

Building Student Abilities: Making Reports And Demonstrations Through Project-Based Learning

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Abstract

The Project-Based Learning Model (PjBL) was used to carry out Primary Level Mathematics Capita Selecta Learning. PjBL was used in seven steps: 1) Discussing the syllabus, materials, groups, math problem, math props, and report form; 2) Collecting data, write reports, and create math props; 3) Presentation; 4) Revising the report in light of the discussion's findings; 5) Reports are being uploaded in revised form; 6) Each group assesses the report of the other group; 7) Implementing Posttest. The purpose of this study was to determine students' creativity and teaching ability in PjBL in the Subject Primary Level Capita Selecta Learning in 2019/2020. The subjects were class B of the fourth semester of Mathematics Education FKIP UNIB2019/2020, with a total of 28 students. This research was conducted ex-post facto, which means that it examined events that had already occurred and then traced back to determine the factors that caused these events. The instrument used to collect information about student creativity was developed as a result of group evaluations of previous group reports. Post-test results are used to calculate the value of learning ability. The results were obtained after the data was processed: The average report score for each group was 83.88, the post-test average score was 85.85, and both were categorized as very good.

Keywords: Learning Ability, Mathematics Props, Project-Based Learning Model

1. Introduction

One of the most important factors in ensuring that students understand the topics is to conduct an effective learning process. In efforts to make students understand teacher and lectures find a way to make learning process meaningful, one of the ways to overcome this case is applying a student centered learning. A student centered learning means learning that considers educational needs, interests, and motivation students are varied (Muhidin, 2017). To realize this kind of learning, lecturer choose one of the learning model such us Project-Based Learning. Project-Based Learning Model (PjBL) is a student-centered learning model. The PjBL model is a learning model that can be used to apply existing knowledge, train various thinking skills, attitudes, and concrete skills. Whereas in complex problems, learning is needed through investigation, collaboration and experimentation in making a project, and integrating various subjects (materials)



in learning. By applying a project-based learning model it is expected to train independence, collaboration and experimentation in students (Yuliana, 2020). Through this model, it was expected that student can develop their understanding by making a project under lecturer's supervision. States that students develop a question and are guided through research under the teacher's supervision (Bell, 2010). Discoveries are illustrated by creating a project to share with a select audience. Organizers support systematization of the processes that will be implemented throughout the research and project phases of PjBL.

PjBL is settled to be applied in one of the subject Mathematics Capita Selecta. The Mathematics Capita Selecta Mathematics for primary level is a compulsory subject offered by the S1 FKIP UNIB Mathematics Education Study Program with 3 credits. For the 2019/2020 school year, capita learning is carried out by implementing PjBL. PjBL is implemented in the following stages: 1) At the first meeting lecturers and students discuss about a) syllabus of mathematics material for primary level; b) determination of the material to be discussed for one semester; c) determination of groups and materials; d) discussing how to collect information that was by conducting a survey to elementary schools; e) explaining the activities will be carried out, that was collecting information, about mathematics learning problems, finding solutions, making props as a tool. f) describing the form of the report format. 2) Students collect information and make reports and mathematics props, within 2 weeks. 3) In the fourth week onward, groups of students begin to do the presentation with these following stages: a) presentation of a report of the problem. b) solutions offered. c) demonstrating the props they have made. d) giving questions to other groups and asking for criticism and suggestions. 4) Revising the report based on the results of the discussion. 5) Uploading revised reports on google classroom. 6) Each group evaluates the report of another group. The results are sent to the lecturer. 7) Implement Post test. The Covid 19 pandemic, which required bold learning, caused lectures in class to be moved to google classroom. The report presentation activity is changed to discussing in Google Classroom.

