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The Understanding Improvement of Natural Science Concept of Primary School Teacher Education Department Students Using Project-Based Learning Model

Dea Mustika[1*], Siti Quratul Ain[2]
[12]*Universitas Islam Riau, Indonesia*

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ABSTRAK
Berdasarkan hasil observasi ditemukan fakta bahwa pemahaman konsep mahasiswa khususnya terhadap materi IPA SD sangat kurang, hal ini dikarenakan proses pembelajaran yang masih didominasi dengan presentasi dan kurang memberi kesempatan pada mahasiswa untuk menggali pengetahuannya sendiri. Penelitian ini bertujuan untuk menunjukkan peningkatan pemahaman konsep IPA mahasiswa melalui penerapan model project based learning. Jenis penelitian yang dilakukan adalah penelitian tindakan kelas dengan subjek penelitian adalah praktisi dan mahasiswa PGSD semester IV kelas B yang berjumlah 49 orang. Metode pengumpulan data berupa tes dan non tes dengan instrument yang digunakan adalah lembar observasi dan soal tes. Hasil tes pra siklus memperoleh nilai rata-rata 64,8 dengan ketuntasan klasikal 47%, pada siklus I nilai rata-rata meningkat 74,3 dengan ketuntasan klasikal 74% dan pada siklus II nilai rata-rata menjadi 85 dengan ketuntasan klasikal 88%. Hasil ini menunjukkan bahwa penerapan model project based learning dapat meningkatkan pemahaman konsep mahasiswa terhadap materi IPA sekolah dasar.

ABSTRACT
Based on the results of observations, it was found that the understanding of the concept of students, especially elementary school science material, is very lacking, this is because the learning process is still dominated by presentations and does not provide opportunities for students to explore their own knowledge. This study aims to describe the application of the project based learning model to improve students' conceptual understanding. This research is a classroom action research . The subjects of this study were students of the fourth semester class B which consist of 49 students. Data collection methods in the form of tests and non-tests with the instruments used were observation sheets and test questions. The pre-cycle test results obtained an average value of 64.8 with 47% classical completeness, in the first cycle the average value increased by 74.3 with 74% classical completeness and in the second cycle the average value became 85 with 88% classical completeness. These results indicate that the application of the project-based learning model can improve students' conceptual understanding of elementary schools science materials.

1. Introduction

Concept understanding consists of two words, namely understanding, and concept. Understanding is the ability level to understand situations or facts, whereas the concept is an abstraction from an experience or a link between facts (Purwanto, 2016; Suhendar & Ekayanti, 2018; Sumarni et al., 2016). Concept understanding can be interpreted as the ability to understand a concept by relating the facts contained therein. Prospective teacher students should master the ability to understand the concept because It can be the primary teaching asset. Someone who understands the concept well will explain that it is fixed on one example and provide a broad picture concerning the surrounding, current, and future conditions. The factors that can influence conceptual understanding are learning media and teaching models or methods. The application of appropriate learning models and media can improve students' conceptual understanding.

The learning model is a plan that can be used to design learning materials and guide the implementation of learning (Fatimah, 2017; Hotimah, 2020; Rusman, 2013). The accuracy in choosing a learning model will help achieve the learning objectives and help students improve their academic and non-academic abilities. Apart from the learning model, instructional media can also increase curiosity

Corresponding author.
E-mail: deamustika@edu.uir.ac.id[1]

about a concept being studied. Learning media are immediately appropriate to convey messages from a source in a planned manner so that the learning process can be carried out more efficiently and effectively. The use of relevant learning media and increased creativity also increase understanding of concepts because information reception involves all five senses (Asyhar, 2014; Hotimah, 2020; Suhendar & Ekayanti, 2018).

Seeing the importance of students' concept understanding skill, causing the Primary School Teacher Education Department of FKIP UIR, makes understanding the concept an indicator of learning achievement in every subject taught, one of which is in the Elementary Science Education course. This course is a continuation of the Elementary Science Education Basic Concept, wherein the previous course students focused on understanding the basics of natural science materials found in elementary school. Furthermore, in the elementary science education course, students' understanding is further deepened by analyzing the low to the high-grade science curriculum.

Based on the result of observation and test of understanding the science concept of Primary School Teacher Education Department students in class IV/B in the even semester of 2019/2020 school year, at the pre-cycle stage, it showed that students' conceptual understanding is still very lacking. Of the 49 students who were given test questions, only 23 students scored 75 with 47% classical completeness. The overall mean was 64.8. these results were influenced by the learning model applied in lectures. Unstructured interviews involving several students stated that students were accustomed to learning science material with a memorization system because courses focused on discussion activities. In the implementation of science lecture activities, the lecture dominantly uses a learning approach in discussion and presentation activities. Although students are assigned to make media or props to increase understanding, there has not been optimal guidance and direction on students' assignments. During the learning process, students are less facilitated in using learning media so that they are less able to make a connection between abstract and formal concepts (Darmawan, 2014; Luh et al., 2020; Mustika & Ain, 2020).

