



The Effect of Project Based Learning with Ethnoscience Approach on Science Conceptual Understanding

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Abstract: The purpose of this study was to analyze the effect of implementing a project-based learning model (PjBL) with an ethnoscience approach on the level of understanding of elementary school students' concepts and to determine student responses to the application of a PjBL with an ethnoscience approach. This study was a quasi experimental research design with a post-test only group design. The samples used were two classes of fourth grade students as the experimental class consisted of 27 students and the control class consisted of 23 students. The sampling technique used was multiple purposive sampling. The data collection method used was the test and non test method. The instruments used are multiple choice post-test questions and student response questionnaires to the application of a project-based learning model (PjBL) with an ethnoscience approach. The normality and homogeneity test as the initial test showed the data were normally distributed and homogeneous. This study used the average difference test with the parametric statistical test Independent-Sample T Test. The t-test results showed that the t-count value is 2.452 > t-table 2.011 so that there is a significant difference in the post-test mean of students in the experimental class and the control class. The average score of student responses to the use of the PjBL model with an ethnoscience approach is 89.6 with very good criteria. The application of the PjBL model with the ethnoscience approach affects science conceptual understanding.

Keywords: conceptual understanding, ethnoscience, project based learning

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INTRODUCTION

The 2013 curriculum explains that the learning process is carried out thematically and in an integrated manner in accordance with the Regulation of the Minister of Education and Culture Number 65 of 2013 concerning Curriculum 2013 process standards. Thematic and integrated learning is learning using a theme in delivering the learning material (Assahary et al., 2017). One of the learning content for elementary school students is Natural Sciences. Natural Science content also needs to be integrated with other contents so that it becomes a complete unit. Natural science material for elementary school students is conveyed in a theme related to other learning content intended to make learning easier for students to understand. Learning for elementary school students is recommended to use thematic and integrated learning. This is because elementary school students have holistic characteristics, namely seeing things as a whole and cannot be separated (Hamidah et al., 2019; Chumdari et al., 2018). Integrative thinking as a way of thinking as a whole and as a whole in a single unit is a way of thinking for elementary school-aged children (Sumantri & Rachmadtullah, 2016). In line with Ardianti's opinion that integrated thematic learning can be used in science content to help create an effective and efficient meaningful learning process so that learning objectives can be achieved properly (Ardianti et al., 2014). The mandate of the 2013 curriculum has the hope that learning in elementary schools is able to invite students to understand science concepts easily if learning materials are linked in a theme. In addition, learning for elementary school-aged children is also expected to be more interesting and fun.

But in fact, the problem that is often encountered in the science learning process is the low ability of students to understand science concepts. Science is often seen as a difficult subject for students because it consists of a lot of memorization and theory accompanied by foreign terms (Raida, 2018a). This causes students to think that science learning is boring and uninteresting for students. In addition, students also assume that science learning is only limited to theoretical learning without knowing the benefits that can be used in real life (Afifah et al., 2021). Students have not been able to relate the concepts learned in school with events that occur in everyday life. This is because science learning carried out by teachers in schools has not connected learning materials with real conditions in the environment around students, for example local culture in the student environment. This student's difficulty can have an impact on the students' understanding of the concept of low science.

Based on observations made by elementary schools, it was found that the science learning process carried out so far has not used varied learning models. Teachers tend to dominate learning activities by explaining the material to students. This causes students to be less able to develop their creativity because the learning is teacher centered learning. In addition, the teacher also gives assignments in the form of working on practice questions in the LKS and student handbooks that tend to emphasize aspects of student knowledge so that learning becomes boring. Based on the observations, it is also known that the worksheets and handbooks used by students contain material by presenting general, non-specific examples according to the area of residence. Science subject teachers do not take advantage of the environment around the school, especially the culture in the environment as a source of learning for students. This causes students to feel that learning abstract material and learning becomes less meaningful. The results of interviews with classroom teachers show that classroom teachers rarely use varied learning models because it requires preparation that requires a lot of time, while teachers also have administrative duties at school. The teacher also said that there were actually a lot of learning resources in the surrounding environment, but the lack of time in preparation caused teachers to prefer to use the lecture method and use teaching materials in the form of worksheets and handbooks from the government.

