

INCREASING STUDENTS' ACTIVITY AND UNDERSTANDING OF CONCEPTS IN MATHEMATICS LEARNING USING LESSON STUDY-BASED PBL

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ABSTRACT

This research is motivated by the lack of student learning activity that affects the understanding of student concepts in mathematics learning in class XI F 4.2 SMA Veteran 1 Sukoharjo. The importance of student activity in learning needs to be done so that learning becomes interesting and students have the curiosity to learn more deeply related to the knowledge taught by the teacher, in addition, understanding the concept is one of the important factors that supports student activity in the learning process. This study aims to improve the activity and understanding of student concepts in mathematics learning using PBL based on lesson study. The subjects in this study were 27 students of class XI F4.2 majoring in social sciences. The study results showed that using the PBL learning model based on lesson study can improve the activity and understanding of student concepts in learning. Based on the study's results, the percentage of student activity increased from pre-cycle 15% and cycle 1 by 59% then cycle 2 by 100%. This is the same as the increase in student's conceptual understanding from the pre-cycle stage with a percentage of 37%, then cycle 1 by 59% to cycle 2 by 100%, so it can be concluded that using the lesson study-based PBL learning model can increase students' activeness and conceptual understanding.

Keywords: Student Activity, Student Understanding of Concepts, PBL (Problem Based Learning) Learning Model, Lesson Study

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INTRODUCTION

Humans need social interaction in social life because every human being needs each other. Education is the initial stage in practicing social interaction patterns and helping students develop the potential within themselves, both for themselves and the surrounding environment (Fahri, 2019). Education is also a step-in developing students to become better students than before, both in terms of personality, spiritual and physical (Anggraini et al, 2023). In the learning process, interaction between educators and students is very important in the learning process so that this interaction requires activities to be carried out actively to foster students' learning motivation optimally using interactive learning strategies (Sardiman, 2016). However,

as a teacher or educator, when carrying out the learning process, you must understand how to make students active in the learning process (Purwasih: 2015).

Mathematics learning is abstract so it requires a systematic, logical, critical and thorough thinking pattern (Endrasmoyo, 2018). Understanding mathematical concepts is very important in learning mathematics, increasing understanding of mathematical concepts needs to be done for students' success in learning (Aledya, V. 2019). When studying mathematics subjects, mathematical concepts must be understood first to make it easier for students to solve mathematics problems with various variants of questions and teachers can use various learning strategies to make it easier for students to solve problems (Rohmatun, AA., 2018). In the opinion of Hadi and Kosum (2015), an important basis for thinking to solve problems related to mathematics and concrete problems relevant to mathematics is through understanding mathematical concepts.

In an effort to increase students' activeness and understanding, teachers use lesson study-based learning planning. Lesson study is an effort to improve the learning process carried out by teachers collaboratively and continuously in preparation (plan), implementation (do), reflection (see) and follow-up. Lesson Study can also strengthen the relationship between daily learning implementation and long-term goals, this also influences teacher motivation to always develop in improving the quality of learning in creating teaching modules including the components and strategies used in learning (Wiharto, 2018). However, as a teacher or educator, when carrying out the learning process, you must understand how to make students active in the learning process

Based on observations made by the teacher, students in class in fact, according to the results of the observations made by the teacher, students have intelligence and ability to understand learning material and are active in different ways between students. Therefore, a learning model is needed that can actively involve students in the learning process and can provide meaningful understanding regarding learning material. The research that teachers use uses the PBL (Problem Based Learning) learning model including orientation stages, organizing students in several groups, guiding students, both individually and in groups, present results, evaluate the learning process (Edi Susanto, 2016). According to Syamsidah and Suryani (2018), problem-based learning (PBL) is innovative learning in facilitating active learning for students and this is in line with the statement of Bhoko et al (2023) and Mariana (2023) indicating that learning is based on problems can improve student learning outcomes and student involvement in learning to be better than before

Therefore, based on the problems that occur in class XI students. F4.2 at Veteran 1 Sukoharjo High School is related to students' lack of activity in the learning process which is influenced by students' understanding of concepts related to mathematics subjects and by using the PBL (Problem Bases Learning) learning model based on lesson study, the teacher wants to increase activity and understanding. the concept of students using PBL with lesson study.

