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IMPLEMENTATION OF PBL-FLIPPED CLASSROOM LEARNING MODEL TO IMPROVE THE LEARNING OUTCOMES OF JUNIOR HIGH SCHOOL STUDENTS IN HUMAN EXCRETION SYSTEM MATERIALS

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Abstract. This study aims to describe the increase in learning outcomes and student responses by applying the PBL-Flipped Classroom learning model in human excretion system materials. The type of research used is pre-experimental design research through one group pretest-postest design. The subjects in this study were involved as a class VIII-D at Junior High School 1 Tugu. The data collection technique was carried out using a knowledge test in the form of multiple choice questions before and after the PBL-Flipped Classroom learning model was applied and student response questionnaires to the application of the PBL-Flipped Learning model. The data analysis technique used is descriptive quantitative. The results of the data obtained were then analyzed in the form of student learning outcomes and student responses. The increase in student learning outcomes can be seen from the N-Gain analysis and paired sample t-test. The increase in student learning outcomes can be seen from the N-Gain analysis and paired sample t-test. The results of the N-Gain test obtained were 0.66, which was included in the medium category. Student learning outcomes have increased significantly, with a significance value of 0.00 < 0.05. The results of the student response were included in the very good category with a percentage of 99%. Based on the facts above, there is an effect of the PBL-Flipped Classroom learning model to improve the learning outcomes of junior high school students on the human excretion system materials.

Keywords: *Learning outcomes, PBL-Flipped Classroom, Excretion system.*

INTRODUCTION

Science is now one of the most important subjects for creating a generation of nations that can contribute and fiercely compete because of the rapid development of science and technology. Students need to be skilled in the use of technology and possess a number of learning and innovation skills to compete effectively in an increasingly competitive environment. Students must acquire these skills to succeed in any subject, including science [1]. Science is a science that uses scientific methods to study the universe in a systematic manner [2]. Principles, concepts, laws, theories, facts, and models are all closely related to IPA. This science teaches scientific processes like discovery, measurement, observation, and investigations that need scientific attitudes and ways of thinking to be applied [3].

The actual situation was different from what was anticipated. In Indonesia, students' ability to learn science content still needs to improve. It affects the learning outcomes for students, and the science learning outcomes do not meet the desired standard of value. Students learning outcomes in Indonesia are poor, according to the Trends in Mathematics and Science Study (TIMSS) that the IEA conducted in 2018. Indonesia's ranking in this international study has decreased annually; it was 34th out of 38 participants in 1999, 35th out of 46 participants in 2003, 36th out of 49 participants in 2007, and 38th in 2011out of 42 participants, and was ranked 45th out of 50 participants in 2015 [4].

Similarly, Indonesia ranks 62 out of 70 countries evaluated in the Program for International Student Assessment (PISA) results, which have been widely discussed. Although Indonesia's PISA scores have increased, they are still significantly lower than other Southeast Asian nations [5]. Facts in the field also back up the survey results obtained. The interviews that were carried out at SMP Negeri 1 Tugu indicated that the learning outcomes in science lessons remained low. According to Sukarman's research that was carried out in natural science lessons in 2022, more information still needs to be available regarding pre-cycle learning outcomes, with 16.67% of all students meeting the KKM. It is because students lack the motivation to learn, which affects their ability to think critically. Nearly all science content, including human excretory system content, has learning outcomes that fall short of this goal.

Students will need help comprehending this information [6]. The primary objective of a learning process is to improve learning outcomes. Changes in student behavior are known as learning outcomes. These changes include cognitive, emotional, and psychomotor aspects [7]. As a result, the target competency of learning must be incorporated into the assessment of student learning outcomes. Students were given a test at the end of a subject matter to determine their learning outcomes. According to Sudjana (2014), learning outcomes are students' abilities after the learning process [8]. The level of student learning outcomes remains a major problem that educators must face. Their main focus is managing and developing learning to obtain the desired student learning outcomes. Therefore, a learning method following the existing problems is needed to increase students' motivation and learning

abilities to achieve the desired target learning outcomes.

