, concepts, principles, processes of discovery and having a scientific attitude (Nugraha, Suyitno, and Susilaningsih, 2017). Science learning is essentially built from three aspects, namely scientific products, scientific processes, and scientific attitudes. Science process skills are a set of skills used by scientists in conducting investigations (Rahma, Sulhadi, and Sumarti, 2016). Science process skills consist of basic skills and integrated skills. At the Elementary School, level science lessons provide the academic ability of students to be able to continue to a higher level of education. In the whole process of education in schools, teaching and learning activities are the most basic activities. The success of achieving educational goals is mainly determined by the teaching and learning process experienced by students. Students who learn will experience changes in their knowledge, understanding, skills, values, and attitudes. The difference in absorption between students with each other towards learning material requires a teacher to carry out innovations in learning so that it is not merely presenting material, but also needs to use appropriate learning models and methods, interesting, and facilitate students' understanding.

The results of field studies conducted at SD Negeri 1 Jatilawang indicate that the learning process takes place in one direction because the learning activities are centered on the teacher. The teacher explains the subject matter while students listen and take notes. This causes students who are not monitored by the teacher. When given the opportunity to ask only a small percentage of students do it. Also, students are less trained in developing their ideas in solving problems. In implementing learning the teacher does not use teaching aids, and less concrete examples are given to students in learning. The impact on students is a lack of interest and motivation in learning. This will affect the low interest in student learning which has an impact on the quality of learning or the quality of school graduation. The achievement of science learning objectives that are in accordance with the demands of the curriculum will not be achieved well, since teachers are less able to design learning plans and direct students' critical thinking skills, resulting in low student learning outcomes, in order to overcome these problems, a learning instrument which is capable of involving students to be active in the learning is needed.

Cooperative learning is a learning approach that focuses on using small groups of students to work together in maximizing learning conditions to achieve learning goals (Sugiyanto, 2009). Through cooperative learning, students will find it easier to find difficult concepts if they discuss with other students about the problem at hand (Kusuma, and Aisyah, 2012). Team Assisted Individualization is a learning model that combines cooperative learning and individual learning (Sutriningsih, 2015). In Team Assisted Individualization learning there is a student who is better able to act as an assistant who is tasked with helping other students who are less capable in one group. Team Assisted Individualization learning will motivate other students to help each other group members so that the spirit of the competition system is created by prioritizing individual roles without sacrificing cooperative aspects (Kolifah, Sugiharto, and Hastuti, 2013).

Based on the problems described above, this study was intended to improve the science process skills and cognitive learning outcomes of students after the Team Assisted Individualization type of cooperative learning model was applied in soil forming material at elementary school students..

METHODS

This study was a type of experimental research consisting of the control class and the experimental class. The study was conducted from April 27 to May 30 in 2014 using grade VA SDN 1 Jatilawang and grade VB SDN 1 Jatilawang as the subjects of the study. This study was intended to improve the science process skills and cognitive learning outcomes of students after

the Team Assisted Individualization (TAI) type of cooperative learning model was applied in forming soil material. The activity of the study begins with the provision of the pre-test for the experimental class and the control class which has a purpose to determine the students' initial abilities. From the initial data obtained, then a homogeneity and normality test was conducted to find out whether the research subjects in the control class and experimental class were homogeneous and in the normal distribution.

The next step was designing the Team Assisted Individualization learning syntax, then arranging the learning instrument in the form of RPP syllabus, teaching materials, and evaluations oriented to science process skills, validation sheets, observation sheets, and response questionnaires. A set of cognitive test questions was used to determine the improvement of student learning outcomes. A validation sheet was used to assess the content validity carried out by experts on the instruments that have been made. The observation sheet was used to find out the aspects of the science process skills of students. The response questionnaire sheet serves to find out the responses of students to the teaching materials used in the learning process. The next stage was expert validation, small group trials, and field trials.

The validation test of learning instrument was done through content validation by the learning experts. The validation of the learning instrument was done in order that the learning instrument developed is feasible to be used in the study. The validation of the learning instrument includes the validation of syllabus, learning implementation plans, and assessment tools. The average of the result of the validation was then analyzed to find the average score in each test.

The limited-scale trial was carried out on the subject of the study, 30 students at SD Gunung Wetan 1. This limited-scale trial was conducted to test the learning instrument before being used in the experimental class and the control class. The experimental class subjects consisted of 30 students of grade VA at SD Jatilawang 1, and the control class subject also consisted of 30 students of grade VB at SD Jatilawang 1. The broad-scale design of the research study referred to the experimental research design of Sugiyono (2009).