METHOD

The method that the teacher uses in this research is the classroom action research (PTK) method. PTK is research carried out by teachers in their classes to improve teacher performance in the learning process and be able to overcome problems in the classroom so that it is hoped that the aim of this PTK can improve student learning outcomes. This research aims to increase students' activeness and understanding of concepts in mathematics learning material, statistics sub-chapter in class. The research carried out consists of 3 cycles, namely pre-cycle, cycle 1, and cycle 2. PTK has 4 stages that must be passed, namely the planning, implementation, observation and reflection stages, which in this research correspond to the *lesson study stages*, namely *plan*, *do*, *see*.

At the implementation stage, the PBL (Problem Based Learning) learning model is used, namely a learning model that offers a form of learning that involves students actively in learning and the PBL learning model can help students apply conceptual understanding, by first being given a problem at the beginning of learning to discuss. and completed together (Ariandi, 2016). These stages include: orientation, organizing students into several groups, guiding students both individually and in groups, presenting results, evaluating the learning process.

Data collection techniques and instruments in research were carried out through observation, questionnaires and written tests. Observation sheets are used to find data about the process of implementing the PBL learning model on students' activeness and understanding of concepts in each cycle. The method used is the questionnaire method using a questionnaire instrument to explore students' opinions regarding their activeness in the learning process. The next method is the test method using written tests to determine students' understanding of concepts, written tests are used in the form of descriptions.

The indicators used as a reference in increasing student activity consist of attention, cooperation and social relationships, expressing opinions or ideas, problem solving, discipline (Nugroho, W., 2016). These indicators are used in the research carried out by teachers. The following table contains the indicators:

Table 1 . Activeness indicators

Activeness Indicator	Number of Statement Items
Attention	3
Cooperation and Social Relations	3
Express opinions or ideas	3
Solution to problem	3
Discipline	3

Indicators of conceptual understanding in the research carried out, the assessment of each indicator is viewed from the indicators of conceptual understanding according to (Sumarno, 2014), which include: (1) Restating the concepts that have been studied, (2) Identifying, (3) Classifying objects. objects according to certain properties in accordance with the concept (4) Presenting concepts in various forms of mathematical representation, (5) Applying concepts algorithmically.

Table 2. Indicators and scores for concept understanding indicators

Question	Indicators of Understanding	Score
1a	Restate concepts that have been learned	2
1b	Identify	2
1c	Classifying objects according to certain properties in accordance with the concept	2
2a	Presenting concepts in various forms of mathematical representation	2
2b	Applying concepts algorithmically.	2

The scoring criteria for student activity include the predicate criteria Very Active, Active, Less Active and Not Active (Arikunto, 2021). Here's the table form:

Table 3. Activeness Scoring Criteria

Score	Predicate	Condition	Fill in the Terms
4	Very active	Qualify	A B C
3	Active	Fulfill 2 conditions	A and B A and C B and C
2	Less Active	Fulfill 1 condition	A only B only C only
1	Not active	No conditions are met	-

Data resulting from activity and understanding of concepts, then data analysis is carried out, where data analysis is a process of searching for and organizing the results of observations, questionnaires, tests and documentation sequentially in the form of field notes and other materials that have been collected by researchers to increase the researcher's understanding of results obtained in research. Indicators of successful activity (Mulyani Modification, 2017) are as follows:

Table 4. Criteria for successful student activity

Activity Level	Category
85%-100%	Very active
75%- 85%	Active
55%-75%	Less Active
0%-55%	Not active

Data from scoring concept understanding can be analysed to produce criteria for success in understanding concepts from Yurun. R, et al (2018), as follows are presented in the table below:

Table 5. Criteria for Successful Understanding of Students' Concepts

Level of Understanding	Category
85%-100%	Very high
75%- 85%	High
55%-75%	Enough
0%-55%	Low

Data analysis is as follows: 1) Data analysis of increasing student activity is said to increase if the activity indicator reaches a score of ≥ 75 ; 2) Data analysis of increasing students' concept understanding is said to have increased if the concept understanding indicator reaches 80% of students who get a score of ≥ 75 or above the KKM is said to be complete and vice versa if it is ≤ 75 then it is incomplete. (Krismaya M, et al. 2019). The formula used for the percentage of students' activeness and understanding of concepts (Nugroho, W., 2016:133) is as follows:

$$P = f/N \times 100\%$$

Where,

P = Percentage number

f = Frequency

N = Number of Frequencies/ Lots of data

RESULTS AND DISCUSSION

The results of research in the pre-cycle, cycle 1 and cycle 2 regarding students' activeness and understanding of concepts can be seen that there has been an increase. The increase in students' activity and understanding of concepts can be described in the percentage data for increasing activity and understanding of concepts in the 2 tables below:

