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The Implementation of Problem Based Learning Model at Mathematics Subject to Increase the Independence and Achievement of Grade 2 Primary Students

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1. Abstract

Based on observations of students in primary school in learning math material on time conversion, students were found to have low learning independence and learning achievement. The problem of low learning independence and student achievement is caused by a learning model that is less learner-centered and can be overcome by carrying out a process of improving the quality of learning in the classroom through a learning model that can accommodate student learning needs. So it is necessary to conduct classroom action research to overcome these problems through a problem-based learning model in mathematics content. This is an effort to increase the independence and mathematics learning achievement of grade II students. The results of this improvement obtained an increase in student independence and learning achievement. Based on the results of the action, in cycle I student independence was found with an average class score of 79 with a percentage of 65.83% with a total of 11 students having met the criteria for completeness or 44%. While in cycle II student independence showed an increase with an average class score of 101 with a percentage of 84.17% with the number of students who met the KKM as many as 21 people or 84%.

Keywords: *learning achievement, learning independence, project-based learning, mathematics.*

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2. Introduction

Today, in the 21st century, education is still an important factor in measuring the progress of a country. Education is a conscious and planned effort to create a learning atmosphere and learning process, so that students can actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state (Sutrisno, 2016: 30). Learning is interpreted as a change in individual behavior due to interaction with the environment which is continuous, functional, positive, active, and directed (Pane & Dasopang, 2017: 334).

According to the National Council of Teachers of Mathematics (Nahdi, 2019: 135) learning mathematics requires the skills of problem solving, reasoning and proving, communication, connection, and representation so that learning mathematics is closely related to 21st century skills. Mathematics is a subject that is often considered difficult by students even though without us realizing it we cannot be separated from mathematics in our lives because mathematics is important and needed anytime and anywhere in life (Novitasari, 2016: 8-9). Students' mastery of mathematics in Indonesia is still relatively low. This can be seen from PISA (The Programme for International Student Assessment) research, Indonesia ranked 62 out of 69 countries that are members of the OECD (Organization of Economic Cooperation and Development) in 2015 (Pertiwi, 2019: 52). In measuring the success of education, especially mathematics learning, of course, it can use the learning achievements that students have achieved. The higher the value of student learning achievement, the better the measure of educational success.

According to Sudjana (Firmansyah, 2015: 37) learning achievement is the ability

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possessed after experiencing learning activities. The process of behavior change in a person is different, this is due to differences in characteristics between individuals, including motivation, health, intelligence level, talent, independence, and others.

According to Brookfield in Martinis Yamin (2011: 107) independent learning is learning carried out by students who freely determine their learning goals, learning directions, planning their learning process, learning strategies. Students' lack of independence in learning is one of the causes of low student achievement. Snelbeker in Rusmono (2012: 8) says that learning achievement is a change or new ability obtained by students after doing learning actions.

Student learning achievement is low because student independence in learning is also still low. This is because learning still focuses on the teacher. The learning that is carried out tends to prioritize lectures, questions and answers, giving example problems and giving exercise problems that are the same as example problems. Such learning tends to make students not independent. Based on the results of observations, the steps taken by researchers in order to foster student independence is to use the Problem Based Learning (PBL) learning model.

Arends in Trianto (2009: 92) states that PBL is a learning model in which students work on authentic problems with the intention of compiling their own knowledge, developing inquiry and higher-level thinking skills, developing independence and self-confidence. In PBL learning is based on giving real problems that require real solutions. So that PBL can foster student independence in the learning process, especially in solving these real problems.

According to Ibrahim and Nur (in Rusman 2010: 243) suggest that the steps of

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Problem Based Learning (PBL) are a. Orient students to the problem, b. Organize students to learn, c. Guiding individual / group experience, d. Develop and present work, e. Analyze and evaluate the problem solving process. Every learning model has advantages and disadvantages, as the PBL model also has weaknesses and advantages that need to be observed for its successful use. According to Warsono and Hariyanto (2012: 152) the advantages of PBL include:

a. Students will get used to facing problems and be challenged to solve problems not only related to learning in class but also facing problems that exist in everyday life.
b. Foster social solidarity by getting used to discussing with friends.
c. Familiarize teachers with students.
d. Getting students used to doing experiments.

Based on these problems, it is necessary to conduct class action research as an effort to improve the mathematics learning process with the Problem Based Learning model on the grade 2 class of a primary school.

