# Using Discovery Learning and Problem-Based Learning to Increase Students' Motivation for Accomplishment

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## ABSTRACT

According to initial observations made during the Basics of Computer Network Engineering and Telecommunications course in class X at TKJ SMK Negeri 5 Gorontalo, students were generally still passive and did not participate much in their education, preferring to listen to what their teachers said. This research aims to analyse: (1) the influence of the Problem Based Learning model on students' achievement motivation; (2) the influence of the Discovery learning model on students' achievement motivation; and (3) differences in achievement motivation between classes treated with Problem Based Learning. This study used a Non-equivalent Control Group Design research design in conjunction with a Quantitative Quasi-Experimental research method. This design consists of two groups that are not randomly selected, then given a pre-test to find out whether there are differences between the experimental group and the control group. The analytical test tool used in testing this research is the Paired Sample T-test with the following test results: (1) The Problem Based Learning model influences students' achievement motivation as indicated by the Sig value; (2) the Discovery Learning model influences students' achievement motivation as indicated by the Sig value (2-tailed) of $0.000 < 0.05$. These results show that there are differences in the average achievement motivation of students in classes given the Discovery Learning model; and (3) Apart from that, the independent t test showed that there was no difference in achievement motivation between classes given the Problem Based Learning model and classes given the Discovery Learning model.

Keywords: Problem Based Learning, Discovery Learning, Achievement Motivation

## INTRODUCTION

The development of science goes hand in hand with the development of technology [1]. The government has issued rules for accelerating digital transformation through the Presidential directive Digital Indonesia Roadmap 2020-2024. The policy of accelerating digital transformation in education aims to improve the quality of education, increase accessibility, and prepare students with relevant skills in the digital era [2]. It can also improve efficiency in the delivery of learning materials and overall education management.

Educational success is determined through an improvement of the quality of education in the nation. For this reason, the government, with its efforts, strives for the quality of education in Indonesia, especially in regard to formal education. One of the efforts made is to increase students' learning achievement. The increase in learning achievement in schools is directly related to students as learners and teachers as educators who strive for the realization of educational goals. One of the factors that affect learning achievement is achievement motivation.

The achievement motivation is an encouragement in students to always act with efforts to improve or maintain their abilities as high and as well as possible in all learning activities at school by applying standards of excellence, namely standard of task excellence, standard of self-excellence, and standard of other students' excellence. Motivation can serve as a drive for the achievement of good results. A person will perform an activity because he is motivated [3]. The results of research conducted by previous studies [4] found that there were indications of low motivation for students' achievement, characterized by the low fighting spirit of students in learning, not liking new challenges, and giving up too quickly. One of the

efforts to arouse students' motivation in learning is to arouse students' interest and one way which can be performed is to use varied learning models and strategies [5]. Based on this statement, it can be concluded that learning models can arouse students' motivation in learning, even in achievement.

"If all students, or the majority of them, actively participate in the learning process on a physical, mental, or social level, then learning can be successful and of high quality. Furthermore, it is demonstrated by the rise in self-assurance, high levels of passion for learning, and large levels of enthusiasm for learning." [6]. Educators must use learning models that facilitate the use of activities that encourage and motivate learners to commit to learning [7]. In the meantime, the use of appropriate and suitable models will improve students' learning outcomes [8]. Thus, a learning model that can increase student involvement actively in learning activities is needed to find or apply their own ideas. These learning models include the Discovery Learning Model and Problem Based Learning.

Discovery Learning model means to learn discovery that is according to and suitable for the active livelihood of knowledge by individuals so that they will get the best results [9]. Through this discovery process, students are expected to use their knowledge and learning independence to motivate learning. This is because knowledge and learning independence have a positive relationship with learning motivation [10]. Even though the Problem Based Learning model incorporates students in learning activities, the model emphasizes real problems from the home, school, and community as a foundation for understanding knowledge and concepts through the development of critical thinking and problem-solving skills [11].