From the results of the material selection, 14 materials were determined to be discussed by 14 student groups. The following list is the group division and the material to be discussed. Group 1 discuss Mathematics Learning Problems with Two-Dimensional Figures Material; Group 2 discuss the Difficulties of Students in Simple Fractions material; Group 3 discuss The Students' Difficulties in Segment, Simple Plane and Solid Figures, and Sequence Patterns; Group 4 discuss Mathematics learning problems in the material of sorting numbers on a number line; Group 5 discuss Sutudents' Difficulties in the same denominated fraction operation material; Group 6 discuss Students' difficulties in angles (right angles, blunt, and sharp) material; Group 7 discuss students' difficulties in fraction valued, fraction form and estimated fraction operations material; Group 8 discuss Mathematics learning problems in Greatest Common Divisor (GCD) and Lowest Common Multiple (LCM). Group 9 discuss Students' Difficulties in the material of area and circumference of rectangles, squares, and triangles; Group 10 discuss



Students' difficulties in fractions; Group 11 discuss Mathematics learning problems in unit area conversion on discharge; Group 12 discuss Students' Difficulties in material proving the formula for the circumference and area of a circle; Group 13 discuss The difficulty of students in the material of Solid Figures; Group 14 discuss Mathematics learning problems in statistical material (mean, median, mode).

After each group received the material to be discussed, the students were off from the class for two weeks. Students are given the opportunity to collect information by doing the surveys at elementary schools. After that, students compiled reports as well as think about solutions and demonstrate props that will be used to solve math learning problems in elementary school. Group 1 and 2 present their reports in the 4th week, and demonstrate props they have made. From the 5th week to the 7th week the report presentation still took place in class. In the 8th week and onward lectures are conducted online. We used google classroom to continue discussed the survey report and making demonstrations. Activities in the google classroom begin with uploading a report to the google classroom, then each student was given time to read the report. After that the presenter group must respond to questions from other groups. The main obstacle often complained by students who late to joined was the signal was hard to get, the quota suddenly run out, the electricity went out.

When a group did a presentation, the group must prepared questions that will be answered by the other groups. Other groups also provide criticism and suggestions for improvement to the presenter group. Answers or suggestions for improvement from other groups are processed and used as improvements to the group's presentation reports. After all group presentations, each group was asked to provide an assessment of the report or props or performance for each of the other groups. To found out how many students absorb the material and how to learn it, then students are asked to carry out post test online. The answer was sent to email.

Based on the implementation of the project based learning of the subject Capita Selecta with a series of activities while the Covid 19 outbreak caused face-to-face learning changing to online lectures, it was deemed necessary to know students' abilitis in making reports, demonstrating props, and finding out students' responses to Matheatic Capita Selecta in Primary Level. Those activities can be the the means to determine the creativity and teaching ability of students in PjBL in the Subject Primary Level Capita Selecta Learning.

The basic difference between online learning and offline learning is about teaching practice using teaching aids that have been made by each group. Offline, the students presenting act as elementary teachers, and other students act as pupils. Students can respond to the strengths and weaknesses of props or reports written by the presenter group. If there is a shortage, then at that time it is immediately given input by students from other groups who act as students. When learning online, the presenter group uploads their report on the GC and cannot practice the props they have prepared. Other students only read from the report

how to make teaching aids and how to use teaching aids in class. For this reason, it is deemed necessary to conduct research on the Ability of Students to Make Reports and Teaching Aids Through Project-Based Learning in the Subject Capita Mathematics Selection for Basic Education for 2019/2020.

2. Method

This study was aimed to determine the creativity and teaching ability of students in PjBL in the Subject Primary Level Capita Selecta Learning in 2019/2020. This research was conducted in mathematics education FKIP UNIB. The subjects were class B of 4th semester in Mathematics Education FKIP UNIB 2019/2020, totaling 28 people. This research was ex-post facto, namely research conducted to examine events that have occurred and then trace back to determine the factors that caused these events. The instrument that used to collect information about student creativity was the result of group assessments of other group reports. The value of learning ability is taken from post-test answers.

The project-based learning steps in this study are in this following stages.