Efforts that can be made to overcome the lack of conceptual understanding apply an appropriate learning model, namely the Project Based Learning (PjBL). PjBL is a learning model that allows students to work independently to construct learning (new knowledge and skills) and accumulate it in real products (Darmawan, 2014; Mustika et al., 2020; Wena, 2016). The PjBL model application can direct the student to be actively involved in the learning process to complete the project. Project assignments in the PjBL model can generate a comprehensive and integrated understanding of the concept. Through the empowerment of science process skills in the PjBL model, students will be proficient in solving a problem and produce a product to increase their understanding of the concept.

The steps for implementing the PjBL model such as: (1) start with essential questions, starting learning by providing stimuli in the form of queries or cases of problems that are around following the planned project assignment; (2) Design a plan for the project, discussing the project task plan by guiding to determine the work rules, as well as the tools and materials used; (3) Create a schedule, compile a program for completion of the task; (4) Monitor the student and the progress of the project, monitor the progress of the project task carried out. Students can also monitor whether the assignment has gone according to plan; (5) Assess the outcome, evaluate the learning process and outcomes. The evaluation result can be used as feedback, strengthening, or providing assistance; (6) Evaluate the experience, conduct a final assessment and discuss things again during the completion of project tasks (Dewi, 2015; Hairunisa et al., 2019; Mustika, 2017). Through the PjBL steps, students can be actively involved in learning individually and in groups, especially in completing project assignments.

Project tasks that can be implementing the PjBL model in the form of making learning media. Learning media does not have to be made with expensive materials. However, media can be made with simple tools and materials but still have high educational value, for example, pop-up book media. Pop-up books are visual learning media in the form of books with three-dimensional effects. When the pop-up book is opened, the pages will give a real impression. Besides that, pop-up book media can help make it easier to capture meaning through attractive image representations (Mustika & Ain, 2020; Permana & Sari, 2018; Rati et al., 2017). Pop-up book media is chosen as a project task in the PjBL model application because the benefits are (1) developing creativity, (2) providing knowledge and object recognition, (3) growing reading motivation, (4) training critical thinking skills, (5) making it easier to grasp meaning through representation interesting picture (Dewanti et al., 2018; Hotimah, 2020; Permana & Sari, 2018). It means that by making pop-up book media, it is hoped that students can more easily remember each material studied so that conceptual understanding will increase.

The researcher has reviewed several studies that serve as references for implementing this research, including research conducted by (Laila & Shari, 2016), who obtained the results that learning media by utilizing materials that were easily obtained could help improve students' creativity learning

outcomes. Another study was conducted by (Dewanti et al., 2018), who revealed the development of pop-up book media for fourth-grade elementary school students. The final result that the pop-up book media was declared feasible as a learning aid media in elementary schools. Additional research by (Permana & Sari, 2018) obtained the result that the researcher did with the previous research was that this study aimed to describe the application of the Project-Based Learning model to improve the understanding of Primary School concepts Teacher Education Department students. The project assignment assigned to the students was in the form of making a pop-up book media.

2. Method

This research is part of the classroom action research model of Kemmis and Mc. Taggart. The steps arranged systematically consist of planning, action, observation, and reflection (Arikunto et al., 2017; Kusuma & Dwitagama, 2012; Trianto, 2019). The research was conducted in two cycles, each of which consisted of four meetings; in addition to that, in the implementation of each cycle, learning action was carried out by applying the Project-Based Learning (PjBL) model stages. The research was carried out in the Elementary Science Education course. The research subject was grade IV/B students of the Primary School Teacher Education Department, totaling 49 people, with 43 female students and 6 male students.