Therefore, it is hoped that the two learning models, Discovery Learning and Problem Based Learning, will increase students' motivation and increase student achievement. This case is in accordance with previous research conducted by Dewi (2015), where it was found that by using

discovery learning, students' motivation for learning increased, the learning process took place more optimally and in the end, students' learning outcomes increased [12]. In addition, the research conducted by Putri et al, (2017) signified that the Discovery Learning model had a significant effect on students' learning motivation [13]. Furthermore, research by Lestari et al, (2021) stated that PBL had a significant effect on the motivation to achieve [14]. In a research conducted by Sumitro et al (2017), the results of his research showed that after applying the Problem Based Learning model, there was an increase in the students' motivation [15].

Although they have different steps, the Problem Based Learning and Discovery Learning models have similarities; the learning process focuses on students working together to find and solve problems. In the application of those learning models, students are expected to be more motivated to learn because students deal directly with the context of the problems that are commonly encountered. A person's motivation will tend to increase if it is directly related to the real aspects that occur around him [16].

Preliminary observations on the Basics of Computer Network Engineering and Telecommunications subject in class X TKJ SMK Negeri 5 Gorontalo revealed that, on average, the students remained passive and did not participate much in their education, preferring to listen to what the teacher said. In addition, the students seemed less eager to learn, some did not pay attention to the teacher's explanation, used cellphones, tended to go in and out of class, and sometimes also chatted with their seatmates. There were also some students who looked bored and sleepy during the learning process. Some students seemed to be lazy to do assignments. Lastly, it was also noticeable that some students did not have the motivation that encouraged them to study.

The main problem with students not being active in class can be caused by students not feeling involved or interested in the material being taught. Students tend to be more active if

the learning material is relevant and interesting to them. As stated by Yasmini (2021), students' low learning motivation when studying during the Covid-19 period was caused by a lack of direct interaction [17]. The same thing was also stated by Gulo (2022) that the low science learning outcomes were caused by a lack of interest and activeness of students in learning, learning activities were always dominated by teachers and the use of learning approaches that did not involve students, so students only depended on what was conveyed by the teacher [18].

In reference to these conditions, a study was conducted entitled the Implementation of Problem Based Learning and Discovery Learning Models in Increasing Students' Achievement Motivation. Based on the previous background elaboration, the objectives of this study included: (1) To ascertain how the Problem Based Learning Model at SMK Negeri 5 Gorontalo affects students' motivation for achievement in the fundamentals of computer network engineering and telecommunications courses; (2) To determine the influence of the Discovery Learning Model on Students' Achievement Motivation in Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo; and (3) To determine the difference in Achievement Motivation between the class with Problem Based Learning model treatment and the class given the Discovery Learning model treatment in Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo

This research provides practical benefits, especially for teachers, students, schools, and other researchers. The benefit for teachers is it can provide information about alternative uses of learning models, on the other hand, it motivates pupils to fully comprehend the subject matter in order to get even greater learning results. Based on the research objectives and theoretical frameworks, the hypotheses proposed in this study were: (1) Ha: The Problem Based Learning model influences students' achievement motivation in the Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo; (2) Ha: The Discovery Learning model influences students' achievement motivation in the Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo; and (3) Ha: In the Basics of Computer Network Engineering and Telecommunications topic at SMK Negeri 5 Gorontalo, there is a difference in the accomplishment motivation between the class given the Problem Based Learning Model treatment and the class given the Discovery Learning treatment.

## METHODS

This study used the Quasi-Experimental Quantitative method with a Nonequivalent Control Group Design. This design was nearly the same as the Pre-test and Post-test Control Group Design, except that in this design, the experimental and control groups were compared but the sample was not taken randomly. The two existing groups were given a pre-test, then given treatment, and finally given a post-test. The Nonequivalent Control Group Design research design utilized is as follows:

Table 1. Research Design

| Group | Pre-test | Treatment | Post-test |
|---|---|---|---|
| $K_{k\ Problem\ Based\ Learning}$ | O1 | $X_{Problem\ Based\ Learning}$ | O2 |
| $K_{E\ Discovery\ Learning}$ | O1 | $X_{Discovery\ Learning}$ | O2 |

Details:

$K_{k\ Problem\ Based\ Learning}$: Problem Based Learning experiment group

$K_{E\ Discovery\ Learning}$: Discovery Learning control group

X1: Treatment with Problem Based Learning

X2: Treatment with discovery learning

O1: Administration of pre-test

O2: Administration of post-test

The test was run both before and after the investigation. Pre-test and observation refer to the test conducted prior to experiment (O1), while post-test and observation refers to the test conducted following experiment (O2). O1 and O2 differ in that O1–O2 is thought to be the result of an experiment or therapy. In this study, questionnaires, interviews, and observation were the methods utilized to collect data. In the meanwhile, a homogeneity test, hypothesis test, and normality test were employed as data analysis methods.