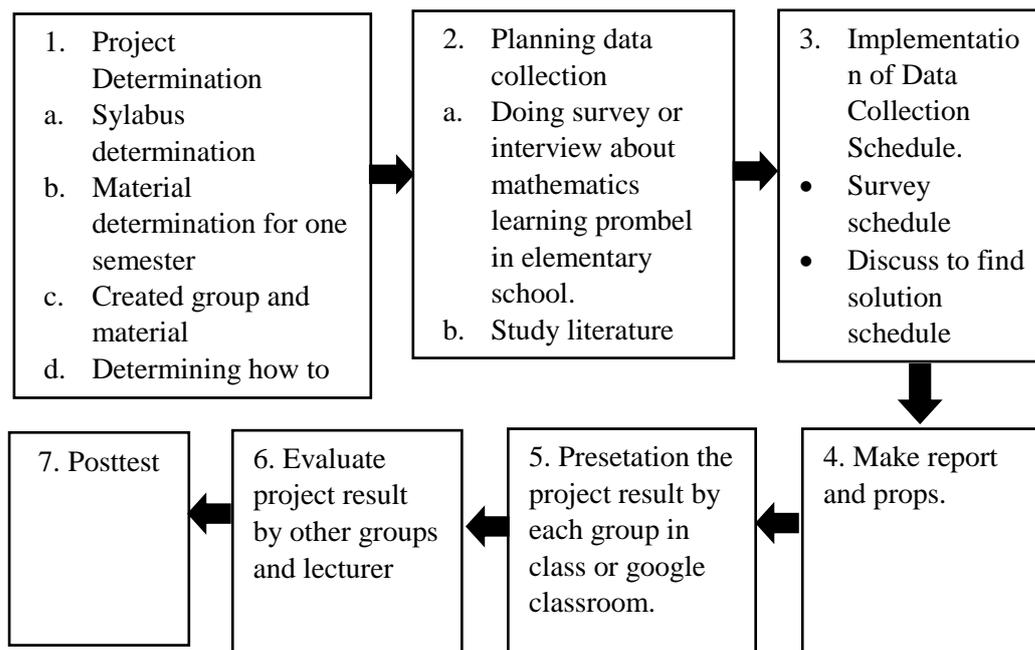


Figure 1. Project-Based Learning Stages Modified from Keser and Karagoca (2010)

1) At the first meeting lecturers and students discuss about a) syllabus of mathematics material for primary level; b) determination of the material to be discussed for one semester; c) determination of groups and materials; d) discussing how to collect information that was by conducting a survey to

elementary schools; e) explain the activities will be carried out, that was collecting information, about mathematics learning problems, finding solutions, making props as a tool. f) describe the form of the report format. 2) Students collect information and make reports and props, and are given 2 weeks. 3) In the fourth week onward, groups of students begin to do the presentation with the following stages: a) presentation of a report of the problem. b) solutions offered. c) demonstrating the props they have made. d) giving questions to other groups and asking for criticism and suggestions. 4) Revising the report based on the results of the discussion. 5) Uploading revised reports on google classroom. 6) Each group evaluates the report of another group. The results are sent to the lecturer. 7) Implementing the Post test. The Covid 19 pandemic, which required bold learning, caused lectures in class to be moved to google classroom. The report presentation activity is changed to discussing in Google Classroom.

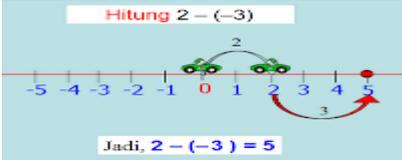
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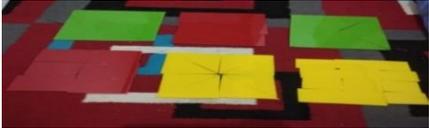
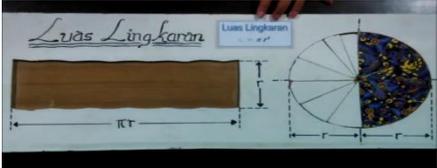
3. Results And Discussion

Students in each group made learning props corresponding to the topic the have gotten beforehand. Each group had different idea and different kind of props to made elementary students easily to understand the material. The learning props that have been made by each group can be seen on the following Table 1 bellow.