One way to overcome this problem is to create environment-based learning. Environmental-based learning can present real examples in the environment so that the learning process is real and meaningful for students. Learning in a real environment can make it easier for students to understand a concept, because students can directly see the conditions in the environment. This will have a positive impact on students' understanding of the concept. The science learning process is expected to have a student-centered approach so that students can develop their respective potentials (Nuraini & Muliawan, 2020). Science learning designed with a student centered learning approach will activate students in learning activities through various activities such as group discussions, practicum, project making, and demonstrations. In addition to activating students, the science learning process is also expected to be interesting and fun and able to interact directly with the surrounding environment.

One of the learning models that can be used to assist teachers in activating students and making it easier for students to understand science concepts is the Project Based Learning (PjBL) learning model. PjBL is a learning model using a project task that must be completed by students. Activities in making a project are activities that are real and relate to the surrounding environment directly. Real activities in project-based learning can actively involve students and can develop student creativity, so that the knowledge transfer process can be carried out optimally (Ardianti et al., 2017). The application of the project-based learning model can be accompanied by an ethnoscience approach. Ethnoscience is an activity to transform original knowledge with scientific knowledge (Ardianti et al., 2019a). Genuine scientific knowledge consists of all knowledge relating to the facts of society. This knowledge comes from beliefs that are passed down from generation to generation and are firmly attached to society. Ethnoscience can be applied in a learning process. Ethnoscience-based learning was developed as science learning that incorporates cultural content from the community in every student learning activity. In project learning activities that are planned by students with surrounding cultural content related to learning materials (Susanti et al., 2020). The ethnoscience approach introduces a way of learning that is culturally nuanced around it by paying attention to its suitability with learning materials (Rosyidah et al., 2013; Ardianti & Wanabuliandari, 2021). Understanding of students' concepts can be achieved properly if there is a synergy between teachers, students, and the learning system that makes learning outcomes achieved optimally (Amin et al., 2021). It is hoped that the application of the PjBL model with an ethnoscience approach can make learning more meaningful through project activities related to the surrounding culture so that it has a positive impact on students' understanding of concepts.

The aims of this study were (1) to analyze the effect of implementing a project-based learning model (PjBL) with an ethnoscience approach on the level of conceptual understanding of elementary school students on the theme Caring for living things with the sub-theme Animals and Plants in My Home Environment, and (2) to find out the responses of 4th graders of SD Muhammadiyah Kudus to the application of the project-based learning model (PjBL) with an ethnoscience approach.

METHODS

This research is a quasi experimental research design with a post-test only group design (Creswell, 2012). This study used two groups, namely the control group and the experimental group. The control group was given learning with conventional learning and the experimental group was given learning model Project Based Learning (PjBL) with an ethnoscience approach. After the treatment, the students in the experimental class and the control class were given a posttest to determine the science concept understanding scores. The research design is presented as follows.

Table 1. Post-test Only Group Design

Group	Treatment	Posttest
EG	X1	O1
CG	X2	O2

Information:

O1 : post-test control group students

O2 : post-test experiment group students

X1 : Learning using the PjBL model with an ethnosience approach

X2: Learning in control class

EG : Experimental Group

CG : Control Group

Participant

The population in this study were fourth grade students of SD Muhammadiyah Kudus. The samples used were two classes of fourth grade students as the experimental class and the control class. The experimental class consisted of 27 students and the control class consisted of 23 students. The sampling technique used purposive sampling because of the limited number of classes. The sample used is grade 4 elementary school students, because grade 4 students can already do project learning based on local excellence.

Instrument

The instrument used in the test method was a multiple choice post-test sheet. While the instrument for the non-test method is in the form of a student response questionnaire to the application of the Project Based Learning (PjBL) model with an ethnosience approach.

Data Collection

The data collection method used was the test and non test method. Based on the normality test (Chi-square test) showed that the experimental class value was 6.627 and the control class value was 5.664 which was smaller than the table 12.592, so the data were normally distributed. Homogeneity test (Test the similarity of two variances) shows the value of F_{count} between the experimental and control classes is $1.424 < F_{\text{table}}$ which is 2.00 then the data is homogeneous.

