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Contextual Learning by Local Wisdom to Improve The Understanding of Simple Machine Concept

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Abstract

This study aims to describe the application of contextual approaches learning (CTL) by local wisdom toward the understanding of students on the concepts of simple machine subject. The research method applied in this study was Mixed Methods with the sequential explanatory design. The first stage of the quantitative method was done to obtain data on the improvement of the understanding of concepts; the second stage of qualitative methods was to support the quantitative data. The sample taken for this study was the fifth-grade students of SDN 3 Troso, with some 30 students and the fifth-grade students of SDN 4 Troso, with some 32 students. The data collection techniques used in this study tested techniques in the form of multiple choice questions and non-test techniques consisting of interviews, and documentation. The results of the analysis of gain test on the understanding concept showed an increase in the experimental class which was categorized as moderate at 0.45, meanwhile, the control class was in the low category at 0.28.

Keywords: contextual approach, local wisdom, understanding concept

INTRODUCTION

Natural Science (IPA) is one of the fields of study that contains events or natural phenomena, the process of identification, and the formulation of problems from observations of natural phenomena and as a way to find answers and solutions to problems faced. Science is not only the mastery of a collection of facts, concepts, or principles but also a process of discovery. Science education is expected to be a way for students to learn about themselves and their surroundings, and the prospects for further development in applying them in their daily lives. The learning process emphasizes providing direct experience to develop competencies so that students explore and understand the natural environment scientifically.

Therefore, science learning at elementary school should emphasize the learning by providing direct learning experiences to be able to develop students' understanding of the material being studied. This experience can be obtained from an environment near the students. The learning process by providing experience through direct interaction with the object of learning helps students to get meaningful and efficient learning outcomes. If students learn about objects and events around them, it is hoped that students will more easily understand the material presented. The design of learning that is applied makes them understand more deeply about the material since they are not only learning using textbook learning resources, but also by directly observing objects that are learned from the environment since basically the environment is a source of learning that provides various in knowledge and able to provide direct, and meaningful experiences for student (Alimah, 2010).

Learning approach is needed in the learning process since it can help students to understand the subject matter through a more contextual material presentation. While about constructivism learning theory, Piaget is known as the first constructivist, asserting that knowledge is built into the child's mind. Piaget argues that children's intellectual abilities develop in level or steps, namely (a) sensory motors (0-2 years), (b) pre-operational (2-7 years), (c) concrete operations (7-11 years), and operations (> 11). Based on that, elementary school student is at the concrete operational level. In this concrete operational level, a child can think systematically about concrete objects and events in his environment. Piaget stated that then one alternative problem solving the concrete operational level could do that is to design innovative learning approaches that are fun and contextually based. The reason for using the contextual approach is that this approach provides opportunities for students to gain knowledge, experience in find-

ing, asking questions, discussing groups, presenting student learning outcomes. Erlisnawati (2013) states that the application of the learning model can significantly improve student learning outcomes compared to the use of conventional learning models. Agustiya, Sunarso, and Haryani (2017) state there are significant differences between IPA motivation and learning outcomes of students learning CTL models compare to those in the CTL model learning with monopoly game media. A contextual approach is an approach that can help students to understand the subject matter through a more contextual presentation of material. Moreover, the learning process can be done using objects in the student environment.

Planting local wisdom values where students are located can be done to contextualize the learning. This is useful for maintaining and preserving local culture while helping students to face growing challenges. Wijayanti, Ibnu, and Muntholib (2017) stated that community culture could be a source of learning so that learning becomes more meaningful and contextual. Meanwhile, according to the research conducted by Sudiana, and Surata (2010) revealed that the aspects of local culture in learning could increase the effectiveness of the learning process. Furthermore, the results of the study by Arfianawati, Sudarmin, and Sumarni (2016) revealed that the chemistry-based ethnics learning model (MKPBE) could improve the cognitive abilities and critical thinking.

