Implementation of the Problem Based Learning Model to Increase Achievement and Motivation in Learning Statistics for Psychology Students

*Corresponding author: fitri.ayuningtiyas@unimal.ac.id

Nurul Afni Sinaga[1], Fitri Ayu Ningtiyas[2*], and Wulanda[3]

[1] Universitas Malikussaleh, Aceh, Indonesia
E-mail: nurulsinaga@unimal.ac.id
[2] Universitas Malikussaleh, Aceh, Indonesia
E-mail: fitri.ayuningtiyas@unimal.ac.id
[3] Universitas Malikussaleh, Aceh, Indonesia
E-mail: wulanda03@unimal.ac.id

ABSTRACT

Education is essentially a process to prepare humans to survive in their environment, as well as education within the scope of universities where students are required to process education by improving problem-solving abilities. Implementing the Problem-Based Learning Model in learning is one of the efforts that can be made by teaching lecturers to improve learning achievement and motivation by integrating problem-based learning. This research aims to see an increase in achievement and learning motivation by implementing a problem-based learning model in statistics courses for psychology study program students in the first semester of the 2022/2023 academic year with Classroom Action Research (CAR). The research is declared successful if there is an increase in learning achievement from the basic score to cycle I and from cycle I to cycle II. Apart from that, research is also declared successful if there is an increase in learning motivation from before the action is taken to after the action is taken. The subjects of this research were 36 students, with details of 9 male college students and 27 female college students. This research was carried out in 2 cycles. Data was collected using tests and observations for learning achievement and non-tests (questionnaires) for learning motivation. The test contains 10 descriptive questions and the non-test (questionnaire) contains 21 statement items that have been validated before. Based on the results of the discussions can be concluded that implementation of the Problem-Based Learning (PBL) learning model can increase the Achievement of Statistics for Psychology Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics and also implementation of the Problem-Based Learning (PBL) learning model can increase Learning Motivation of Statistics for Psychology Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics.

Keywords: Problem Based Learning, Learning of Achievement, Learning Motivation, Classroom Action Research (CAR).

1. Introduction

Education is essentially a process to prepare humans to survive in their environment. To be able to survive, every individual needs to be equipped with knowledge to have skills in the form of skills that produce a product or skills in dealing with problems that occur in society. Therefore, problem-solving skills must be possessed by every learner in every subject given in education. This skill is needed, especially for students, where in the future, students will be future leaders of the nation, for this reason, students are expected to have a healthy and strong soul, personality, mentality, and a good perspective on a problem or problem (Pratisti & Shusena, 2022:83).

According to Riyanto, et al (2023: 2) A student should be able to master problems or problems no matter how difficult and have a positive way of thinking about themselves, other people can overcome challenges and obstacles that will occur and need to have an attitude of never giving up in every situation. Therefore, guiding students to develop problem-solving abilities is something that must be done by educators at the University. Implementing the Problem-Based Learning Learning Model in learning is one of the efforts that can be made by lecturers to improve students' problem-solving abilities, where if this can increase significantly, it is hoped that students' achievement and learning motivation will also increase.

Implementation of problem-based learning in the classroom apart from being a solution for increasing student achievement and learning motivation, problem-based learning can also stimulate students' mindsets to become accustomed to finding solutions to every problem they face, both problems in learning and even being able to find ways and solutions from every problem in their daily

life (Fatih, M.S, 2023: 2). Therefore, this research aims to see the increase in achievement and learning motivation of college students who are taught using the Problem-Based Learning model. This research will provide valuable insight into how the learning process in the classroom can be optimized by applying learning models that are appropriate to the learning objectives. This research also provides maximum benefits in improving students' problem-solving abilities, so that they can become undergraduate graduates who are competent and effective in applying the knowledge they have to the next generation.

2. Literature Review

2.1. Problem Based Learning

The problem-based learning model is a student learning approach with learning model for authentic problems in order to students may construct their knowledge, develop higher skills and inquiry, become independent, and growth confidence (Saputra, H, 2023:3). According to Sinaga, N. A and Ningtiyas, F.A (2022: 18) Characterized this model is by use the real-life problems as something that college students must learn to train and growth their critical thinking and problem-solving skills as well as gain knowledge of important concepts, the teacher's task must be focus to help students achieve their self direction skills. Problem-based learning is used at a higher level of thinking, in problem-oriented situations belonging learning.

The problem-based learning model needs to start by raising problems that are appropriate to the material and are contextual. According to Hasanah, et al (2023: 63), The questions and problems raised should meet the following criteria:

- Authentic, namely problems oriented to real-world life

- Clear, that is, the problem is formulated without creating a new problem and can make it difficult for students to solve it

- Easy to understand, that is, problems should be structured and created according to the student's level of development

- Useful, namely that the problem that has been formulated must provide an increase in learning outcomes and arouse student learning motivation

According to Lee, N & Jo, M (2023: 3) the application of the problem-based learning model contain five main steps which start with the teacher introducing students to the problem situation and end with presenting and analyzing the results of the student work, namely: (1) orientation to the problem ; (2) organizing to study; (3) guiding individual and group inquiry; (4) develop and present work results; (5) analyze and measure the problem-solving process.

