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The Effectiveness of The Constructivist Learning Model Using Children Learning In Science (CLIS) Type in Improving Science Learning Outcomes

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Abstract

In primary schools, students are given lessons that can be used to develop their character and various potentials, one of them is science subjects. The CLIS model can be used as an alternative learning model in teaching science because it contains constructivist learning elements that lead to meaningful learning. The purpose of this study was to analyze the effectiveness of the constructivist learning model using Children Learning In Science (CLIS) type in improving student learning outcomes. This study used a quasi-experimental method. The sample was taken using a random cluster technique were students of grade V SDN 2 Patikraja as the control class and students of grade V SDN 1 Notog as the experimental class. The data analysis used was a one-sample proportion test, N-Gain analysis, and independent-sample t-test. The results show that the use of the CLIS constructivist learning model is effective in improving student learning outcomes compared to learning with the expository method. This is evidenced by the increase in student scores before and after the implementation of the CLIS constructivist learning model is in the medium category, students in experimental class achieve classical completeness >75%, and the average learning outcomes of the experimental class is higher than the control class, as well as students shows positive responses. So this research can be helpful for the students and the teachers in learning sains.

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INTRODUCTION

One of the formal education at the basic education level is an elementary school. In Elementary School, students are given various subjects that can be used to develop their character and various potentials, one of them is Natural Sciences (IPA). By learning science, students are expected to get to know the natural environment and natural resources in the environment, so that they can make the best use of these natural resources. Besides, science learning aims to increase student awareness to participate in maintaining, protecting, and preserving the surrounding environment.

According to Aristiyani (2017), science is learning that is related to find out everything about nature in a systematic and organized way, it is obtained through a series of scientific activities. Natural science learning should usually be done through a process of experimental activity, observation, collecting data, testing concepts and drawing conclusions (Suarni, et al. 2014).

The process of delivering science material conducted by teachers is commonly using the expository method so that there are no observations and internalization of character education activities. The teacher provides material only to read material from books and the role of students is only to listen. Amaliah, *et al* (2014) stated that the expository method is a teaching method that has been very popular for teachers since ancient times. In a lecture, students just sit quietly listening to the material which is presented by the teacher, without having the opportunity to be actively involved in building their knowledge and asking and answering questions from the teacher, so that students get bored quickly.

One of the ways to make the learning more interactive is by applying constructivist learning. According to Ahmad, *et al* (2015) constructivism is based on Jean Piaget's theory of cognitive development, which means that students are not only given information. Instead, students must build their own knowledge through prior knowledge and experience.

According to Desstya (2016), the application of constructivist learning in science learning makes the students get direct experience which is important in encouraging the speed of student cognitive development, can stimulate the psychomotor aspects of children, and avoid the saturating conditions. Furthermore, It is explained that constructivism makes the students have to actively do the activities, actively think, and formulate concepts, so that what they have learned becomes more meaningful (Sudarsana, 2018). One of the learning model that departs from a constructivist view and applies observations to the learning process, namely the CLIS (Children Learning In Science) model.

The CLIS learning model is a model that describes a series of stages of student activities to learn the concepts which are given and involves the students in observation and experiment activities by using student activity sheets (Nurseha et al, 2015). Meanwhile, Budiarto (2015) the CLIS model is a learning model that seeks to develop students ideas or concepts about a particular problem in learning and reconstruct ideas or concepts based on observations or experiments so that the CLIS model is under the science learning. Wiyase (2015), also emphasizes that the CLIS model is a model that develops students' ideas and concepts about a problem in learning.

The Children Learning in Science (CLIS) learning model is following the characteristics of elementary school students who like to play, do motion activities, work in groups, and do something directly. Samatowa (2011) explains the benefits of CLIS learning, including more ideas, can be raised, students are accustomed to learning to solve the problems, creating comfortable and creative classes, mutual cooperation between the students, creating more meaningful learning, teachers can teach more effectively because all of the purposes of the learning can be achieved optimally. The CLIS model can be used as an alternative learning model in teaching science because this model contains the elements of constructivist learning that lead to meaning in learning. Therefore, CLIS is suitable for science learning which emphasizes that students have a meaningful learning experience through observation and experimentation activities.