The abundance of local potential in Jepara district can be utilized and integrated into the process of learning science at all levels of education, including science materials in elementary schools. According to the research conducted by Tresnawati (2018), science learning based on local wisdom can foster the consideration of indigenous knowledge as part of a national culture which has implications for the conservation of natural resources and environmental balance. Science learning in elementary schools does not link the learning with the local culture in the community. Therefore, science learning only becomes memorization that has never been linked to the real world. This is not by Permendikbud Number 57 of 2014 that each student can apply IPA wisely to maintain and preserve the cultural preservation. According to the research by Sudarmin, and Pujiastuti (2015), the knowledge of community science based on local culture and local wisdom about unique things has not been widely studied; it has never even been used as a source of learning in the science learning. This study aims to describe the application of contextual approaches learning (CTL) by local wisdom toward the understanding of students on the concepts of simple machine subject.

METHODS

The research method used in this study was mixed methods with a sequential explanatory design that combines a quantitative research method with a qualitative research method sequentially, in which the first stage used is quantitative methods and the second stage used is qualitative methods (Sugiyono, 2013). The population in this study was all the fifth-grade students of SDN Sub Area 1 Pecangaan, Jepara in the academic year of 2018/2019. The sampling was done by the researcher using a purposive sampling technique based on several considerations. After conducting the procedures of purposive sampling technique, the research sample obtained was the fifth-grade students of SDN 4 Troso, with some 32 students as the experimental class and the fifth-grade students of SDN 3 Troso, with some 30 students as the control class.

The data collection technique in this study was done using a test and nontest techniques. The data collection instruments in this study were the pre-test and post-test questions in the form of multiple choices, interview guidelines, and documentation. The quantitative data analysis technique in this study was the analysis of prerequisite tests and hypothesis testing. Prerequisite test analysis includes the tests of validity, reliability, level of difficulty, and differentiation. Hypothesis test analysis was used to describe the difference in the mean scores of students before and after learning using N-Gain test. The qualitative data analysis technique in this study was descriptive qualitative. The data analysis conducted during the data collection procedure done in the field of study using the Miles and Huberman models carried out interactively through the process of data reduction, data presentation, and data interpretation and concluding.

Before learning, students should conduct the pre-test of understanding concepts. The initial test serves to determine the understanding of students' concepts before learning using a contextual approach by local wisdom. The teaching and learning activities of simple machine materials were carried out in 3 meetings.

The learning activities carried out were by linking simple mechanic material with the objects that are around the students. Students are in the environment of weaving and carving artisans so that the teacher shows the looms and carvings included in the example of a

simple model. The learning activities involved seven main components of effective learning, namely constructivism, asking (questioning), finding (inquiry), learning community, modeling, reflection, and authentic assessment.

Another test after the third meeting was the post-test of understanding of the concept to illustrate the learning outcomes of learning using a contextual approach based on local wisdom. Post-test also functions as a comparison to review the initial and final state of the score for the students' understanding concepts. Based on the research data, it was discussed descriptively about student learning outcomes.

RESULTS AND DISCUSSION

Fitrah (2017) defines that understanding concepts is the ability of students in the form of mastering some subject matter, meaning students not only remember a few concepts but can explain again in other patterns and apply them to concepts that fit the cognitive structure of the students themselves. The purpose of understanding the concept is that students can explain or redefine the concept or principle of a given lesson and have a sentence arrangement that is not the same as the concept given, but the meaning is the same. Indicators of understanding concepts according to Bloom as cited by Kuswana (2012) include interpreting, giving examples, classifying, concluding, guessing, comparing, and explaining.

The ability of students' understanding concepts in this study was measured by using multiple choice tests which consisted of 20 items and used four indicators of understanding concepts which include; (1) providing examples; (2) classifying, (3) concluding, and (4) explaining.

The trial of concept understanding test instruments was carried out in the trial class, namely at SDN 2 Troso. Multiple choice questions consisted of 25 items was tested in a trial which produced 20 valid and reliable items of multiple choice questions. The normality test using SPSS Kolmogorov Smirnov in the control class obtained sig 0.348 > 0.05 and in the experimental class obtained sig 0.802 > 0.05 which means that H0 is accepted, therefore, the data were normally distributed. The homogeneity test with SPSS using the Lavenes's Test obtained sig value to 0.987. Since the value of 0.987 > 0.05 (5%) means that H0 is accepted. Therefore, based n this sample test analysis, it can be concluded that the data was homogenous.