The validation of this learning instrument was then analyzed qualitatively. If the results of the instrument validation have reached a predetermined average score of ($\geq$ 3.00), then the learning instrument was then immediately tested, however, if it did not meet the set average score, then the revision should be done at first before conducting the other tests.

This study is considered successful if the students can meet predetermined KKM. KKM is the minimum completeness criteria to certify learners achieve mastery. KKM should be set at the beginning of the school year by education unit based on the results of the deliberations of subject teachers in the educational unit, or some educational units have similar characteristics. KKM serves as a reference for the teacher to assess the competence of learners by the basic competencies. This study was considered successful if it meets the following criteria: (1) The learning materials that have been developed obtain an average score from the validator in the category of feasible or valid, (2) The cognitive learning outcomes of students reach the KKM $\geq$ 75 with 75% classical completeness, (3) The percentage of science process skills of students obtain a minimum of "high" $\geq$ 70% criteria, (4) The Improvement of science process skills and the classical learning outcomes of students meet the minimum criteria of "moderate" based on the N-gain value obtained, (5) The minimum 70 % of the number of students gave a positive response to the learning conducted.

RESULTS AND DISCUSSION

This study was started by identifying and gathering information about the various initial conditions of the learning process that took place at school. The initial conditions include the learning methods used and the characteristics of students in science learning in soil formation material. The next stage was to prepare and develop various research tools needed; then the

instrument validation was carried out by experts. At this stage, the teaching materials and other supporting instruments that have been designed and tested were validated based on the content and construction by experts. This stage aims to validate the learning instrument developed before being tested.

Inputs and suggestions from the validator were used as references in improving the research instruments in order to obtain a valid instrument. The instruments produced after going through repairs according to the input from the experts were used in the small-scale trial phase. The results of the validation of the entire research instrument can be presented in the following Table 1.

Based on Table 1, it can be seen that the instruments developed belong to the valid criteria and can be used as the instrument in the study, however, they need to be improved according to the advice of each validator. This is due to that the arrangement, the learning model developed based on the adequate theory (content validity) and all components of the learning model are related to each other consistently (construct validity), in accordance with Rochmad opinion (2012), indicators used to state that the learning models developed was categorized valid based on the curriculum or learning model developed was based on strong theoretical ratios. Also, the learning model developed showed internal consistency between the components of the model.

Table 1. The Summary of Validation of the Overall Instrument of the Study

Instrument	Validator I	Validator II	Total Score	Average	Criteria
Syllabus	4.5	4.3	8.8	4.4	very good
RPP	4.7	4.6	9.3	4.6	very good
Material	4.3	4.6	8.9	4.45	very good
Learning outcomes test	4.7	4.6	9.3	4.6	very good
Students respons questionnair	4.5	4.6	9.1	4.5	very good

After the research instrument was revised and approved by the validator, a small group trial was conducted on students who were not the subject of the study. Small group trials were conducted to find out and look for deficiencies, weaknesses, constraints, and obstacles that may occur during the learning. The aspects of science process skills of students analyzed in this study include identifying variables, classifications, asking questions, composing hypotheses, conducting experiments, observing, compiling observations, analyzing data, formulating conclusions, and communicating the results of observations. The assessment of science process skills in the cooperative learning process Team Assisted Individualization (TAI) on soil forming material was carried out through observations conducted by the researcher from the 1st to 3rd meetings and the learning outcomes tests.

Observations were carried out in two stages of the experimental class where each class consisted of 30 students which divided into six groups. The development of science process skills of students was observed through the observation of science process skills of students during the learning process using Team Assisted Individualization type of cooperative learning models, to determine the improvement of science process skills in each experimental class. The improvement of science process skills in both experimental classes was carried out by analyzing the N-gain scores obtained. The magnitude of improvement in the overall science process skills of students from the 1st to the 3rd observations can be seen in the following Table 2.

The development of Team Assisted Individualization type of cooperative learning models on soil forming material can effectively improve students' process skills with the acquisition of N-gain in the experimental class 1 of 0.71 and experimental class 2 of 0.76, which both fall into the high category. The improvement of science process skills in the two experimental classes was caused by the use of Team Assisted Individualization type cooperative learning models in the learning activities, providing opportunities for students to be more active in the learning independently, in accordance with the

statement of Rahmawati, and Budiningsih (2014) that the Team Assisted Individualization learning model can train students to appear, and be more active in the classroom.