Table 1. Learning Props Each Group

No	Name of Group	Material	Date of Presentation	Props Picture
1	Lara Sentik, Sahida Dini Alifia	Mathematics learning problems with Two-Dimensional Fugures and how to solve them	26/2/2020	
2	Epran, Agung Roihan	The difficulties of Students in Simple Fractions material	26/03/2020	

3	Rahmat Zayadi, Anang Budiarto	The Students' Difficulties in Segment, Simple Plane and Solid Figures, and Sequence Patterns	05/03/2020	
4	Hanny Nurhikma P, Nanda Lorenza	Mathematics learning problems in the material of sorting numbers on a number line	05/03/2020	
5	Rati Fajrian, Linsida	Students' Difficulties in the same denominated fraction operation material	12/03/2020	
6	Aliya Monik, Mentari Mughni	Students' difficulties in angles (right angles, blunt, and sharp) material	12/03/2020	
7	Nadiyya Shaffitr, Annisa Azzahra	students' difficulties in fraction valued, fraction form and estimated fraction operations material	19/03/2020	
8	Regita Putri R, Septa Suherti	Mathematics learning problems in Greatest Common Divisor (GCD) and Lowest Common Multiple (LCM) material	19/03/2020	

9	Miftahul Jannah, Siti Masitoh	Students' Difficulties in the material of area and circumference of rectangles, squares, and triangles	26/03/2020	
10	Miftah Sakina Noer, Sonya Vera Yola	Students' difficulties in fractions	26/03/2020	
11	Arsya Viandra Y, Intan Safira	Mathematics learning problems in unit area conversion on discharge material	2/04/2020	
12	Palentin Peradik, Venti Destiani	Students' Difficulties in material proving the formula of for the circumference and area of a circle	2/04/2020	
13	Galih Faraid A, Ahmad Faathir	The difficulty of students in the material of Solid Figures	9/04/2020	
14	Ririn Pebriyanti, Melani Carolina	Mathematics learning problems in statistical material (mean, median, mode) material	9/04/2020	

Result of Project and Posttest

As can be seen in Figure 1 above, project evaluation that has gone through the presentation and discussion also revision stages, will be evaluated by the other groups. The mean scores of the other groups are shown in Figure 2 below. After the assessment of each report from the other groups, a post test was held consisted of 6 essay questions with open answers. Example questions 1. Choose the easiest material to understand for grade 4, grade 5, and grade 6. Give examples of questions and how to learn it. The exam took place online. To overcome the problem of no signal, no quota, or no power, the post-test time is very long, that was 10 hours long. Generally, students answer the method of learning for their chosen material was equipped with teaching props. There were some people who did not use teaching props in the learning material that they have chosen, and the quality of the explanation was less than perfect. After the data was processed, the results are shown on Figure below.