## RESULT AND DISCUSSION

Two class groups were selected as research samples for this study: class X TKJ 1 served as the experimental class and class TKJ 2 as the control group. The experimental class received instruction using the Problem Based Learning model, while the control class received instruction using the Discovery Learning model. Researchers determined the two classes on the condition that both classes had the same ability, which was homogeneous. The advancements in computer network engineering and telecommunications technologies served as the source material for this study. It covered the topics of MTK 5G, Microwave Link, and Fiber Optic.

The control class in this study was treated by providing a discovery learning model. The data analysis from the control class was obtained from an achievement motivation questionnaire. This study's subjects were 20 TKJ 2 students at SMK Negeri 5 Gorontalo. The total results analysis description of the control class questionnaire pre-test value can be seen in full of the Table 1. Table 1 shows that the research obtains a valid value of 20, an average value of 61.45, a median value of 62, a standard deviation of 7,126, a variance value of 50,787, a range value of 28, the smallest value of 44, the highest value of 72, and a total value of 1229. Thus, it is known that the highest frequency score is 56 from 3 students or 15%.

Table 1. Descriptive Analysis of Pre-test in Control Class

| N | Valid | 20 |
|---|---|---|
| | Missing | 0 |
| Mean | | 61.45 |
| Std. Error of Mean | | 1.594 |
| Median | | 62.00 |
| Mode | | 56 |
| Std. Deviation | | 7.126 |
| Variance | | 50.787 |
| Range | | 28 |
| Minimum | | 44 |
| Maximum | | 72 |
| Sum | | 1229 |

Source: Data processing results 2022

Table 2. Descriptive Analysis of Post-test in Control Class

| N | Valid | 20 |
|---|---|---|
| | Missing | 0 |
| Mean | | 68.25 |
| Std. Error of Mean | | 1.401 |
| Median | | 69.00 |
| Mode | | 59 |
| Std. Deviation | | 6.265 |
| Variance | | 39.250 |
| Range | | 18 |
| Minimum | | 59 |
| Maximum | | 77 |
| Sum | | 1365 |

Source: Data processing results 2022

Table 2 conveys that the research obtains a valid value of 20, an average value of 68.25, a median value of 69, a standard deviation of 6,265, a variance value of 39,250, a range value of 18, the smallest value of 59, the highest value of 77, and a total value of 1365. Thus, it is known that the highest frequency score is 59 from 4 students or 20%.

The experimental class in this study was treated by providing a discovery learning model. The analysis data from the control class was obtained from an achievement motivation questionnaire. This study's subjects were 20 students of TKJ 2 at SMK Negeri 5 Gorontalo. The total results analysis description of the experimental class questionnaire pre-test scores can be observed in the table below:

Table 3. Descriptive Analysis of Pre-test in Experimental Class

| N | Valid | 20 |
|---|---|---|
| | Missing | 0 |
| Mean | | 59.05 |
| Std. Error of Mean | | 1.505 |
| Median | | 58.00 |
| Mode | | 58 |
| Std. Deviation | | 6.732 |
| Variance | | 45.313 |
| Range | | 25 |
| Minimum | | 46 |
| Maximum | | 71 |
| Sum | | 1181 |

Source: Data processing results 2022

Table 3 explains that the research obtains a valid value of 20, an average value of 59,05, a median value of 58, a standard deviation of 6,732, a variance value of 45,313, a range value of 25, the smallest value of 46, the highest value of 71, and a total value of 1181. Thus, it is known that the highest frequency score is 58 from 3 students or 15%.