Table 2. The Result of Analysis of the Improvement of SPS

Class	Observation period	Average SPS score	N-gain	Explanation
Experiment 1	1	21.63		
	2	23.95	0.71	N-gain score in the experiment class 1 is in the high category
	3	27.84		
Experiment 2	1	21.13		
	2	23.80	0.76	N-gain score in the experiment class 1 is in the high category.
	3	28.00		

The Team Assisted Individualization learning model can train students to be more motivated since students not only able to construct their knowledge individually but also obtain direct guidance from peers who are more capable in terms of their academic abilities. In this study, a value analysis was also carried out on each aspect of science process skills. The results of the N-gain score achieved in each aspect of the performance of the science process can be seen in the following Figure 1.

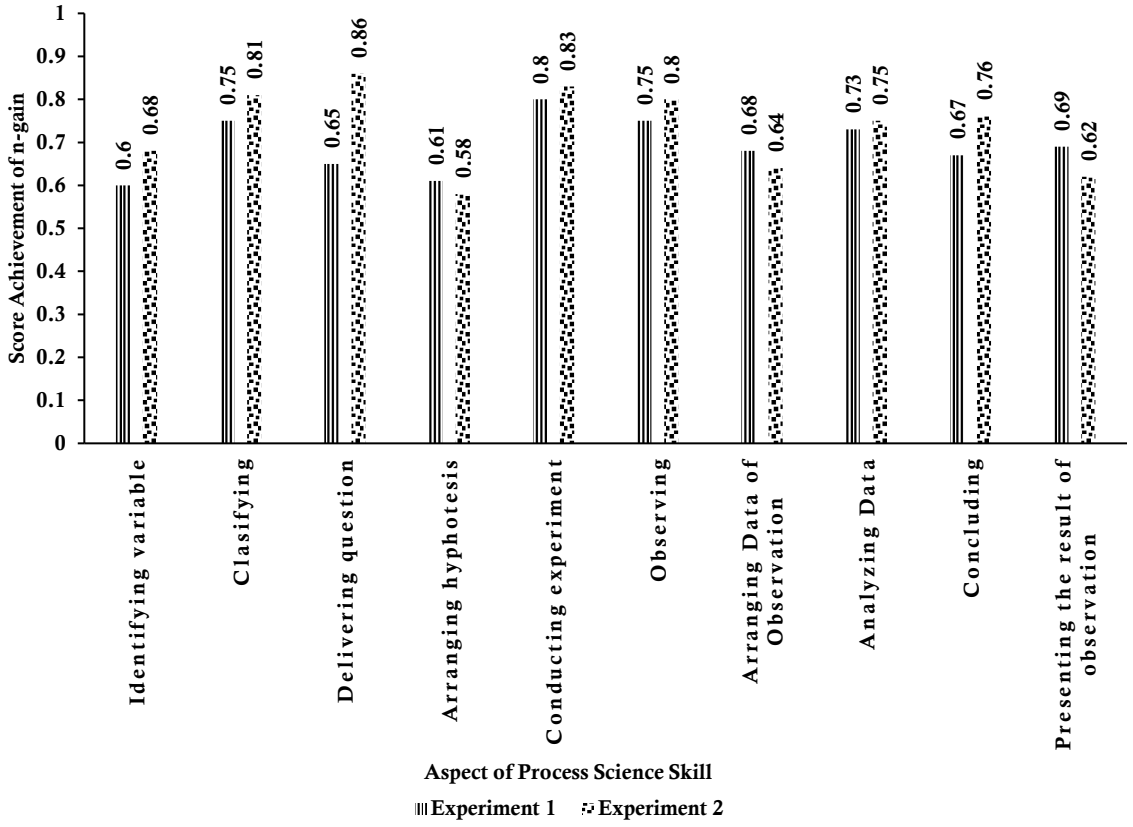
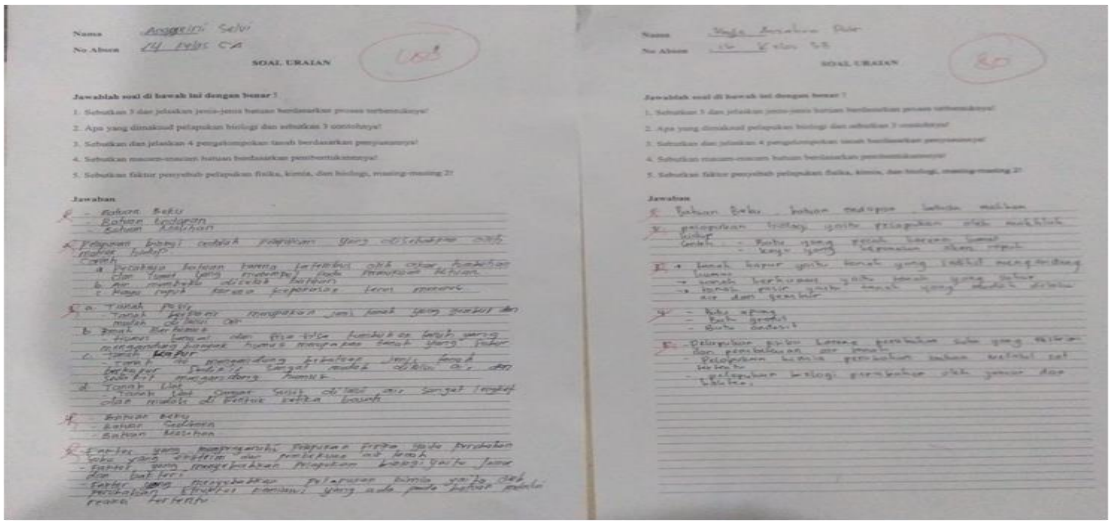