The CLIS learning model in this research is different from the CLIS learning model conducted by other researchers. The CLIS learning performed by the researcher is not only to optimize learning outcomes but also to form student character. It is according to the character of UNNES conservation. It includes the characters of responsibility, honesty, tolerance, and environmental care. It is applied in every learning meeting so that conservation values can be embedded. The purpose of this study is to analyze the effectiveness of the constructivist model using CLIS type on science learning in improving student learning outcomes.

METHOD

This study used a quasi-experimental method with a nonequivalent control group design. Samples were taken by using the cluster random sampling technique, namely the research sampling in the form of groups that were randomly carried out with the consideration that the population was divided into classes that were normally distributed and had the same homogeneity. The subjects of this study were students of class V SDN 2 Patikraja as the control class totaling 27 students who were given a lecture model, and class V SDN 1 Notog as the experimental class totaling 28 students who were given the CLIS learning model.

The independent variables of this study were learning by using the CLIS constructivist model and learning by using the lecture method. The dependent variable of this study was the science learning outcomes which were measured by using test questions with the properties of light learning material and student responses were measured by using a questionnaire.

Data analysis used effectiveness analysis consisting of an increased test (n-gain), individual completeness test with a minimum Minimum Mastery Criteria limit of 70 and classical completeness> 75%, and an independent sample t-test conducted by students' science learning outcomes with a significance level of 5% and with the prerequisite test for normality and homogeneity. Data were analyzed by using the IBM SPSS 20 and Ms. Excel.

RESULTS AND DISCUSSION

The constructivist learning model makes the students explore the knowledge which is learned through observation, experiment, discussion, question, and answer, reading from books, and even exploring knowledge via the internet. Santi (2015) explains that the constructivist model emphasizes social interaction which later students find the concepts through investigating, collecting, and interpreting data through activities that the teacher has designed.

The CLIS model more emphasizes the importance of student activities to get ideas, adapt to existing knowledge, solve, and discuss problems that arise (Laili et al, 2015). Meanwhile, according to Samatowa (2011), CLIS learning is learning that seeks to develop students' ideas or concepts about a particular problem in learning and reconstruct these ideas and concepts into observation and experimental activities.

Samatowa (2011) also states that the CLIS learning model consists of a series of stages of activities that are carried out by students in learning science concepts which include 5 (five) phases, including (1) orientation; (2) emergence of ideas; (3) rearranging ideas which consist of three steps, namely (a) expressing and exchanging of ideas; (b) opening up a conflict situation; (c) constructing new idea and evaluating; (4) implementing of ideas; and (5) stabilizing ideas.

Henceforth, an effectiveness analysis is conducted to find out how effective the implementation of the constructivist learning model using the Children Learning in Science (CLIS) type in improving student learning outcomes compared to learning with the lecture method. According to Nasution (2017), an appropriate and effective learning model can make it easier for teachers to carry out the tasks and have a positive impact on improving student-learning achievement. The constructivist-learning model of CLIS type is said to be effective if: 1) the increase in student learning outcomes (n-gain) is at least in the moderate category, 2) student learning outcomes meet classical completeness, and 3) the average student learning outcomes in the experimental class are higher than the class control.

The test results show that the normality test of students' science learning outcomes both in the pretest and posttest using Kolmogorv-Smirnov shows that the control class and the experimental class have a significance value more than alpha 0.05 so that the data are concluded to be normally distributed. While the results of the homogeneity test show that the significance value of each of the pretest and posttest learning outcomes of the control class and experimental class is more than 0.05, so the data is declared homogeneous.

The analysis of the improvement in learning outcomes by using n-gain shows that the average n-gain value of the experimental class is 0.559 which is in the moderate category and when is compared with the control class using the lecture method, the increase of scores between the pretest and posttest (n-gain) has an average of only 0.279 which is in the low category. Furthermore, the increase in the score (n-gain) of each student is categorized based on the n-gain category, namely low, medium, and high as presented in Figure 1.