3. Methods

This research is a Classroom Action Research using the Kemmis and Taggart model. This model is a revision of the Kurt Lewin model which has been interpreted by Kemmis as a spiral form in, consisting of several cycles of activities (Arifin, 2011). The initial stage of this research is planning, where the research design is made. Then, the action or implementation (act) is carried out to improve or correct problems in learning. During the implementation of the action, observations are made to record and understand how the

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action takes place. Implementation and observation cannot be separated because they are part of a unity of activities at one time. Furthermore, the results of the actions and observations are reflected upon by the researcher to identify the shortcomings that occur. The results of this reflection become the basis for improving or developing planning and action in the next cycle.

The subjects in this study were students of Primary schoolin the 2022/2023 academic year. There were 25 students in class IIB with 12 male students and 13 female students. Classroom action research is carried out collaboratively with the cooperating teacher and conducts observations together. The object of this research is the application of Problem Based Learning to increase independence and achievement in learning math time conversion material.

Data collection techniques in this study used observation techniques, questionnaires, documentation and tests. Researchers conducted observations to observe student activities in participating in the learning process by using the Problem Based Learning learning model for class IIB at SDN Jurug. While the questionnaire to find out data about student learning independence. The questionnaire was distributed to all grade IIB students at SDN Jurug. This questionnaire is a 24 item list of questions about student learning independence before and after using the Problem Based Learning learning model in mathematics learning. The questionnaire used is a paper leaflet containing questions related to student learning independence. The documentation technique was used to obtain data on the number of teachers, the number of students and infrastructure at SDN Jurug, collect data on lesson plans, school profiles, syllabi, lesson plans and so on. Written tests in this study are practice questions (10 items) in the form of 7 multiple choice questions and 3 complex multiple

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choice questions. This written test is used to determine the improvement of student learning achievement. Data analysis is useful for producing information that can be used as a basis for answering existing problems. This study uses two data analysis techniques, namely quantitative data analysis techniques and qualitative data. This analysis is used to measure the learning independence of students through distributing questionnaires of interest in learning mathematics. The formula used to calculate the percentage of students' learning independence according to Sudjana (2006) is:

$$P = \frac{F}{N} \text{ X } 100$$

Description:

P = percentage number

F = number of respondents' answers

N = total number of students

Determining the Interpretation of the Learning Independence Scale

a. Determining the total score = answer score x number of respondents who answered.
b. Determining the number of low scores = 1 x number of respondents
c. Determining the presentation of the respondent group = total score / total ideal score x 100%.

Description: Score Interpretation Criteria

Numbers 0% 20% = Very Weak

Number 21% 40% = Weak

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Number 41% 60% = Enough

Number 61% 80% = Strong

Figure 81% 100% = Very strong

This analysis is done through learning achievement tests obtained from the end of each cycle. The learning achievement score given by students is based on the acquisition of correct answers with a score scale between 0 and 100. The formula used to calculate the results of the activity sheet according to Suharsimi Arikunto (2010: 183) is as follows:

$$\text{Score} = \frac{\Sigma \text{ score obtained}}{\Sigma \text{ maximum score}} \text{ X } 100$$

To determine the development of students learning achievement, a comparison of the class average of each cycle is carried out. Descriptively, the average formula (mean) used in this study is the sum of all existing numbers divided by the number of these numbers. To find the classical average calculation from a set of values that have been obtained by these students, you can use the average formula (Suharsimi Arikunto, 2010):

$$\overline{X} = \frac{\Sigma X}{N}$$

Description:

$\overline{X}$ = class average (mean)

$\sum X$ = Number of student scores

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N = Number of students

To calculate the completeness of student learning classically can use formula as follows (Aqib, 2014: 41):

$$P = \frac{\Sigma \text{ completed students}}{\Sigma \text{ students}} \text{ X } 100$$

This data analysis was carried out to reflect on each cycle in this study. The results of the reflection were used to determine further planning in the next cycle. The results of this reflection are used to improve the next learning design. The following are the criteria for student success rates in %.

Tabel Success Rate

Success Rate (%)	Meaning
> 80%	very high
60-79%	high
40-59%	medium
20-39%	low
<20%	very low

Learning in this study is said to be successful if the increase in the average student score each cycle is from the specified completeness value. In mathematics learning primary schooland classically considered complete learning if 70% of the total number of students get a score of at least 70.