Data collection techniques were in the form of tests and non-test with instruments in observation sheets and test questions. Observation sheets to measure the performance of lecturers in the implementation of lecture activities. The observation sheet contains 6 aspects following the stages of the PjBL model. Each aspect was then broken down into 3 indicators with four ranges of answer choices, namely Very Good, Good, Enough, and Less. The total score for the lecturer performance observation sheet is 24. The following is a grid of lecturer performance observation sheet instruments, which can be seen in Table 1

Table 1. Lattice sheet of lecturer performance observation

No	Observed aspects	Question number	Score
1	Ask basic questions	1,2,3	4
2	Guiding project planning and assignment	4,5,6	4
3	Guiding the preparation of task work schedules	7,8,9	4
4	Monitor task progress	10,11,12	4
5	Test the learning process and result	13,14,15	4
6	Carry out an assessment	16,17,18	4
	Total Score		**24**

Furthermore, the test questions were intended to measure the ability of students to understand concepts. The questions that were designed consist of 20 items that must be answered by students individually. The first cycle's test questions focused on low-grade science material and the test questions in the second cycle focused on high-class science material. The test questions were designed following the material from the pop-up book media produced by students. The item grid to measure students' conceptual understanding is shown in Table 2.

Table 2. Grid test question to measure conceptual understanding

Cycle	Indicator	Material	Cognitive Aspect	Question Number
I	Describe the occurrence of day and night events	Day and night events	C2, C3	1,6,11,14
	Identify the concept of changing the form of objects	Form change	C3, C4	2,7,16,18
	Describe the events of photosynthesis in green plants	Photosynthesis	C3, C5	3,9,12,20
	Identifying weather changes and their effects	Weather changes	C2, C4	4,10,17,19
	Identify the concepts of growth and development in living things	Mortal	C4, C5	5,8,13,15
II	Comparing the life cycles of several	Animal life cycle	C4, C5	1,8,12,18

Cycle	Indicator	Material	Cognitive Aspect	Question Number
	types of living things			
	Analyze the relationships between ecosystem components	Ecosystem	C2,C4	3,9,13,20
	Identify the sense organs and their functions	Sense organ	C2,C4	5,7,14,19
	Describe the locomotion and its function in humans	Locomotion organ	C4,C5	4,10,15,16
	Describe the digestive organs and their functions in humans	Digestive system	C3.C4	2,6,16,17

Data analysis using qualitative and quantitative data analysis models. Data analysis started from the beginning of data collection and was then reduced by selecting and classifying relevant data. Irrelevant data discarded, and relevant data continued for analysis. Subsequent data were presented by compiling the information obtained for later conclusions. Temporary conclusions were drawn after implementing the first cycle, while the findings were obtained after executing the last cycle. The quantitative data were processed using the stated percentage technique formula (Arikunto et al., 2017; Kusuma & Dwitagama, 2012; Trianto, 2019):

$$KB = \frac{T}{Tt} x\ 100\%$$

Annotation:
KB = Completeness of Study (*Ketuntasan Belajar*)
T = Score Obtained (*Jumlah skor yang diperoleh*)
Tt = Total Score (*Jumlah skor total*)

The interpretation of the value obtained adopts the criteria stated by (Arikunto et al., 2017; Kusuma & Dwitagama, 2012; Trianto, 2019) can be seen in Table 3.

Table 3. interpretation of the percentage category of conceptual understanding

(%)	Category
0 – 54	Very less
55 – 59	Less
60 – 74	Enough
75 – 84	Good
85 – 100	Very good

Following the Department of Education and Culture's statement, individual completeness could be determined if the correct answer was ≥ 65%, and classical completeness is determined if ≥ 85% was complete in learning. Then the research was said to be successful if the students' average test score was ≥ 75 with classical completeness ≥ 85%.

3. Result and Discussion

The data collected in this study were conceptual understanding data obtained using test questions and lecturer performance data obtained from observation sheets. The research began with observation at the pre-cycle stage. The implementation stage of the research action was divided into two cycles. An overview of the implementation and results of the research can be described as follows.

Pre-cycle

This research began to be carried out on grade IV/B students of the Primary School Teacher Education Department apart from FKIP UIR in the elementary Science Education course before the emergence of the home policy study. Observations in the pre-cycle were carried out at the beginning of the lecture in March 2020. Pre-cycle observations found that students' conceptual understanding of elementary school science material was still very poor. The data were obtained by giving a pre-test to measure students' conceptual understanding. Of the 49 people who took the initial test, only 23 students

achieved completeness with an overall average of 64,8. When questioning and answering questions related to elementary school science materials, students were less able to handle and tend to be passive. Overall classical completeness in the pre-cycle was 47%. Furthermore, learning was continued online while still applying the PjBL model states, which were divided into two cycles. In the implementation of the action, it can be observed that lecturers' performance in managing learning used the PjBL model stated and increased in students' conceptual understanding.

Cycle I

The cycle I was carried out from April to May 2020 for four meetings. Activities in the first cycle included planning, action, observation, and reflection. The planning stage was carried out by preparing a lesson plan, designing assignments and instruments used to retrieve research data.