Table 4. Descriptive Analysis of Post-test in Experimental Class

| N | Valid | 20 |
|---|---|---|
| | Missing | 0 |
| Mean | | 68.85 |
| Std. Error of Mean | | 1.292 |
| Median | | 68.50 |
| Mode | | 58[a] |
| Std. Deviation | | 5.779 |
| Variance | | 33.397 |
| Range | | 22 |
| Minimum | | 58 |
| Maximum | | 80 |
| Sum | | 1377 |

Source: Data processing results 2022

Table 4 reveals that that the research obtains a valid value of 20, an average value of 68.85, a median value of 68.50, a standard deviation of 5,779, a variance value of 33,397, a range value of 22, the smallest value of 58, the highest value of 80, and a total value of 1377. Thus, it is known that the highest frequency score is 71-73 from 6 students or 30%.

A sig value is derived from the output results shown in Table 5. 0.2 from the control class (DL) and 0.2 from the experimental class

(PBL). The results from the achievement motivation questionnaires to the two classes are normally distributed since the value of sig for the two classes is >0.05, which is the same criterion used for decision-making in the Kolmogorov-Smirnov normality test.

Table 5. Normality Test

| Class | | Kolmogorov-Smirnov[a] | | |
|---|---|---|---|---|
| | | Statistic | df | Sig. |
| Results | DL | .130 | 20 | .200* |
| | PBL | .112 | 20 | .200* |

Source: Data processing results 2022

Based on the test results using SPSS (Table 6), it is known that the significance value (sig) is 0.954 > 0.05, so it can be interpreted that the data variance between the experimental class and the control class is homogeneous or the same.

Table 6. Homogeneity Test

| | | Levene's Test for Equality of Variances | |
|---|---|---|---|
| | | F | Sig. |
| Result | Equal variances assumed | .003 | .954 |
| | Equal variances not assumed | | |

Source: Data processing results 2022

The basis for decision making based on significance value (Sig.) according to Santoso (2014) [19]: (1) 1. If the value of Sig. (2-tailed) < 0,05, then Ho is rejected, and Ha is confirmed; and (2) 2. If the value of Sig. (2-tailed) > 0,05, then Ho is confirmed, and Ha is rejected. Based on the output of pair 1 in Table 7 a Sig. (2-tailed) value of 0,000 < 0,05 was obtained, then it can be concluded that there is a difference in the average of students' achievement motivation in the class that was treated with Problem Based Learning model. Thus, the Ha hypothesis is confirmed, meaning that there is an influence of the Problem Based Learning model on students' achievement motivation in the Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo.

Table 7. Paired Sample t Test for PBL

| | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|
| Pair 1 | *Pre-test* PBL – *Post-test* | -5.182 | 19 | .000 |

Source: Data processing results 2022

The average achievement motivation varied before and after receiving the Problem Based Learning model treatment, according to the study's findings. This finding is consistent with the theory put forth by Pamungkas et al. [11] which states that problem-based learning is an approach to education that involves students in learning activities, starts with problems, and emphasizes real-world issues from the home, classroom, and community as a foundation for understanding concepts and knowledge through the application of critical thinking and problem-solving abilities. Neriasari and Ismawati (2018) also found that the Problem Based Learning model is superior to the lecture method; students have a high level of motivation for learning, and there is no relationship between the use of PBL learning models and student motivation for learning outcomes related to student learning achievement in writing explanations [20].

Problem Based Learning (PBL) is a learning style that allows students to improve thinking abilities, problem solving skills, and train students' independence, according to Bound & Felleti [21]. Problem Based Learning (PBL) is a teaching approach that presents students with a problem in order to help them develop higher order thinking and problem-solving skills, according to Harapit [22]

The present study's results are in line with the research conducted by Setyowati (2022), which has shown that the implementation of the Problem Based Learning model can enhance students' motivation and academic achievements. Research by Lestari et al. [14] also demonstrated that students using the Problem Based Learning model had much higher accomplishment motivation than students using traditional learning methods. Sulfemi (2019)

presented similar research findings, demonstrating that the adoption of the discovery learning paradigm enhanced students' motivation and improved citizenship education learning outcomes [23].

A Sig. (2-tailed) value of 0.000 < 0.05 was calculated based on the output of pair 1 in Table 8. This suggests that there is a difference in the average of students' achievement motivation in the class that received the Discovery Learning model treatment. Therefore, the Ha hypothesis is supported, and the Ho hypothesis is rejected, indicating that the Discovery Learning approach has an impact on students' desire for achievement in the Basics of Computer Network Engineering and Telecommunications course at SMK Negeri 5 Gorontalo.