2.2. Learning of Achievement

Learning outcomes are the result of a student's direct process in the form of student behavior through the teaching and learning process that is appropriate to the material they are studying, so that learning outcomes can be used as output in the teaching and learning process from those who cannot to those who can, and the assessments used are tests and non-test (Hidayatullaily, S, et al, 2023: 113). In higher education, learning achievement can usually be used as an output in the teaching and learning process from those who cannot do it to those who can. According to Nurfadhillah, S, et al (2023:33) in higher education, each student's learning achievement is usually evaluated at the end of each semester which is reviewed based on the quality scores of all the courses they have taken. The evaluation results obtained are in the form of an achievement index (IP) which describes the student's achievements. IP is the basis for assessing student abilities up to a certain period, calculated based on the number of Semester Credit Units.

Learning achievement is influenced by the following factors: (a) internal factors (from within the student), namely physiological factors including physical condition and psychological factors which include intelligence, both intellectual intelligence and emotional intelligence, skills, talents, interests, motivation, attention, and maturity. (b) external factors (from outside the individual)

namely the family, school, and community environment (Chen, C & Huang, P, 2020: 103). Therefore, learning achievement is very much needed in improving students' ability to learn.

2.3. Learning Motivation

Learning motivation is very necessary in the teaching and learning process because the success of learning activities is influenced by the level of a person's motivation in carrying them out. According to Hikmah, S. N & Saputra, V.H, 2023: 44) with motivation students will study more diligently, be tenacious, persistent, and have high and full concentration during learning process. This opinion is confirmed by the results of Budiyani's research (2021:5) which states that students with high learning motivation will have a good influence on good learning outcomes. Meanwhile, students with low learning motivation will have low learning outcomes.

According to Jufrida (2019:403), lack of motivation to learn has an impact on students' mathematical understanding. This happens because motivation plays a role in students' success in achieving learning goals, especially in improving students' mathematical understanding abilities. The ability for understanding mathematics is important for students to have because understanding knowledge is the ability that underlies a student's understanding (Rohaeti, 2018: 166). Students' mathematical abilities, one of which is problem-solving abilities, will be difficult for students to possess if their learning motivation is low. Therefore, to arouse students' learning motivation and problem-solving which is part of mathematical understanding.

3. Research and Method

3.1 Data

This research is Classroom Action Research (PTK) with the Problem-Based Learning (PBL) model which was carried out in the odd semester of the 2022/2023 academic year in North Aceh. The subjects of this research were 36 students in the first semester of Statistics at the Psychology Study Program at Malikussaleh University, with details of 9 male students and 27 female students. The choice of this subject is also based on the type of course being taught, where the Statistics course uses various types of problem-solving questions during the learning process. The research was carried out in two cycles, with each cycle consisting of planning, implementation, observation, and reflection stages. The action taken in this research is the implementation of the Problem-Based Learning (PBL) learning model to increase the Achievement and Learning Motivation of Statistics for Psychology Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency carried out in cycle I and Inferential Statistics carried out in cycle II.

3.2 Data analysis method

This research used learning tools and data collection as instruments. Learning tools consist of Semester Learning Plans (RPS), Lecture Contracts, and Student Worksheets. Data Collection Instruments consist of observation sheets and motivation questionnaires. Data collection techniques in this research are observation techniques, test techniques, and non-test techniques. The observation technique is carried out by observing student activities. The following is an analysis of the data used.

a. Analysis of Student Activity Data

Student activity data was obtained through observation sheets during the research. Researchers analyzed the activities carried out to identify deficiencies that occurred in Cycle I so that improvements could be made in Cycle II.

b. Analysis of Student Statistical Learning Achievement Data

Data related to student statistical learning achievement is obtained by calculating the results of individual learning achievement tests on the main material of Central Tendency and Inferential Statistics. Increased learning achievement can be seen by comparing the results before taking action. This action is declared successful if there is an increase in student test results from the basic score to cycle I and cycle II.

c. Analysis of Student Statistical Learning Motivation Data

Data related to students' mathematics learning motivation was obtained by giving validated motivation questionnaires and observation sheets to students. Increased learning motivation can be seen by comparing the results before taking action. This action is declared successful if there is an increase in student questionnaire results and observations from the basic score to final cycle.