Based on Figure 1, it can be seen that the majority of the gain values in control class students, there are 17 students (63%) are in a low category, while the majority of the gain values in the experimental class students are in the high category, totaling 23 students (82

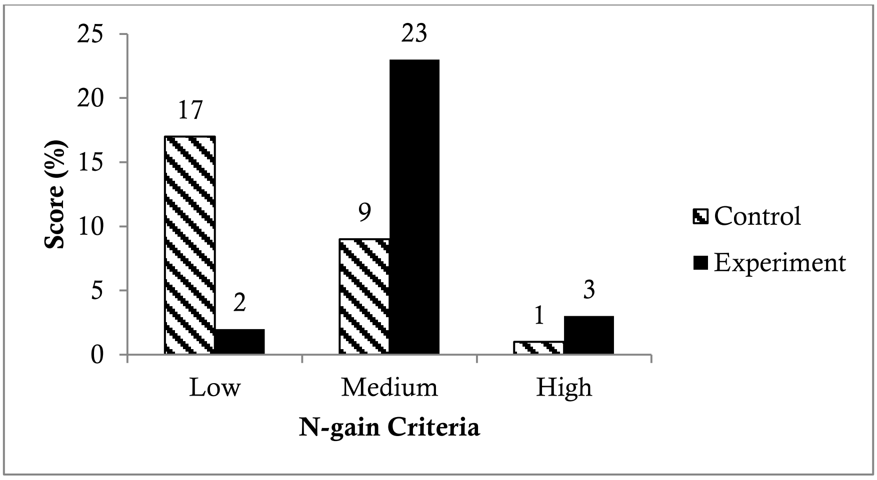

Figure 1. Graph of N-Gain Category

Furthermore, the mastery test of learning outcomes in the experimental class shows the percentage of completeness after being given the CLIS constructivist learning model with a Minimum Mastery Criteria 70 limit of morethan 75%, t Address his is indicated by the value of z_{table} totaling 1.746 which is more than the z_{table} of 1.64. Overall, the recapitulation of the percentage of student learning outcomes can be explained based on the diagram in Figure 2

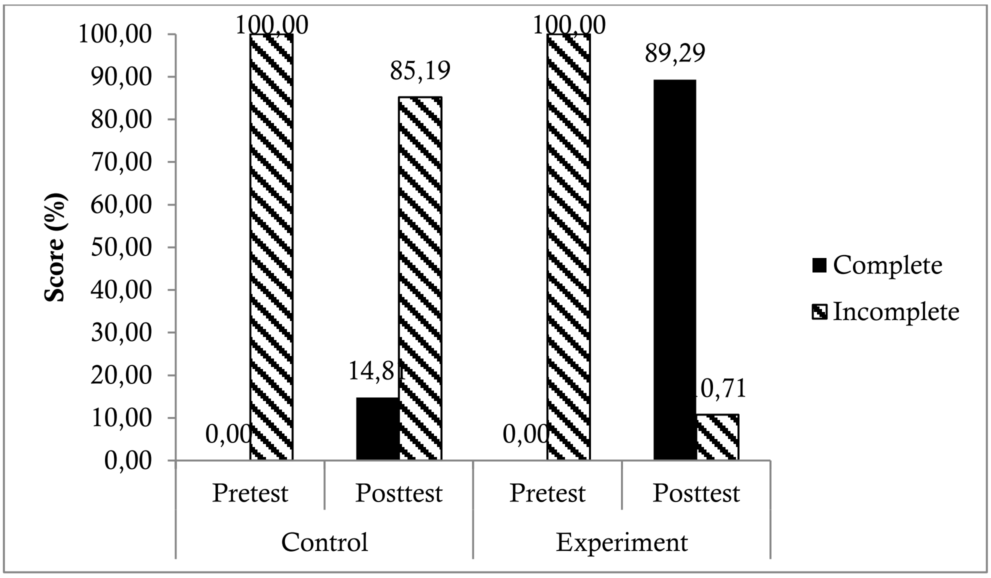

Figure 2. The Completeness Graph of Students Learning Outcomes

Based on Figure 2, the learning outcomes of the control class students have 85.19% of children who complete the Minimum Mastery Criteria with an increase in mastery of 70.38% while the learning outcomes of the experimental class students have 89.29% of children who complete the Minimum Mastery Criteria are higher than the control class with an increase in completeness amounted to 78.58%.