Table 8. Paired Sample t Test for DL

| | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|
| Pair 1 | *Pre-test* DL – *Post-test* | -4.666 | 19 | **.000** |

Source: Data processing results 2022

From the results of this study, it was found that there was a difference in the average achievement motivation before and after being given the Discovery Learning model treatment. By using the Discovery Learning methodology, students can solve problems by classifying, observing, hypothesizing, explaining, drawing conclusions, and more.

This result is in line with the theory proposed by Jetti [24], which explains that in order to identify concepts or principles, students use a variety of learning strategies, including classification, explanation, hypothesis testing, and drawing conclusions. The results of other research, such as those by Putri et al. [13], which demonstrated the substantial impact of the Discovery learning model on student learning motivation, are also in line with the findings of this investigation. In the meantime, a study by Janah et al. [25] demonstrated that the Discovery learning approach had a favorable impact on

students' motivation to learn. The findings of the analysis in the study by Koem et al. [26] indicated that learning motivation was positively impacted by the application of the Discovery learning paradigm.

Table 9. Independent Sample t-Test

| Hasil *Post-test* (PBL & DL) | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| | Equal variances assumed | .572 | .454 | .315 | 38 | .755 | .6000 |
| | Equal variances not assumed | | | .315 | 37.755 | .755 | .6000 |

Source: Data processing results 2022

Based on the Table 9, a Sig. (2-tailed) value of 0.755 > 0.05 was obtained, so it can be concluded that there is no difference in students' achievement motivation between the class given the Problem Based Learning model treatment and the class given the Discovery learning model treatment in Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo, thus, the 3rd hypothesis is rejected.

The findings of this study indicated that there was no difference in the achievement motivation of the Discovery Learning class and the Problem Based Learning class. It was evident that the two classes were equally skilled and had done an excellent job of raising students' motivation to succeed in the fundamentals of computer network engineering and telecommunications. As a result, the third hypothesis is disproved.

This is a result of the Discovery Learning paradigm being used in the learning process and Problem Based Learning, they were equally effective because students played a more active role in finding, processing and understanding concepts and relationships in an intuitive process to solve problems regarding the basic material of computer network engineering and telecommunications that were associated with real problems commonly experienced. In this case, in addition to having students record information from the teacher, learning activities also involve employing engaging and interactive media. Learning activities were made enjoyable

and have the potential to increase students' motivation to study [27].

This study's findings corroborated those of a study by Fadilah et al. [4], which found that students who received instruction using a scientific approach to problem-based learning and a scientific approach to discovery learning outperformed students receiving instruction using a conventional learning model in terms of learning achievement. We can conclude that the scientifically approachable Problem Based Learning model and the scientifically approachable Discovery learning model have similar mathematical learning outcomes.

The findings of this study differed from those of Oktaviani et al.'s research [28], demonstrating variations in the average outcomes and demonstrating that learning outcomes from the Problem Based Learning model were noticeably better than those from the Discovery Learning model.

**CONCLUSION**

Several conclusions can be made based on the research and discussion, including the following: (1) The Problem Based Learning paradigm has an impact the students' achievement motivation in the Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo; (2) The Discovery learning model influences students' achievement motivation in of Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5

Gorontalo; and (3) There is no difference in achievement motivation between the class given the Problem Based Learning model treatment and the class given the Discovery Learning model treatment in the Basics of Computer Network Engineering and Telecommunications subject at SMK Negeri 5 Gorontalo.

In accordance with the previous conclusions, a follow-up to the results in the form of several suggestions can be put forward: (1) the schools ought to encourage the growth of problem-based learning and discovery learning in order to enable other educators to implement these models, encourage students to use learning strategies that emphasize their independence as thinkers, and facilitate students' ability to solve problems; (2) teachers should keep making the most of the application of problem-based learning and discovery learning lesson models. This will give students the chance to actively participate in the learning process, develop their creativity in addressing real-world problems, and inspire their motivation and creative thinking; and (3) the next researchers should conduct research by adding other variables, namely the variables of critical thinking ability, learning motivation, expertise competence to see how far the ability from the learning model is in making students more independent in the learning process.

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