The Description of the Implementation of Contextual Approach by Local Wisdom

The application of a contextual approach based on local wisdom on science learning on simple aircraft material carried out at SDN 4 Troso Pecangaan, Jepara as an experimental class and at SD N 3 Troso Pecangaan, Jepara as a control class using conventional methods which were done according to the learning plan. A contextual approach combined with local wisdom was conducted in the experimental class to provide the understanding of subject matter through a more contextual presentation of material and able to foster a love of indigenous knowledge as part of national culture. Fitria, Sumarni, and Wusqo (2016) state that the Contextual approach based on Science, Environment, Technology, and Society (SETS) influences students 'understanding of concepts and characters. Furthermore, research by Warpala, Subagia, and Suastra (2010) with the results of the study shows that there is a positive contribution from local wisdom-based teaching materials to improve students' understanding of concepts and scientific performance. The advantages of the contextual approach based on local wisdom on simple machine material in this study are that students can easily learn the material since it is close to their daily lives. Also, learning material is also associated with local wisdom. Local wisdom-based learning can make students have a sense of love and own their area and nation (Damayanti, Rusilowati, and Linuwih, 2017). Ethno-science based education is also in line with Dewey's opinion which emphasizes that the purpose of education is not only to produce students who are cognitively superior but also familiar and master their culture and related knowledge (Dewi, and Akhlis, 2016). Ethnosains-based learning is included in innovative learning where Johnson as cited by Sarwi, Supriyadi, and Sudarmin (2013) states that innovative learning is if students are associated with the material delivered by connecting academic subjects with their personal, social, and cultural contexts. Local wisdom around the student residence is Troso weaving and carving crafts. Therefore, in the environment nearby students, there are many found processes and weaving craft tools and carvings that can be used as a source of learning for students, namely linking it with science learning.

In the initial activity of learning, the teacher presented a picture of objects near the student, one of which is a loom and carving. Looms and carvings are objects that are around the students since most of the parents' livelihoods are workers weaving and labor

Table 2. The Result of N-Gain Analysis of the Experimental Class and Control Class

Class	The average of pre-test	The average of post-test	The gain score	Criteria of gain factors
Experiment	57.50	76.40	0.45	Moderate
Control	55.33	68.33	0.28	Low

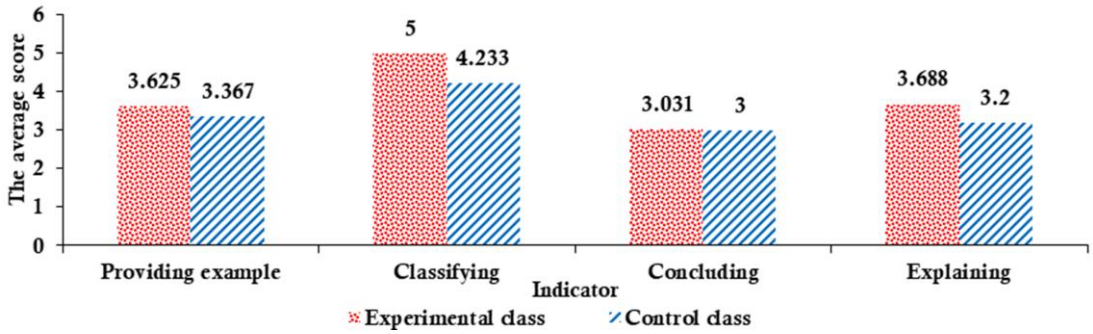

Figure 1. The Improvement of Concept Understanding of Student for Each Indicator

carving. The tools are very close to the lives of students and every day seen by students. Students are directed by the teacher to observe these objects; the students explored their knowledge through objects around them. Then students discussed each other to determine examples and classify objects included in a simple machine. By using objects that are nearby, students become easier to receive the material provided to facilitate students' understanding.

The Profile of Indicator of Students Understanding Concept on Simple Machine

The understanding concept was measured by using tests in the form of multiple choice questions, which consisted of 20 items. The following are the data on the average value of the pre-test and post-test of the experimental class and the control class presented in table 1.

Table 1. The Average Value of pre-test and post-test of Students

Class	Pre-test	Post-test
Experiment	57.50	76.40
Control	55.33	68.33

Based on table 1, it can be seen that the average value of the students' pre-test on the understanding concept test in the experimental class was 55.33 and improved to 76.40 in the post-test results. Whereas, the average value of the pre-test of students in the control class was 55.33 and improved to 68.33 in the post-test results. The results showed that in the experimental class, the average value of students had a higher improvement than in the control class. The N-Gain calculation aims to find out the level of improvement in the conceptual understanding of the students in the experimental class and control class after being treated. The results of the calculations are presented in table 2.