The implementation of stages was carried out by applying the PjBl model stages in lecture activities. At this stage, the students agreed on some low-grade science materials as the materials for making pop-up books. Students were allowed to plan, create, present, and evaluate the media produced during the assignment. Based on research (Hotimah, 2020; Mustika & Ain, 2020; Wena, 2016). This action is useful to gain experience, understand obstacles and find alternative solutions to solve problems. The observation was in the form of observing the action taken using the instruments that have been prepared. Observation of lecturer performance was measured using the lecturer observation sheet. The result of observations of lecturer performance in the first cycle obtained a score of 20 out of a total score of 24. The average percentage obtained was 83% in the good category. The data on the result of concept understanding was obtained from students' conceptual understanding test questions. The data were distributed in the last meeting of cycle I. In the first cycle, the overall average was 74.2, with the highest score of 90 and the lowest score of 40. The number of students who achieved the minimum completeness was 36 students, and 13 students did not complete it. The percentage of classical completeness was 73%, with a good category.

The reflection stage was carried out by examining and discussing the experiences that emerged in cycle I. The mean students' conceptual understanding was 74.2 with 73% classical completeness, while the success indicators had an average score of 75 with 85% classical completeness. These results have shown an improvement compared to the results obtained at the pre-cycle stage. According to (Rati et al., 2017), the PjBL model's application can make learning conditions more enjoyable and attractive with project assignments so that they impact learning outcomes. Even though it had shown improvement, the result in cycle I had not reached the expected target, so that the research was continued in cycle II.

Cycle II

The implementation of action in cycle II was carried out from May to June 2020 with four meetings. Activities in cycle II include the stages of planning, action, observation, and reflection. The planning stage is carried out by re-preparing the Lesson Plan, the design of the project assignment, and the instruments used for retrieving research data.

Cycle II was carried out by re-applying the PjBL model stages in lecture activities. At this stage, the material distributed is in teaching materials accompanied by videos of making pop-up book media. Students agree on high-class science materials to be used as material for making pop-up books in cycle II. The difference with cycle I was that the pop-up book media in cycle II was determined by adding a complete component, such as explaining each picture and adding quizzes or exercises at the end of the explanation. According to (Luh et al., 2020; Mustika et al., 2020; Permana & Sari, 2018), adding components in making media, besides increase creativity, could also help students better understand the material the media that was made. Students were allowed to be creative in making, presenting, and evaluating the pop-up book they have made during the assignment. The observation stage is in the form of observing the actions taken using the instrument that had been prepared. Observations on the performance of lecturers in cycle II obtained a score of 22 out of a total score of 24. The average percentage obtained was 92% in the outstanding category. Concept understanding data were obtained from the test questions at the end of cycle II. The results showed the students' conceptual understanding in the second cycle overall average of 85 with the highest score of 100 and the lowest score of 60. The number of students who achieved minimum completeness was 43 students and did not complete 6 students. The percentage of classical completeness obtained is 88%, with a good category.

The data from observation of lecturer performance and the students' conceptual understanding improvement in cycle II had increased compared to cycle I. The comparison of the advancement of lecturers' performance observation in implementing the stages of PjBL from cycle I and cycle II could be seen in Figure 1.

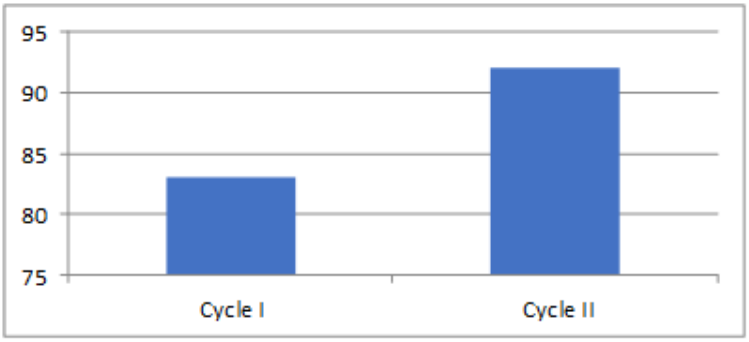

Figure 1. Comparison of Lecturer Performance Results using the PjBL Model

Based on the diagram above, it could be observed that the increase in lecturer performance in managing learning showed an increase of 9%. This performance improvement was due to the PjBL model's stages helping to assign project tasks that are more focused on students in each cycle. (Darmawan, 2014; Rahayu & Samsudin, 2019; Sastrika et al., 2013) Stated that the PjBL model's steps, lecturers can direct the learning that develops cognitive, affective, and psychomotor aspects, but by giving project assignment, students can also build their abilities. It meant that implementing learning by implementing the stages of the PjBL model could improve lecturer performance in managing lecture activities. The result of the improvement of students' conceptual understanding also showed an increase at each stage. The result of students' conceptual understanding improvement can be summarized in Table 4.