Data Analysis

Data analysis was carried out to determine whether there was a difference in the mean of the post-test scores of the control group and the experimental group students. The hypothesis proposed is as follows.

$$H_0 : \mu_1 = \mu_2$$

$$H_1 : \mu_1 \neq \mu_2$$

Information:

μ_1 : post test scores of control class students

μ_2 : post test scores of experiment class students

The average difference test was carried out by using the parametric statistical test Independent-Sample T Test. H_0 is accepted if $t\text{-count} < t\text{-table}$ means that there is no significant difference between the students' post-test scores in the control class and the experimental class. H_a is accepted if $t\text{-count} > t\text{-table}$ means that the post-test scores of the experimental class students are greater than the post-test scores of the control class students. The data from the questionnaire were analyzed descriptively quantitatively. Data on student responses to the application of the Project Based Learning (PjBL) model with an ethnosience approach is measured by a check list. The percentage of student responses is obtained by calculating the score obtained from the check list divided by the maximum number of scores.

The results of the presentation of student response data are described using the criteria in [Table 2](#).

Table 2. Criteria for Percentage of Student Response Scores

Interval Percentage Score	Criteria Response
81% - 100%	Very good
61% - 80%	Good
41% - 60%	Enough
21% - 40%	Less
0 % - 20%	Poor

RESULT AND DISCUSSION

This research was conducted on fourth grade students. Learning using a project based learning (PjBL) model with an ethnoscience approach is carried out in an experimental class with learning steps consisting of, 1) Start With the Essential Question; 2) Design a Plan for the Project; 3) Create a Schedule; 4) Monitor the Students and the Progress of the Project; 5) Assess the Outcome; and 6) Evaluate the Experience. In the second step, namely the design of a project design, students are asked to plan a project using local advantages or local wisdom in their area.

The learning process using a project based learning (PjBL) model with an ethnoscience approach was carried out on 4th grade students for 6 meetings. The study was conducted on the theme Caring for living things with the sub-theme Animals and Plants in My Home Environment. Students are asked to create a project to produce a product in the form of an Album of Animals and Plants in the Home Environment. Students identify the parts of animals and plants in the environment. Animals and plants used in the project are based on local advantages that exist in the Kudus area, for example "Parijoto" as a typical plant of the Kudus area which is believed to be good for consumption by pregnant women. Students in groups make the album and present it in class discussion. The product of project results in learning using a project based learning (PjBL) model with an ethnoscience approach can be seen in the following figure.

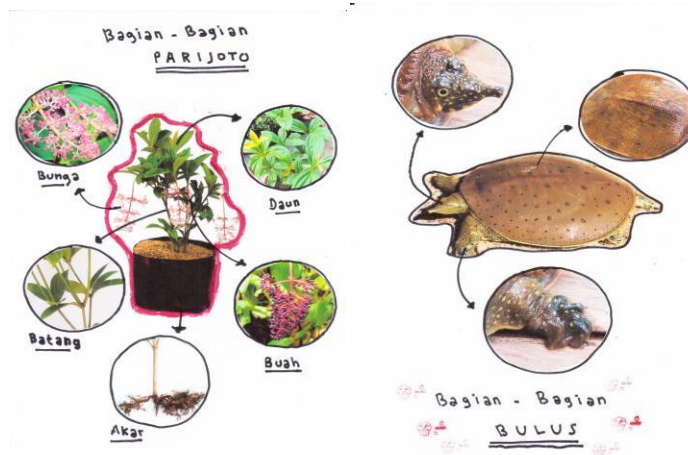


Figure 1. Fill in the albums of animals and plants as products made by students

Students arrange animal and plant albums based on local advantages around them. Animals and plants used in the album are unique from the Kudus area. Figure 1 shows students using parijoto plants and bulus animals. Parijoto plant as a typical plant of the Kudus area which is believed to be good for consumption for pregnant women. Meanwhile, Bulus is a sacred animal in the Jekulo Kudus area and is usually known as the Bulusan Tradition. This is a separate characteristic of learning using a project based learning model with an ethnoscience approach.

At the end of the meeting, students were given a posttest and a student response questionnaire to the learning that had been done. The data from the research results are in the form of science concept understanding scores with learning using the Project Based Learning (PjBL) model with an ethnoscience approach. Indicators of understanding the concept of science analyzed in this study include 1) restating a concept; 2) classify objects according to certain properties (according to the concept); 3) give examples and non-examples of the concept; 4) presenting concepts in various forms of mathematical representation; 5) developing the necessary or sufficient conditions for a concept; 6) using, utilizing, and selecting certain procedures or operations; and 7) apply concepts or algorithms to problem solving. (Ministry of National Education, 2006)

The scores of science conceptual understanding in this study were obtained from the results of the students' post-tests using a multiple choice question instrument. The recapitulation of students' post test results in the experimental class and control class is presented in [Table 3](#) below.