Figure 1. The Result of N-gain Score in each Aspect of SPS

Based on Figure 1, it can be seen that in the experimental class 1, the highest N-gain score can be achieved in the aspect of conducting experiments with the achievement of the N-gain score of 0.82 (high). This is because the experimental activities use the Team Assisted Individualization type of cooperative learning model that is different from the experimental activities that are usually done previously by students. Learning that is real and contextual feels more fun and students who are initially unfamiliar with the experimental activities in this

study, are increasingly becoming actively interested in conducting experimental activities. Experimental activities are very important to do because according to Prasetyo, Hindarto, and Masturi (2015), a sign of the existence of real activities, the skills in applying concepts to problems, explaining problems, compiling hypotheses and arguments, and making conclusions are still low.

Based on Figure 1, it can also be seen that the experimental class 2 has the highest increase in the science process skills in the aspect of asking questions with N-gain gain of 0.87 (high). This happened since, in the Team Assisted Individualization learning model, there is a communicative student who has a higher academic ability which acts as an assistant so that it helps explain individually to other students who experience difficulties in understanding the material taught in a group. Students are given the opportunity to discuss and interact with each other. The presence of peers is tasked with helping other students explain the material being taught, making students feel comfortable and not ashamed to ask friends who act as assistants when experiencing difficulties in the material being taught. This is consistent with the statement of Hidayat, Kirana, and Widodo (2015) with peer tutors who are less active students being active since they are not ashamed to ask questions and able to express their opinions freely to their peer tutors.



Experimental class Control class

Figure 1. Learning Outcomes of Student

In the final stage of this study, the learners were presented about the form of description that aims to determine the learning outcomes of students after obtaining the type of cooperative learning model team assisted individualization. The types of questions given to students were about the description. The number of the question given was five questions in this description contained about aspects of science process skills. Giving a matter of description that was presented to the learner aims to find out the results of the science process skills of learners. In the above figure were, the answers of students of the experimental class and control class are presented. Based on the answers of each student in the experimental class and control class, there were differences in the learning outcomes of students from both classes.

The cognitive learning outcome test was used to determine the increase in the mastery of subject matter before and after learning by using the Team Assisted Individualization learning model. The cognitive learning outcomes of students were tested with pre-test questions consisted of 30 items. After doing the pre-test and post-test related to the ability to understand the

concept of soil forming material using a cooperative Team Assisted Individualization model obtained scores of each student. Pre-test data provide an initial picture of students before learning. The description of the data from the pre-test and post-test classes given treatment can be seen in the following in Table 3.

Table 3. A score of Pre-test and Post-test of Students Cognitive Learning Outcome

Class	Average pre-test	Average post-test	Value of t_{value}	Value of t_{table}	Level of confidence	Confidence
Experiment 1	64.5	83.6	13.70	1.690	0.05	Significant
Experiment 2	64.6	83.8	14.04			

Table 3 it can be seen that the mean values of the experimental class 1 and 2 pre-test are 64.5 and 64.6. The pre-test value of experimental class 1 ranged from 46.7 and 80, whereas, the pre-test value of experimental class 2 ranged from 50 and 80. The mean post-test values of experiment class 1 and 2 were 83.6 and 83.7. The post-test values of experiment class 1 and 2 ranged between 66.7 and 96.6. The data of improvement was the data obtained from the difference between the results of post-test and pre-test obtained by students. Based on the cognitive learning test data, it can be seen that the gain achieved is 0.54. Therefore, the implementation of the Team Assisted Individualization type of cooperative learning model that was used can improve the student learning outcomes and increase the learning outcomes in the form of normalization gain in the medium category.