1. **Analyze the value of individual development and group rewards**

    In cycle I, the individual development score is obtained from the difference in scores on the basic score and the Midterm Exam, while in cycle II it is obtained from the difference in scores on the Midterm Exam and Final Exam. Group awards are obtained from group development scores. Determining group awards can be done by calculating individual and group scores. The purpose of calculating student tests is that the results will be contributed as a group score. Student development scores are calculated from difference between the basic score and the final test score. In this way, each student has the same opportunity to contribute scores to their group. Furthermore, group awards are calculated based on the average development value contributed by group members.

Table 1. Quiz Score Criteria and Individual Progress Points

QUIZ SCORE	PROGRESS POINTS
More than 10 points below the initial score	5
10-1 points below the initial score	10
The initial score up to 10 points above the initial score	20
More than 10 points above the initial score	30
Perfect score (regardless of initial score)	30

(*Source: Slavin, 1995*)

The group score is calculated based on the average development value contributed by group members. Based on the average development value obtained, guided by the group award level according to Ratumanan (in Trianto 2009), in this study the researcher used the following group award criteria.

Table 2. Group awards

Average of group development score	Criteria
$5 \leq \bar{x} \leq 15$	Good
$15 < \bar{x} < 25$	Great
$25 \leq \bar{x} \leq 30$	Super

Source: Modification from Ratumanan (on Trianto,)

2. **Analysis of complete learning achievement**

    Completeness analysis is obtained by comparing the percentage score before the action with the percentage of the basic score after the action. The percentage of students who achieve completion can be calculated by this following formula.

$$\text{Percentage of students who achieve completion} = \frac{\text{the number of college students who achieved completion}}{\text{total number of college students}} \times 100\%$$

In this study, students were declared complete after getting scores more than or equal to 70.

3. **Analysis of increased motivation**

    Obtained by transforming ordinal data into interval data. This is done by looking at the results of motivation before the action and after the action is completed. The indicators of

learning motivation used in this research are (1) The desire and desire to succeed; (2) There is encouragement and need for learning; (3) Diligently facing tasks; (4) Resilient in facing difficulties; (5) There are interesting activities in learning; (6) Enjoys finding and solving problems (Sardiman & Uno, 2007).

Table 3. Level of Learning Motivation

Percentage of College Student's Motivation	Interpretation
< 20,00	Very low motivation
21,00-40,00	Low motivation
41,00-60,00	Adequate motivation
61,00-80,00	High motivation
81,00-100,00	Very high motivation

4. Result and Discussion

During the research carried out, there were several obstacles, namely the lack of time allocation arrangements when carrying out research in the first cycle. At the first meeting, there were still obstacles where the teaching and learning process could not run as it should because college students were not on time in completing the Student Worksheet because they were not used to the learning model being implemented. Apart from that, researchers were still not optimal in allocating time for several learning stages in the first few cycle meetings, including when organizing students in groups, researchers needed more time at first.

The shortcomings in cycle I became material for improvement for researchers to carry out the learning process in cycle II. So that the stages of cooperative learning in the Problem Based Learning model have been carried out according to plan in cycle II. Based on data analysis regarding college student activities can be concluded that the Problem Based Learning model is increasingly in accordance with semester learning plans and the learning process is also improving. Colege students also become more active in participating in each phase during the learning process, such as when college students are problem oriented, individual and group investigation guidance processes. College students ask opinions or questions if there is something they do not understand and they were more enthusiastic in solving questions given by the lecturer. So this means that in this process it can be said that there is an improvement by learning process in cooperative learning with the Problem Based Learning model to increase Achievement and Motivation for Learning Statistics for Psychology Students at Malikussaleh University, semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics.

Based on statistical analysis of student learning achievement data, it is known that there has been an increase from the frequency of college students completing cycles I and cycle II (Table 1). The percentage of completion in the UTS is 50% (18 students) and the UAS is 72.22% (26 students), which is getting better compared to before the action, namely 38.89% (14 students). This means that there has been an increase in the learning achievement of Statistics college students. Based on data analysis regarding college student statistics learning outcomes, it is known that there has been an increase in the number of college students who have completed their studies.

Tabel 4 shows that the number of college students in the group who achieved completeness from the basic score to UTS increased, as well as from UTS to UAS there was also an increase. From the basic scores, UTS and UAS there is a change in the frequency of the number of college students at certain intervals and the distribution of student scores moves in a better direction. This means that there was an increase in student statistical learning achievement between before the action and after the action. This shows that the actions taken in this research have an influence on student statistics learning outcomes. So, it can be said that the learning process carried out in cycle I and cycle II has improved. Table 4 below is the individual development value of cycle I and cycle II students.

Table 4. Frequency Distribution of Learning Achievement Scores

Interval	Frequency		
	Base Score	Midterm Exam	Final Exam
10-24	2	1	-
25-39	3	3	3
40-54	8	5	3
55-69	9	9	5
70-84	9	11	10
85-99	5	7	25

The development value of the basic score, UTS and UAS obtained by the student will determine the student's individual development value. Table 4 below is the individual development value of cycle I and cycle II students.