Based on table 2, obtained the data that shows an improvement in the experimental class which is in the moderate category at 0.45; meanwhile, the control class is in the low category at 0.28.

The difference in the improvement of concept understanding between the control class and the experimental class of each indicator can be seen in the following figure 1.

Based on figure 1, it can be seen that the improvement in the average value of each indicator of the conceptual understanding of the students in the experimental class was higher compared to the control class. This is in line with the result of a study by Samo, Darhim, and Kartasasmita (2018) which showed that culture-based contextual learning is more effective to improve the problem-solving ability compared to conventional learning. Research by Fuadi, Johar, and Munzir (2016) showed that there was an increase in the ability of mathematical understanding and an increase in students' mathematical reasoning abilities through a contextual approach. The increase occurs in indicator 1, which gives an example, indicator two is classifying, and indicator four is explaining. The highest increase occurred in the classifying indicator because learning using a contextual approach based on local wisdom is done by presenting examples of objects including simple planes around the students. So that students directly see and determine their classification of each object presented. Hudson, and Whisler (2012) stated that with contextual learning students could express concepts in daily life. Whereas in indicator 3, it was concluded that the experimental class had only a slight increase compared to the control class. This happened since there is not enough time to train students

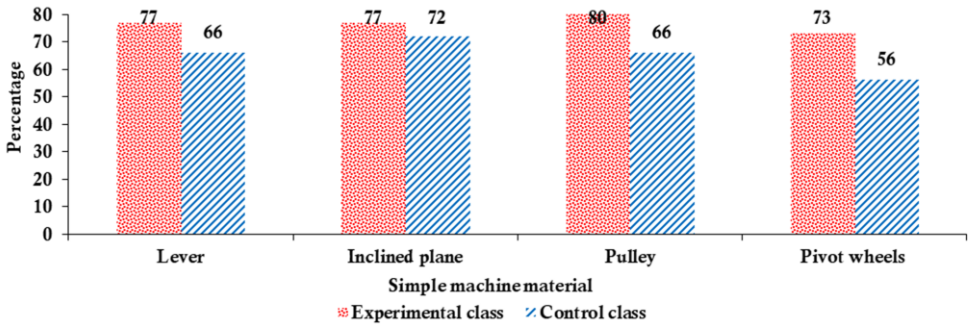

Figure 2. The Improvement in Each Sub-Chapter of Simple Machine

in concluding skills during learning. Therefore, students have not been able to conclude when presented statements relating to the simple machine.

The Profile of Understanding Concept in Each of the Subject Matter

This study was conducted on the subject of a simple machine which included levers, tilted ridges, pulleys, and porous wheels. Each section has a different improvement. An increase in each simple machine sub-section can be seen in the following figure 2.

Based on figure 2, all improvements in the experimental class were higher than the control class. The most prominent difference is seen in the sub-section of the pulley and the pivot wheels. This happened since students with pulleys and wheels observed the objects given by the teacher. Pulleys and porous wheels were found on looms that are near students; therefore, the students obtained a better understanding of this matter. This indicated that objects that are around the students influence the improvement of students' conceptual understanding. Çoker, Çatlıoğlu, and Birgin (2010) argued that students who learn contextually would benefit more both in understanding related concepts, environmental and social issues. By the study of Murtiani, Fauzan, and Ratnawulan (2012) the CTL approach facilitates students in learning since students learn real phenomena that are close to their daily lives, so that learning becomes more meaningful, and students more easily understand the contents of the subject matter.

CONCLUSION

Based on the results of the study described, it can be concluded that the application of a contextual approach by local wisdom can improve the conceptual understanding of students in simple machine material. In each indicator, the conceptual understanding of the students has considered improved. The highest improvement was in the indicator of classifying. Meanwhile, the lowest improvement can be seen through the indicator of concluding. The improvement in the simple machine sub-section was the sub-section of the pulley. Meanwhile, the lowest improvement was the sub-section of the incline material.

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