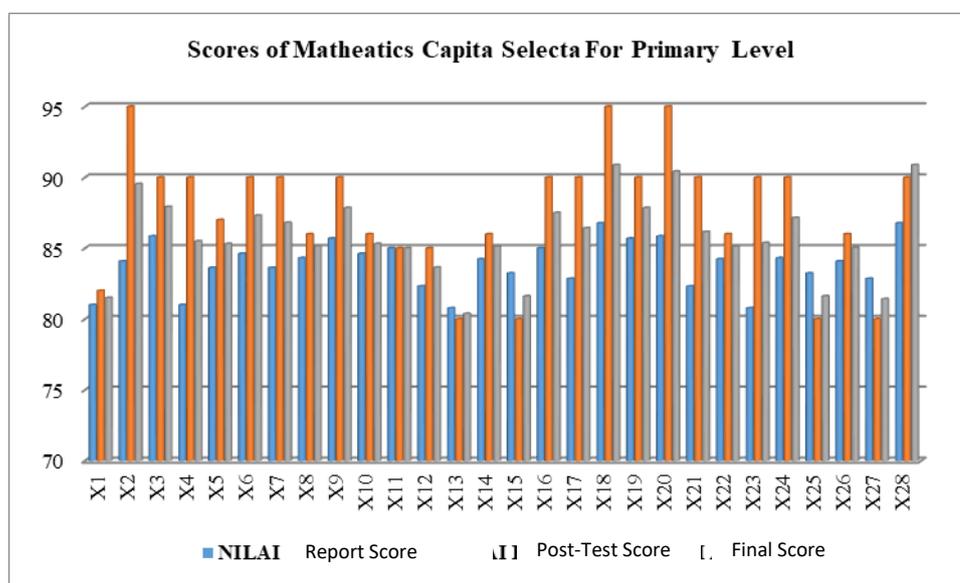


Figure 2. Mean Scores for Project Report and Post-Test

The mean score from the post-test is 85,85 and its highest score is 90,88 while its lowest score is 80,38. For the score from the report is obtained that the mean is 83,88 and its highest score is 86,77 while its lowest score is 80,77. In Figure 2 can be seen that in general the post test was higher than the score of the project report. It means that students can master the material and how to teach it well.

Outcomes

Mathematics Capita Selecta Learning for Primary Level based on Project-based Learning, in which students in small groups carry out a series of tasks in the following order: 1) Syllabus of mathematics material for Primary level; 2)



determine the material to be discussed for one semester; 3) dividing groups and materials; 4) collect information about mathematics learning problems by conducting surveys to elementary schools; 5) compiling reports on problems, making plans to solve problems, making props. 6) presenting reports, and practicing using props in front of the class.

The series of activities for sequences 1 - 5 were carried out for 3 weeks. On the fourth week there was a group of students who presented their reports and demonstrated the props they made. The report consisted of: 1) Material to be surveyed and how to learn it; 2) problem in learning; 3) Solution given. Before the lecture took place online, there were already several groups presenting. When a group was presenting, they have to prepare questions or questions that will be answered later by the other groups. Other groups were also asked to provide criticism and suggestions on props made by a group. When learning took place online. The group that will be presenting submits soft copy of their report to the head of the class. The leader will upload the report in google classroom. Another group read and asked questions in writing to the presenter. The presenter explained in writing. Those activities can train students to build their teamwork, help them to understand the material more deeply and gain the essential knowledge from the topics that has been studied by them. This statement is in line with (Ferrara, 2012) which states that project based learning is as ystemic teaching method that engages students in learning essential knowledge and skills through an extended, student influenced inquiry process structured around complex, authentic questions and carefully designed tasks and products. Sukamta, Florentinus, (Sukamta et al., 2018) also state that project based learning not only equips students with science but in the process of project work requires students to be able to implement their real-life understanding through teamwork.

From the online classes that had been done, it was kind of difficult to monitor who was in class or who was leaving the classroom, because it cannot be detected from the application. At the beginning of the learning process, each student filled in the attendance list by writing their name and NPM. For questions that were presented by the presenter to other groups, the answers went directly to the personal lines of the members of the presenter's group. At the end of the learning process, each group gave a score for reports and props made by other groups. The score was sent to the lecturer. To ascertain whether each student participated in making reports or participating in listening to discussions in class or on google class, the Mid-term-test and Final-test were conducted. Material for grade 1, grade 2 and class 3 were asked at Mid-term-test. Material for grade 4, grade 5 and class 6 were asked at Mid-term-test. Each test consisted of 3 questions. Students were asked to provide examples of material with the easiest, medium and difficult level of understanding, complete with learning examples. Learning outcomes were taken from the mean scores of the groups and the scores from the Mid-term-test and Final-test. The result can be seen in Table 2 below.

Table 2. Students’ Outcomes in Mathematics Capita Selecta Learning for Primary Level

No	Student	Score	No	Student	Score
1	X1	81,5	15	X15	81,62
2	X2	89,54	16	X16	87,5
3	X3	87,92	17	X17	86,42
4	X4	85,5	18	X18	90,88
5	X5	85,31	19	X19	87,85
6	X6	87,31	20	X20	90,42
7	X7	86,81	21	X21	86,15
8	X8	85,15	22	X22	85,12
9	X9	87,85	23	X23	85,38
10	X10	85,31	24	X24	87,15
11	X11	85	25	X25	81,62
12	X12	83,65	26	X26	85,04
13	X13	80,38	27	X27	81,42
14	X14	85,12	28	X28	90,88

From Table 2 can be seen that all of the students got high learning outcomes to mean 85,85. This score proved that students understand the topic. Made learning props and know how to learn it made them way easier to understand the material. This situation is in line with (Dewey, 1997) which states that PjBL is a learning model that used project as media in learning process to increase students’ knowledge and skills, or simply “learning by doing”. The results also corresponding to Edgar Dale’s Cone of Experience as you can see on Figure 3 below.