The analysis technique used is the Miles and Huberman model in Sugiyono (2015)

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with 3 components including: 1) data reduction; 2) data presentation; 3) conclusion drawing. The explanation of each component is as follows:

1) Data reduction

   Data reduction carried out in this study is by collecting data through the learning process, syllabus, observation, tests, documents or photos of learning activities about independence and learning achievement using the Problem Based Learning model, then sorting the data.

2) Presentation of data

   Presentation of data in the form of an arrangement of information that can provide an overview of drawing conclusions and taking action. The data presented in this study include:

   a. Data on the observation value of learning independence of class IIB students at SDN Jurug.
   b. Data on the learning achievement scores of students in class IIB SDN Jurug.

3) Drawing conclusions

   Drawing conclusions is the process of analyzing the results of the data obtained to answer the formulation of research problems. The results of all stages in data analysis are the key to drawing conclusions.

In this study, the subjects used were limited to grade IIB students of Primary schoolregarding the application of Problem Based Learning to increase independence and mathematics learning achievement at SDN Jurug.

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4. Results and Discussion

This research was conducted in two cycles. Each cycle was carried out in two meetings. After cycle 1 at the end of the meeting a formative test was given. To determine student learning outcomes after following a series of lessons delivered by the teacher. In cycle 2 at the end of the meeting a formative test was held to determine the increase in student learning outcomes. From the observation sheet, the assessment of student learning interest obtained increased from 64% in cycle 1 to 80% in cycle 2. This indicates an increase in student learning independence which is reflected in the Problem Based Learning model.

Student Learning Achievement

	Pre action	Cycle 1	Cycle 2
Lowest Score	30	50	60
Highest Score	90	90	100
Average	59	69,3	84,7
Completeness	12 students	16 students	20 students
Percentage	48%	64%	80%

The questionnaire of students' mathematics learning independence amounted to 24 questions with the following indicators. This research was carried out in two cycles of giving

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a questionnaire of mathematics learning independence. The cycle was carried out in two meetings. The first meeting before giving material and the second after giving material in cycle 2. Before the cycle is given a mathematics learning independence questionnaire to determine the independence of students' mathematics learning before following a series of lessons delivered by the teacher. In cycle 2 at the end of the meeting a mathematics learning independence questionnaire test was held to determine the increase in student learning independence.

Questionnaire indicator table

No.	Indicator
1.	Not dependent on others
2.	Self-steadiness
3.	Initiative
4.	Responsible
5.	Progressive
6.	Able to make decisions

Questionnaire of students' learning independence

	Cycle 1	Cycle 2
Lowest Score	51	112
Highest Score	96	75
Maximum Score	120	120
Average	79	101

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Completeness	11 students	21 students
Percentage	65,83%	84,17%

Based on the table of learning independence of students in class IIB SDN Jurug, it shows that students have high category learning independence after using the Problem Based Learning method. From the observation sheet, the assessment of student learning interest obtained increased from 44% in the first session to 84% in cycle 2. This indicates an increase in student learning independence.

5. Conclusion

Based on the test results and observation data on learning by applying the Problem Based Learning learning model described above. Concluding that learning by applying the Problem Based Learning model, learning becomes active and is able to increase independence and learning achievement in learning Mathematics time conversion material at SDN Jurug. Evidenced by the results of the action in cycle 1 obtained an average score of 69.3 with a percentage of completeness of 64%. The results of research in cycle 1 show that the results are not yet optimal. Based on the results of the action in cycle 2, an average score of 84.7 was obtained with a percentage of completeness of 80%. Based on these results, it can be concluded that the application of the Problem Based Learning learning model can improve the learning achievement of students in primary schoolwith an increase from cycle 1 to cycle 2 by 16%.

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Student learning achievement has increased after applying the Problem Based Learning (PBL) learning model in Mathematics subject on time conversion material in class IIB SDN Jurug. This is evident from the percentage of student learning completeness in the pre-cycle getting an average of 59 (less) with a completeness percentage of 48%, in cycle I, the average score of one class reached 69.30 with a completeness percentage of 64%. Meanwhile, in cycle II, the average score of one class reached 84.7 with a completion percentage of 80%. Based on the data in cycle II, it can be said that the average score and percentage of student completeness increased. The average value of students increased by 13.04% and the percentage of learning completeness increased by 26%.

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