The results above are in line with the research of Sujarwanto (2015), which states that the implementation of the constructivist learning model can improve student understanding so that it has an impact on improving student learning outcomes. In connection with this opinion, the CLIS model learning according to Nurseha *et al* (2015), states that learning by using the CLIS model makes students more active in learning and has a better understanding than previous understanding or there is an increase in concept understanding and forming the knowledge into students' memory so that the concept lasts a long time. Therefore, the constructivist model using the CLIS type can further improve student understanding of concepts and longer memory so that it will improve student learning outcomes and student achievement.

The results of this study are in line with the research of Ginanjar *et al* (2019) which states that the CLIS learning model can significantly improve student cognitive learning outcomes with an increase of 46.4. Laili, et al (2015) explains that the CLIS learning model accompanied by multi-representation-based worksheets also affected improving learning outcomes and student learning activities in physics subjects.

Furthermore, another measure of effectiveness is the posttest average difference test using the independent sample t-test. The hypothesis used in the different tests is.

H_0: $\mu_1 = \mu_2$ (There is no difference in the average of student learning outcomes between the control class and the experimental class).

H_1: $\mu_1 \neq \mu_2$ (There is a difference in the average of student learning outcomes between the control class and the experimental class).

Based on the results of the independent sample t-test, it can be seen that the significance value is 0.000. Since 0.000 <0.05, H0 is rejected, which means that there is a difference in the average student learning outcomes between the control class and the experimental class. Because there is a significant difference between the control and experimental classes, it is carried out by further testing by looking at the average value in Table 1.

Table 1. Descriptive Statistics of Posttest Data on Student Learning Outcomes

Class	N	Mean	Std. Deviation	Std. Error Mean
Control	27	54.0741	12.57952	2.42093
Experiment	28	74.4643	8.85472	1.67338

The average value of the control class is 54.07 and the average experimental class is 74.46, so it can be concluded that the average value of the experimental class students' learning outcomes is higher than the control class. For more details, the average student learning outcomes are shown in Figure 3 below.

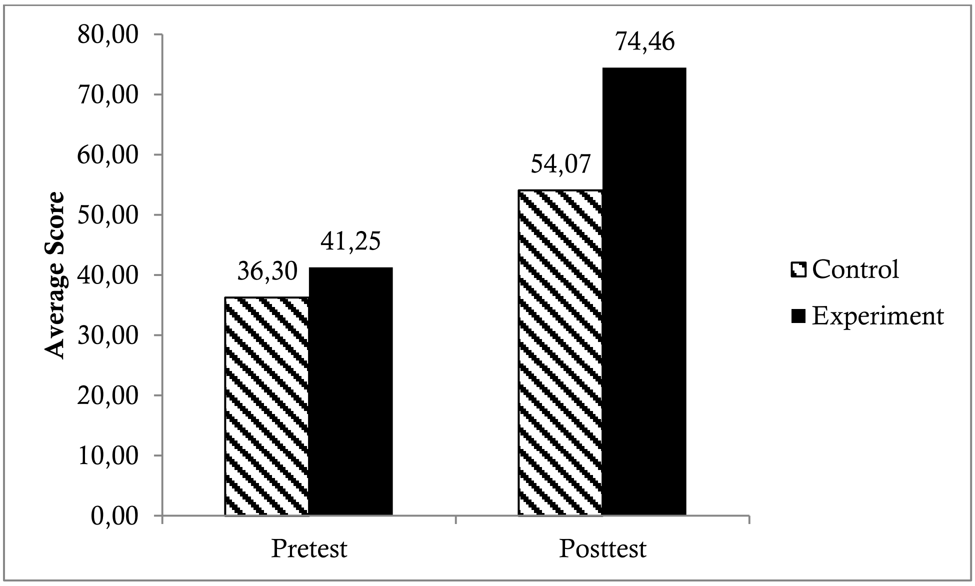

Figure 3. Graph of Average Value of Student Learning Outcomes

From the three test results, it shows that the effectiveness criteria are achieved and it is obtained that the experimental class gets higher learning outcomes than the control class. So it can be concluded that the class with the constructivist learning model using Children Learning In Science (CLIS) is effective in improving student learning outcomes.

With an effective constructivist CLIS learning model, it can create a more meaningful learning condition and make students more creative in solving the problems. This is in line with the opinion of Damanik and Sani (2014), the advantages of CLIS learning include creating student creativity, students being directly involved in activities, creating more meaningful learning, and teachers teaching more effectively because it can create an active learning environment.