Based on the result of calculation, the value of the experimental class 1 and 2, was calculated at 13.70 and 14.04. It is known that t_{table} with data amount of = 36 (dp = N - 1 = 35) was 1.690. Based on the results of the calculation, it can be seen that the t_{value} calculates the average test between the pre-test and post-test values, after there was Team Assisted Individualization cooperative learning treatment, greater than the t_{table} value of 13.73 > 1.690 in the experiment class 1, and 14.08 > 1.690 in the experimental class 2, thus, H_0 was accepted since there was a significant change between the values of the pre-test and post-test, after being treated with the Team Assisted individualization learning model. The increase in the learning outcomes was also indicated by the percentage of learning that can be seen in the following Table 4.

Table 4. The Percentage of Learning Outcome

	Number of students complete	Number of students not complete	Percentage completeness (%)
Experiment 1	31	5	86.1
Experiment 2	32	4	88.69

Based on the percentage of completeness of individuals in the experimental class 1 and experiment 2, it can be stated that from each of the 36 students who took part in learning on soil formation material with the application of the Team Assisted Individualization cooperative learning model, the results were 31 students in experimental classes 1 and 32 students in the experimental class 2 were declared complete with a score of > 75 in accordance with the KKM that had been set in the school, while as many as 5 students in the experimental class 1 and 4 of the experimental class 2 students were declared incomplete with a score of < 75. The percentage of classical mastery learning in the experimental class 1 was 86.1% and in the experimental class 2 was 88.69%. Therefore, it can be concluded that the learning outcomes in the two experimental classes were completed. By the classical completeness criteria, the learning is completed if > 80% of students complete in a classical manner.

Increased learning outcomes also occur due to the direct involvement of students during the learning process. This is consistent with the statement of Agustanti (2012) that the learning principle is to experience itself, meaning that students who are directly involved and do the learning process themselves will get optimal learning outcomes. The response of students in participating in learning becomes an important

part to consider to support the learning process of the next student. The response analysis of students in this study was carried out using questionnaires responses of students to find out the responses of students to the Team Assisted Individualization type of cooperative learning model used during the learning. The response of students in the experimental group 1 while given the Team Assisted Individualization learning was 4 people (11.1%) included in the very agree category, 28 people included in the category agreed, and those included in the category disagree 4 people. In the experimental group 2, there were 2 people (5.6%) responses included in the very agree category, 30 people included in the agree on category, and 4 people included in the disagree category.

Data analysis resulted in the overall response of students as a whole in the good criteria both in the experimental class 1 and 2 which reached 77.8% and 83.3%. Based on the results of the analysis, it was indicated that after the learning activities using the Team Assisted Individualization type of cooperative learning model, students were more active, communicative, and motivated. This is consistent with the study of Gull, and Shehzad (2015) that cooperative learning can increase students' motivation. Questionnaire responses of students also showed that Team Assisted Individualization cooperative learning made students work together, share knowledge with other friends. The Team Assisted Individualization learning method can make it easier for students to understand soil formation material and improve student learning outcomes by the research by Sulistyaningsih, Ashadi, and Setyowati (2015) that the application of the Team Assisted Individualization method can increase the activities and student achievement.

CONCLUSION

Based on the results of the study, it can be concluded that the purpose of this study which was to improve the science process skills and cognitive learning outcomes of students after the Team Assisted Individualization (TAI) type of cooperative learning in soil forming material in the elementary school students was considered successful, this can be seen from the acquisition of N-gain values in the experimental class 1 was 0.71 (high) and in the experimental class 2 was 0.76 (high). The Team Assisted Individualization learning model developed effectively can improve the student learning outcomes in both experimental classes. Other effectiveness is shown by the percentage of students who complete with KKM > 75 reaching to 86.1% in the experimental class 1 and 88.9% in the experimental class 2. Students give a positive response to the implementation of Team Assisted Individualization cooperative learning models with a percentage of 77.8 in the experimental class 1 and 83.3% in the experimental class 2.

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