Table 3. Recapitulation of the post test results of the experimental and control class students

Component	<i>Post test score</i>	
	Experiment Class	Control Class
Average	71,1	65,9
Maximum score	88,0	78,0
Minimum score	58,0	58,0

Based on [Table 2](#), it is known that the post test results of students in the experimental class were higher than those of the control class. This can be seen in the post-test average score of the experimental class students reaching 71.1 while the control class reached 65.9. The post-test scores were then analyzed statistically using the t-test. The t-test result shows that the t-count value is $2.452 > t\text{-table } 2.011$. It can be concluded that there is a significant difference between the post test scores of the experimental class students and the control class. The difference in science concept understanding posttest results was due to the application of the Project Based Learning (PjBL) model with an ethnoscience approach.

The application of the project based learning model with an ethnoscience approach has an influence on the understanding of science concepts for fourth grade students. The increase in the application of the project based learning model with an ethnoscience approach to understanding the concept of science can be seen in each indicator of understanding the concept of science. The recapitulation of the understanding of science concept scores per indicator is presented in [Table 4](#) below.

Table 4. The recapitulation of the understanding of science concept scores per indicator

Statement	Percentage (%)
Restating a concept	77,3
Classify objects according to certain properties	78,8
Give examples and non-examples of the concept	86,8
Presenting concepts in various forms of mathematical representation	73,5
Developing the necessary or sufficient conditions for a concept	58,7
Using, utilizing, and selecting certain procedures or operations;	52,9
Apply concepts or algorithms to problem solving	68,8

[Table 4](#) shows that the highest percentage of concept understanding on the indicators of giving examples and non-examples of concepts is 86,8%. it shows that the application of the project based learning (PjBL) model with an ethnoscience approach helps students to be able to name examples of certain concepts. This is because through the ethnoscience approach students can get real examples from the surrounding environment. These real examples help students learn directly so that learning becomes meaningful. The existence of a project in helping students in developing problem solving skills. Based on the results of the recapitulation of the score of understanding science concepts per indicator, it is also known that 68,8% of students are able to apply concepts to problem solving. This proves that learning using local advantages can create real direct learning for students.

The Project Based Learning (PjBL) model invites students to plan a project so that it ends up in the form of a product output. Students carry out planning activities to making projects and the results are immediate, so that learning becomes real ([Pratiwi et al., 2018](#)). Students experience directly all learning activities so that learning becomes meaningful. Direct experience obtained from real conditions makes the learning received by students meaningful ([Ardianti et al., 2019b](#); [Raida, 2018b](#)). Meaningful learning can make it easier for students to understand the concept of learning material. Learning with the Project Based Learning (PjBL) model can increase student activity in learning activities which will have a positive impact on student understanding ([Ardianti et al., 2017](#)). Students are active in discussions in making projects and students can express creative ideas in the projects they make. Students make albums of animals and plants based on the local advantages of the sacred area in groups. Making this album can make students learn in a real environment and get new experiences. This was not obtained by students in the control class. The use of the Project Based Learning (PjBL) model also invites students to feel and experience directly the learning process so that it can make it easier for students to understand a concept of learning material.

Apart from the Project Based Learning (PjBL) model, science learning is also delivered using an ethnoscience approach. The ethnoscience approach is an approach in which science learning is packaged by connecting the local culture of the surrounding environment with learning materials. The implementation of the Project Based Learning (PjBL) model with an ethnoscience approach invites students to learn in the surrounding

environment in the form of real activities, so that students can gain direct experience. Students can learn science concepts in a concrete manner based on examples they find around them. Ethnoscience learning can help students understand concepts because learning is more real (Wanabuliandari et al., 2018; Yamin, 2017). So, it will make it easier for students to understand the material.