Table 5. Value of College Students Individual Development of Cycle I and Cycle II

Developmental Value	Cycle I		Cycle II	
	Number of College Students	Percentage	Number of College Students	Percentage
5	0	0	0	0
10	8	22,22	4	11,11
20	19	52,78	16	44,44
30	9	25	16	44,44

Based on the data contained in Table 5, it can be seen that there were 8 students who contributed a development score of 10 points in cycle I. This means that there were 8 students whose UTS score was 10 to 1 point below the basic score, while in cycle II, the number of students Those who contributed a development score of 10 were reduced to 4 students. This means that the number of students whose UAS scores are lower than UTS is decreasing.

In cycle I, there were 28 students who contributed development scores of 20 and 30 points. This means that there were 28 students whose UTS scores were higher than the basic score, while in cycle II, there were 32 students who contributed development scores of 20 and 30 points. This means that there are 32 students whose UAS scores are higher than the basic score. This means that the number of students who experienced an increase in their daily test scores increased from cycle I to cycle II. Based on this table, it can be seen that there is an increase in learning achievement in each cycle. The awards obtained by each group in cycles I and II can be seen in Table 6 below.

Table 6. Description of Group Awards in Cycle I and Cycle II

Group	Cycle I		Cycle II	
	Group's Development Value	Award	Group's Development Value	Award
I	15	Good	22,5	Great
II	22,5	Great	25	Super
III	20	Great	27,5	Super
IV	20	Great	22,5	Great
V	20	Great	22,5	Great
VI	25	Super	27,5	Super
VII	15	Good	15	Good
VIII	25	Super	27,5	Super
IX	20	Great	20	Great

From the data in Table 6, it can be seen that there was an increase in the number of groups whose group development scores increased from cycle I to cycle II. There was an increase in the number of super groups in cycles I and II, in cycle I there were 2 super groups, 5 great groups and 2 good groups. In cycle II, there were 4 super groups and 4 great groups and 1 good group. Based on the table, it can be seen that more and more students experienced an increase in their individual development scores so that the average group development score also increased.

Table 7. Percentage Before and After Taking Action

Range Percentage's Motivation	Amount College Students Before Action's Taken	Percentage	Amount College Students After Action's Taken	Percentage	Interpretation
< 20,00	0	0	0	0	Very low motivation
21,00-40,00	7	19,44	0	0	Low motivation
41,00-60,00	8	22,22	11	30,56	Adequate motivation
61,00-80,00	19	52,78	16	44,44	High motivation
81,00-100,00	2	5,56	9	25	Very high motivation

Tabel 7 shows that there is an increase in student learning motivation from before the action is taken to after the action is taken. This can be seen that before being given learning using the Problem Based Learning model, there were still students who had low motivation, namely 7 students. However, after being given action, there were no more students who had low motivation. This can also be seen from the increase in students who have motivation ranging from fair, good or very good.

If the level of student motivation is analyzed according to motivational aspects, the following table 8 can be created.

Table 8. Analysis of Increasing Motivation for Each Aspect

Motivation's Aspect	Percentage's Before Taking Action	Interpretation	Percentage's After Taking Action	Interpretation
There is desire and desire to succeed	60,69	High motivation	71,67	High motivation
There is encouragement and the need to learn	59,25	Adequate motivation	71,30	High motivation
Diligently facing tasks	62,78	High motivation	70,37	High motivation
Resilient in facing difficulties	59,72	Adequate motivation	68,47	High motivation
There are interesting activities in learning	56,11	Adequate motivation	71,81	High motivation
Enjoys finding and solving prob	53,89	Adequate motivation	70,19	High motivation

It can be seen from table 8 that there is an increase in the quality of motivation felt and experienced by students from every aspect. Even though several aspects have the same interpretation, only in percentage terms there has been a significant increase, including that seen in the first aspect, before the action was taken, the percentage of student motivation in this aspect was only 60.69. However,

after taking action it increased to 71.67. Apart from that, in aspects 2, 4, 5 and 6 there was an increase from adequate to high.

So, the results of this analysis support the proposed action hypothesis, namely implementation of the Problem-Based Learning (PBL) learning model to increase the Achievement and Learning Motivation of Statistics for Psychology College's Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics.

5. Conclusion

Based on the results of the discussion in the previous chapter, it can be concluded that:

1) Implementation of the Problem-Based Learning (PBL) learning model can increase the Achievement of Statistics for Psychology Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics.

2) Implementation of the Problem-Based Learning (PBL) learning model can increase Learning Motivation of Statistics for Psychology Students at Malikussaleh University semester I (odd) of the 2022/2023 academic year with the main material of Central Tendency and Inferential Statistics

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