To further illustrate the effectiveness of the implementation of the constructivist learning model using CLIS, it is necessary to have student responses after implementing the CLIS constructivist learning model. The results of the student response analysis are shown in Figure 4 below.

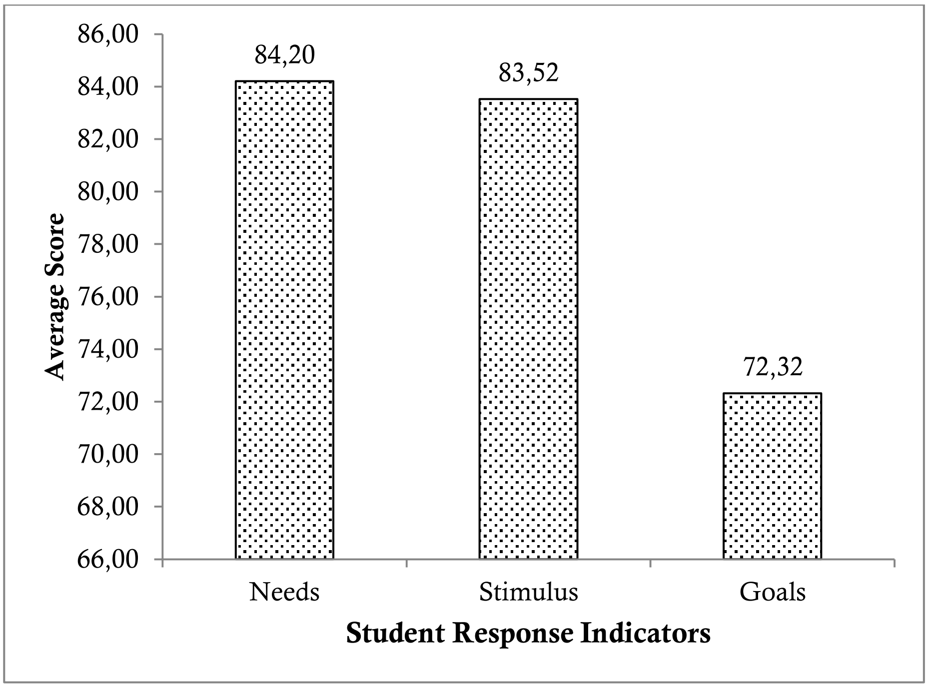

Figure 4. Student Response Graph for Experiment Class

Indicators of student response questionnaire descriptions which were used in this study are needs, encouragement, and goals which are used as a reference for seeing learning outcomes, attractiveness, learning media, and students' thinking about the material properties of light which is taught by applying the CLIS constructivist learning model. . Based on the graph in Figure 4, the results of filling out the student response questionnaire are obtained by students give a positive response, it is known that the average response of the experimental class students who obtained the constructivist learning model using Children Learning In Science (CLIS) in each aspect of the assessment is 84.20% on the aspect of need, 83.52% on the aspect of encouragement and 72.32% on the aspect of the goal.

Therefore, it can be concluded that the highest average response of experimental class students on the constructivist learning model of Children Learning In Science (CLIS) is in the aspect of needs, as well as student learning motivation in every aspect of assessment of student responses to get an average learning motivation that is very strong. CLIS can increase motivation, skills, and learning outcomes. A pleasant feeling will result in students having a positive response to follow the learning that is delivered. Research by Anwar et al (2017) also states that students give the response very well to providing CLIS learning models. Students can be more active and independent to seek and find their own knowledge through the implementation of the CLIS learning model, so the concepts that are learned can last a long time and have an impact on learning outcomes (Danil, et al. 2015).

CONCLUSION

Based on the results, it can be concluded that students who receive a constructivist learning model using Children Learning In Science (CLIS) in the experimental class fulfilled more than 75% of classical completeness. The improvement in science learning outcomes of the experimental class students is in the medium category while the n-gain of the control class is in a low category. The average of science learning outcomes of the experimental class students is higher than the control class students. Student responses to the implementation of the model get a positive CLIS constructivist learning model and the majority state that they need this learning model in understanding the concept of learning science. So, it can be concluded that the implementation of the constructivist learning model using the CLIS type is effective in improving student learning outcomes.

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