The Flipped Classroom learning model with PBL, which combines the flipped learning model with the Problem-Based Learning (PBL) model, was selected based on the preceding explanation. One of the most recent and cutting-edge learning models is the Flipped Classroom, which is suitable for education in the twenty-first century. Flipped learning is a method of education in which students study material before in-person meetings. It is hoped that students will have a better understanding of the previous material and will be able to maximize the classroom learning process by using this learning model. Study time during class will be used more effectively in this manner [9]. PBL, on the other hand, is a learning model that puts students in real-world, meaningful problem-solving situations, such as presenting everyday phenomena as the basis for student research [10]. The choice of the Flipped Classroom learning model with PBL for the excretory system material in humans in junior high school science classes is because the Flipped Classroom learning model with PBL focuses on helping students learn and comprehend the material better. As a result, this model can motivate students to identify concepts that will be utilized in problem-solving. It is anticipated that this learning model will enhance students' capacity for creative thinking. Based on this presentation, it is necessary to conduct research using PBL-Flipped Classroom on Human Excretion Systems material at Junior High School 1 Tugu, which aims to increase student outcomes.

RESEARCH METHODS

The type of research used is a pre-experimental design with a One-Group Pretest-Posttest Design. The research design is described in Table 1. The subjects of this study were class VIII-D students at Junior High School 1 Tugu totaling 31 students.

Table 1. The Research Design

Pretest	Treatment	Posttest
O_1	X	O_2

O_1: Pretest results to measure students' science literacy before being given treatment
X: Interactive multimedia usage treatment
O_2: Posttest results to measure students' science literacy before being given treatment [11].

Procedure

The data collection used in this study was using a knowledge test in the form of multiple choice questions given before and after the PBL-Flipped Classroom learning model was applied and student response questionnaires to the application of the PBL-Flipped Learning model. The test aims to see the learning outcomes. Student response questionnaires are given after the learning is carried out. This research was carried out asynchronously and synchronously in two sessions, one asynchronous meeting via Whatsapp group and one synchronous meeting using a learning design that leads to problem-based learning.

Instruments

The learning implementation instrument consists of 10 points statement covering the preliminary aspects of 2 points, the core aspects of 6 points, and the closing aspects of 2 points. The questions presented in the pretest and posttest test sheets to improve the learning outcomes are the same but with random numbering. The student response questionnaire was presented as description questions related to learning using the PBL-Flipped Classroom model.

Data Analysis

The data are analyzed descriptively and quantitatively. Analysis of students' outcomes pretest and posttest data using N-gain. The n-gain analysis measures the increase in pretest and posttest results [12]. The questionnaire of student responses to learning using interactive multimedia is analyzed descriptively and qualitatively because the instrument is in the form of a description question.

RESULTS AND DISCUSSION

The research was conducted to identify an increase in students' cognitive learning outcomes in the selected material, namely the human excretory system, using the PBL-flipped classroom model. Data on students' cognitive learning outcomes obtained from the pretest and posttest scores were analyzed using the paired t-test and the N-Gain test. The purpose of doing the t-test is to determine whether there are differences in students' cognitive learning outcomes before and after treatment, as indicated by the pretest and posttest scores. Before that, a normality test was carried out a determinant if the data obtained was normally distributed. Based on the pretest dan posttest data normality tests, a significance value of 0,24 was obtained. The result was a significant>0.05, meaning the existing data is normally distributed [13]. Then a paired t-test is performed (Table 2).

Table 2. Paired t-Test Result

	Mean	t	df	Sig (p)
Pretest-Posttest	-31.93	-16.96	30	.000

Table 2 shows the t-test that has been carried out. The level of signification (a) = 5% is 0.000 < 0.05, so the null hypothesis is rejected, and the alternative hypothesis is accepted [14]. It means there is a difference between the scores before and after

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the implementation of the PBL-flipped Classroom, which influences student learning outcomes.

The category of improving student learning outcomes can be obtained through the analysis of N-Gain scores. The N-Gain test was carried out to identify improved student learning outcomes after implementing the PBL-Flipped Classroom. The N-Gain test obtained was 0.66, included in the medium category. Based on these results, the PBL-Flipped Classroom learning model effectively improves student learning outcomes in the human excretion system materials. The students' N-Gain test categories are shown in Figure 1.

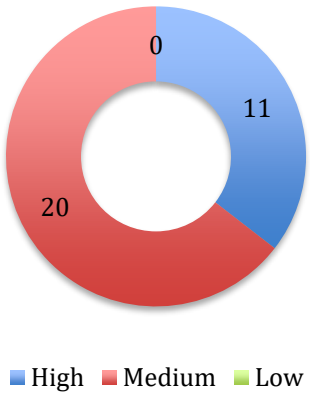

Figure 1. Student N-Gain Test Chart

Figure 1 shows the N-Gain test that has been carried out. Out of 31 students, 11 experienced an increase in learning outcomes with the high category, 20 experienced an increase with the medium category, and none experienced an increase with the low category. Based on the data above, most students experienced increased learning outcomes with the medium category.