The use of the surrounding local culture as a learning resource makes learning more meaningful. Students can relate real-life examples in the surrounding environment with learning materials (Arfianawati et al., 2016). Learning through the surrounding culture helps students understand the concept of learning through real examples in the environment so that it has an impact on improving student learning outcomes (Seftiana et al., 2019; Anggraini & Kusniarti, 2017). Students can learn real science concepts and make it easier for students to understand the learning material. This can help reduce or even eliminate students' assumptions that science material is difficult

The ethnoscience approach used in learning can not only broaden students' knowledge of the local culture around them but also create an interesting and fun learning process for students. At the end of the lesson, students are also given the opportunity to express their opinions regarding the application of the ethnoscience-based Project Based Learning (PjBL) model through student response questionnaires. Student response data was obtained by analyzing student response questionnaires at the end of the lesson using the Project Based Learning (PjBL) model with an ethnoscience approach. The results of the student response analysis can be seen in Table 5 below.

Table 5. Student responses to the PjBL model with an ethnoscience approach

Statement	Answer Yes (%)
Interest in the PjBL model with an ethnoscience approach	96,3
The PjBL model with an ethnoscience approach presents science learning with real examples in the environment	88.9
The PjBL model with an ethnoscience approach can help students get to know the local culture around them better	92,6
The PjBL model with an ethnoscience approach can provide new experiences from project activities	88.9
The PjBL model with an ethnoscience approach can facilitate students' understanding of concepts	81,5
Average	89,6

Table 5 shows the results of students' responses to learning the Project Based Learning (PjBL) model with an ethnoscience approach. Overall, students gave a positive response to Project Based Learning (PjBL) with an ethnoscience approach. The success of science learning using the Project based Learning (PjBL) model with an ethnoscience approach is measured by the results of student responses at the end of the lesson. The student response data was obtained by analyzing the results of the questionnaire at the end of the lesson with the Project Based Learning (PjBL) model with an ethnoscience approach, namely: 1) Interest in the PjBL model with an ethnoscience approach, a score of 96.3; 2) The Project Based Learning (PjBL) model with an ethnoscience approach presents science learning with real examples in an environment with a score of 88.9; 3) The Project Based Learning (PjBL) model with an ethnoscience approach can help students get to know the local culture better around a score of 92.6; 4) The Project Based Learning (PjBL) model with an ethnoscience approach can provide new experiences from project activities with a score of 88.9; and 5) The Project Based Learning (PjBL) model with an ethnoscience approach can facilitate students' understanding of concepts with a score of 81.5.

Based on the results above, students' responses to learning the Project Based Learning (PjBL) model with an ethnoscience approach, overall students gave a positive response to learning with the Project Based Learning (PjBL) model with an ethnoscience approach. The average score of student responses to the use of the Project Based Learning (PjBL) model with an ethnoscience approach is 89.6 with very good criteria. The results of the student responses indicate that the application of the Project Based Learning (PjBL) model with an ethnoscience approach makes students interested in learning so as to increase students' enthusiasm for learning. A total of 96.2% of students stated that students were interested in learning using a project based learning (PjBL) model with an ethnoscience approach. This is because learning becomes real and students can directly carry out project activities in the surrounding environment (Wanabuliandari et al., 2018). This learning model is suitable for learning in elementary schools according to the characteristics of elementary school students, namely learning through concrete objects.

Based on the results of research that has been carried out using the PjBL model taking an ethnoscience approach to fourth grade students of SD Muhammadiyah Kudus, the advantages of this model are: being able to increase student motivation in learning activities with a project to make educational albums in groups,

students being able to solve problems and tasks in groups, based on their creativity. each group member. However, there are also obstacles in learning activities, namely in making educational albums as projects carried out by students requiring skills to decorate and attaching images require a longer time, tools and infrastructure must be more complete because not only books and pens but dyes, scissors, glue and other supporting tools. In addition, the limitations of this study are the lack of knowledge of students and teachers in identifying local advantages. This becomes an important part when implementing ethnoscience-based learning.

CONCLUSION

Based on the results of the t-test, it shows that the t-count value is $2.452 > t\text{-table } 2.011$ so that H_0 is rejected and H_a is accepted, which means that there is a significant difference in the posttest mean of students in the experimental class and the control class. The average score of student responses to the use of the Project Based Learning (PjBL) model with an ethnoscience approach is 89.6 with very good criteria. Based on the results of the research that has been done, it can be concluded that the application of the Project Based Learning (PjBL) model with the ethnoscience approach affects science conceptual understanding.

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