Table 6. Increasing Student Activeness

Data Obtained	Results					
	Pre-Cycle		Cycle 1		Cycle 2	
	F	%	F	%	F	%
Participants who have active and very active categories	4	15%	17	59%	27	100%

Based on Table 6, it shows that the learning activity of students in the pre-cycle of activity was 15%, in cycle 1 the activity was 59% and in cycle 3 the activity of students increased by 100% and reached the classical indicator of student activity so that there was no need to make improvements in the cycle. next. Based on the results in the table, it shows that there has been an increase in the learning activity of students in class XI. F4.2 at Veteran 1 Sukoharjo High School using the PBL learning model with lesson study stages. Moreover, increasing students' understanding of concepts in pre-cycle, cycle 1 and cycle 2 can be presented in table 7 below:

Table 7. Increase in Students' Understanding of Concepts

Data Obtained		Results					
		Pre-Cycle		Cycle 1		Cycle 2	
		F	%	F	%	F	%
Score ≥ 75	Complete	10	37%	16	59%	27	100%
Score ≤ 75	Not Completed	17	63%	11	41%	0	0%
Total		27	100%	27	100%	27	100%

Based on table 7, it shows that students' understanding of concepts in pre-cycle to cycle 1 and then cycle 2 has increased in statistics learning material. Based on the table above, the ratio of students who complete and do not complete is inversely proportional to pre-cycle learning, cycle 1 and cycle 2. Completeness of understanding classical concepts in the pre-cycle was originally 37% to 59% in cycle 1 and increased in cycle 3 reaches 100%. Meanwhile, students who have not yet completed the classical understanding of concepts are 63% in pre-cycle, 41% in cycle 1 and 0% in cycle 2.

Based on the results presented in table 6 and table 7, the stages of each cycle from pre-cycle, cycle 1, and cycle 2 have quite significant improvements. It can be concluded that increasing activity and understanding of statistical material concepts using the Lesson Study-based PBL model is able to increase activity and understanding. student concept.cThe implementation of the lesson study stages in this research consists of 3 stages, namely as follows:

1. The learning planning stage (*plan*) was designed in the form of a teaching module together with other teachers, the results obtained were related to learning strategies that were deemed appropriate in increasing student activity and providing students with an understanding of the concept of statistical material, so the PBL (*Problem Based*) *learning model was chosen. Learning*) where this learning model at each stage involves students in the learning process, in addition to determining the learning model the teacher also

- prepares the media that will be used in the learning process as well as various assessments in pre-cycle to cycle 2.
2. (do) stage carries out observations to observe the learning process, the observations made focus on students' activities in discussing and collaborating with the PBL learning model and the teacher notes what is active and other things that could hinder students in the learning process. Each group consists of 5-6 students, students carry out the stages of discussion, presentation and summing up the learning results at the meeting, all under the supervision of the teacher, the teacher can also observe students who need more learning guidance in the classroom.
 3. (see) stage is evaluating the learning that has been implemented. At this stage, teachers will share teaching experiences with other teachers or ask students to reflect on learning. This is done so that in the implementation of learning in the next cycle the teacher recognizes student patterns in the learning process so that students in class XI are active and understand concepts. F4.2 may increase.

The advantage of using the PBL learning model is that it makes students more interested in participating in learning, learning activities are carried out by competing to exchange opinions to solve the problems given, this can help students to be more active in the learning process and in understanding the concepts of mathematics learning material, especially statistics, because through the discussion process students will understand each other. This is in accordance with the statement of Dewi, et al (2016) which states that the problem-based PBL model can increase students' activeness in learning mathematics. This research is supported by relevant research entitled "Implementation of the Problem Based Learning (PBL) Model in Increasing Learning Activeness" carried out by Anisa Mayasari, et al (2022). The results of this research show that the application of the PBL learning model can increase student activity in the learning process.

CONCLUSIONS AND SUGGESTIONS

This study concludes that the lesson study-based Problem-Based Learning (PBL) model effectively increases student engagement and enhances their understanding of mathematical concepts, particularly in the statistics chapter. By encouraging active learning through problem-solving, this model helps students develop a deeper grasp of mathematical ideas, making it a beneficial approach in mathematics education. For optimal results, the implementation of the PBL model requires thorough planning, with careful attention to time allocation during lessons. Additionally, the evaluation phase should focus on identifying areas for improvement and fostering ongoing development in the learning process. These considerations will help maximize the benefits of the PBL model and further enrich students' learning experiences in mathematics.

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