The learning outcomes data obtained showed an increase in the average pretest score, originally 47.7 to 79.67, during the posttest. The number of students who completed the pretest was only 7 out of a total of 31 students with a completeness percentage of 22.5%, then increased to 29 students who completed the posttest with a completeness percentage of 93.5%. A class can be said to have completed learning if> 85% of students have completed learning [15]. It can be concluded that learning mastery has been fulfilled after implementing the PBL-flipped classroom learning model. The completeness of student learning before and after implementing the PBL-flipped classroom model can be seen in Table 3.

Table 3. Student Learning Completeness

	Complete	Incomplete
Pretest	7	24
Posttest	29	2

An increase in student learning outcomes can occur if learning is carried out correctly. It can be seen from the response questionnaires given to students after the PBL-Flipped Classroom learning model was carried out. The results of student responses after learning are shown in Table 4.

Table. 4 Student Responses To the PBL-Flipped Classroom Learning Model

No.	Student Response	Score
1.	Learning using the PBL-flipped Classroom that has been implemented is interesting	100%
2.	Learning using the PBL-flipped Classroom that has been implemented is fun and not boring	100%
3.	Learning using the PBL-flipped Classroom that has been implemented makes me more active in learning	100%
4.	Learning using the PBL-flipped Classroom can increase my understanding of the human excretion system materials	100%
5.	The material provided using videos is more interesting and easy to learn	93%
6.	The worksheets are easy to understand	100%
7.	Group discussion helps me understand the material easily	97%
8.	Group discussions are more interesting and make me more active during my learning	100%
9.	Using the PBL-flipped Classroom learning model helps practice applying concepts to solve science problems	100%
10.	Evaluation questions according to the material provided	100%

Table 4 showed a good response from students after learning with the PBL-Flipped Classroom model, where all questions were included in the very good category with a percentage of 93%-100%. From the student response questionnaire analysis results, enthusiasm and liveliness are seen, which are expected to encourage learning motivation to improve learning outcomes. Motivation influences learning outcomes [16].

Applying the PBL-Flipped Classroom learning model in this study creates problem-based, student-centered learning activities; students are required to be active in finding solutions to problems that occur. PBL is a learning model where students are faced with a problem, and then students are required to search for information about the problems that occur to find solutions [17]. In its application, PBL will be easier to learn if students have an initial

understanding of the problems to be faced. Besides that, PBL takes quite a long time [16]. The flipped classroom learning method is used to support the PBL learning process. The concept of learning with the Flipped Classroom method is that learning usually done at school can be done at home [18].

Flipped Classroom method involves the participation of students to understand material outside the classroom with unlimited time individually. This PBL-Flipped Classroom learning model encourages students to learn to understand and study material independently related to the problem-solving process that will be encountered so that students will have an initial picture or understanding useful for minimizing the use of learning time [19]. In solving problems, students will be more enthusiastic because they already know about material related to these problems through learning materials that have been studied at home [16]. When students have enthusiasm for learning, students will be more motivated and try to actively understand what is being studied so that optimal learning achievement can be achieved [20]. There is an increase in student learning outcomes caused by increased learning motivation after applying the student-centered learning model combined with the flipped Classroom [21].

Improving learning outcomes using the PBL-Flipped Classroom learning model is also supported by the underlying learning theory, namely constructivism learning theory. In constructivism theory, learning is student-centered, and the teacher's job is only as a facilitator [22]. It aligns with the PBL and Flipped Classroom, student-centered-based learning models. Students study the material individually before learning in class and discuss the material obtained through group discussions. Thus, students can build their knowledge of the material so that there will be an increase in learning outcomes with a more effective time.

CONCLUSION

Based on the results and discussion of research that has been carried out. There was a significant increase in learning outcomes of grade VIII D students of Junior High School 1 Tugu after using PBL-Flipped Classroom was applied to human excretion system materials, with an average pretest score of 47,7 to 79,67 on the average posttest score. Improving students' learning outcomes has an N-Gain index score of 0.66, including the moderate category. The application of learning using the PBL-Flipped Classroom model received a positive response from students. Students find learning using the PBL-Flipped Classroom model on human excretion system material fun, attractive, easy to understand and use, helping to understand the material to solve problems. The results of this study imply that teachers can design the right learning model using various attractive models to improve student's learning outcomes.

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