Table 4. Data Processing Result of Students' Conceptual Understanding Test

No	Minimal Completeness (75)	Pre-Cycle		Cycle I		Cycle II	
		f	%	F	%	F	%
1	Complete	23	47	36	73	43	88
2	Not Complete	26	53	13	27	6	12
Total		49	100	49	100	49	100
Average		64,8		74,2		85	
Completeness Percentage		47%		73%		88%	
Incompliance Percentage		53%		27%		12%	
Highest Score		90		90		100	
Lower Score		30		40		60	

Based on the table, it could be observed that there was an average increase from the pre-cycle stage 64.8 to 74.2 in the first cycle and 85 in the second cycle. The completeness percentage showed a rise of 26% from pre-cycle to cycle I and 15% from cycle I to cycle II. More clearly, the comparison of the result of increasing conceptual understanding obtained by students could be observed in Figure 2

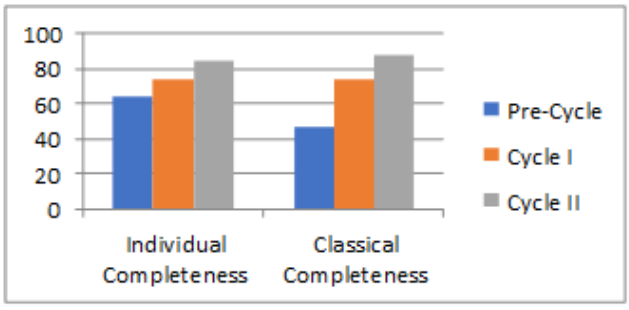

Figure 2. Comparison Diagram of Students' Conceptual Understanding Ability

Individual completeness and classical completeness have increased, although the result of individual completeness was not very significant; in classical completeness, it can be observed that the increase is relatively high compare to the pre-cycle stage. It meant that making pop-up book media a project assignment in implementing the PjBL model helps students better understand science material. (Hairunisa et al., 2019; Prilestari et al., 2019; Sumarni et al., 2016) Stated that it can increase learning motivation to affect students' enthusiasm can cause learning outcomes in each cycle in following each learning stage with project assignments given by applying the PjBL model. The result obtained in cycle II has reached the set target; namely, the score of individual students completeness test was > 75 with classical completeness > 85%. The research's implementation can be concluded as successful and sufficient until cycle II.

The result of this study supports several previous studies that had been conducted. (Hairunisa et al., 2019) In their research, those who applied the PjBL model stated that implementing the PjBL model in learning could improve students' learning outcomes. Student learning outcomes in the first cycle increased from 63.75 to 70.73, and in the second cycle increased from 68.75 to 81.35. The PjBL model's application increased the enthusiasm and willingness to learn so that students could compile their knowledge and develop critical thinking skills. It has an impact on the ability to understand a concept (Pratiwi & Setyaningtyas, 2020). Research conducted by (Sastrika et al., 2013) using the quasi-experimental method, post-test only control group design, stated that the conceptual understanding ability of students who learned with the PjBL model was better than those who knew using conventional methods (Fcount = 13.921 > Ftable = 3.91). It was because of the opportunity to learn to develop ideas and solutions realistically.

(Kurniawan, 2017) In his research, which applied the PjBL model to create learning media, 42% of participants chose to agree strongly, and 32% of participants decided to agree that the PjBL model was suitable for learning activities. Participants stated that the given project assignment activities could encourage new ideas to understand better the material being studied. This result was confirmed by research conducted by (Isnaniah, 2017) that the PjBL model can help increased student understanding because students were trained to think creatively. It could be seen from the increase in the second cycle to 80.41% high category. Also, (Mustika & Ain, 2020) stated that making media by applying the PjBL model and increasing creativity could also improve students' conceptual understanding. The improvement could be seen from the first cycle's learning outcomes, which obtained an average value of 75.93, increasing in the second cycle to 85.93. This increase occurred because the project-based learning made students were encouraged to be more courageous in exploring and actualizing their desire to learn

4. Conclusion

Based on the results of the analysis and discussion of the research. It was concluded that after the implementation of the Project-Based Learning model in the Elementary Science Education course in class IV/B of Primary School Teacher Education Department, apart of FKIP UIR. The data showed the improvement of students' test results from the pre-cycle stage to the second cycle. These results proved that applying the Project-Based Learning model could help improve students' understanding of science concepts.

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