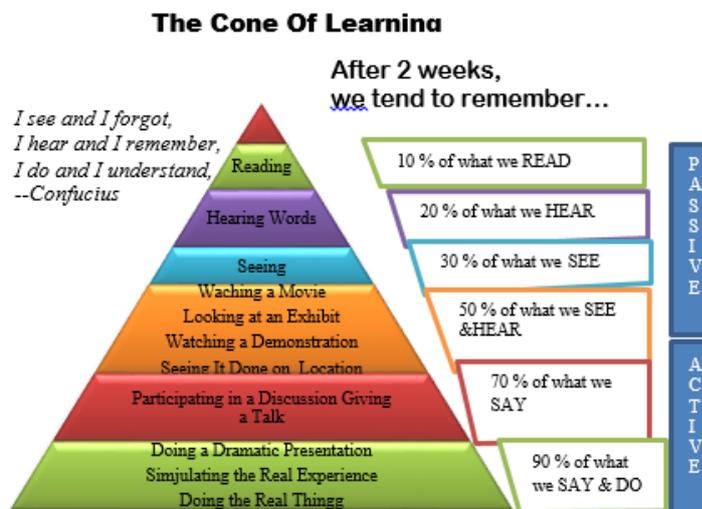


Figure 3. Edgar Dale’s Cone of Experience (Davis & Summers, 2015).



In Figure 3, it can be seen that in the bottom position, students tend to remember 90% of what they say and do, such as making teaching props by the students and then presented it. This result was much better than students who try to understand the material by studying it from various sources and explaining it in front of the class. Both can analyze, can define, can design, and can evaluate.

Based on the experience of guiding students to make teaching props for learning Linear Program, the following conclusions are obtained. When each group presented the props they have made, they took turns explaining in front of the class, and this showed that there was cooperation between groups. There were opportunities to practice communicating in front of the class for each group member. There was happiness on their faces which indicated that they enjoyed making Linear Program props and understood Linear Program material well. When the post test was carried out, students generally completed very well, namely 75% of students scored ≥ 80 (Hanifah, 2020).

In addition, made learning props can help students more creative and think in different way to solve a problem. By made learning props students can explore a different kind of way to complete the props. This statement is in line with (Ummah et al., 2019) which states that making the mathematics learning media can improved student's creativity in completing the project. Kurniasih (Kurniasih, 2014) also stated the positive impact of the assignment of making teaching props, that were: "(1) increasing the learning motivation of students to learn, encouraging their ability to do important work, and they need to be appreciated; (2) improving the problem solving skills; (3) making students more active and successful in solving complex problems; (4) increasing collaboration; (5) encouraging students to develop and practice communication skills; (6) improving the skills of students in managing resources; (7) providing experiences to students to learn and practice in organizing projects and making allocations of time and other resources such as equipment for completing tasks; (8) providing learning experiences that involve students in a complex and designed to develop according to the real world; (9) involving students to learn to take information and show their knowledge, then implemented in the real world; (10) making the learning atmosphere fun, so that students and educators enjoy the learning process.

4. Conclusion

Students got high learning outcomes to mean 85,85. This score proved that students understand the topic. Made learning props and know how to learn it made them way easier to understand the material. This statement corresponding to Edgar Dale's Cone of Experience which in the bottom of the cone means students tend to remember 90% of what they say and do. It also applies to what student have done, that was making teaching props and then presented it. The result was much better than students who try to understand the material by studying it from various sources and explaining it in front of the class. Both can analyze, can define, can design, and can evaluate. From made learning props students can also



improved student's creativity in completing the project. Not only that, the knowledge that has been obtained is useful as a provision to become a teacher in the future.

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