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THE EFFECT OF PROBLEM BASED LEARNING MODEL USING ANIMATION VIDEO ON STUDENT LEARNING OUTCOMES ON THE HUMAN RESPIRATORY SYSTEM MATERIAL

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Abstract: The objective of this study is to determine the effect of the Problem Based Learning model assisted by animated videos on science learning outcomes in the topic of the Human Respiratory System among eighth-grade students at SMP Imelda Medan. The population of this research comprised all eighth-grade students at SMP Imelda Medan. The sample classes were selected using random sampling, with two classes chosen as the sample. This study employed a quantitative research method, specifically a quasi-experimental approach with a Pretest-Posttest Nonequivalent Control Group Design. Data collection techniques included pre-research observation, interviews with science teachers of grade VIII, written multiple-choice tests for students, and documentation during the research. Data analysis was conducted using hypothesis testing (one-tailed t-test). These data indicate that the implementation of the Problem Based Learning model assisted by animated videos significantly improves students' learning outcomes of eighth-grade students at SMP Imelda Medan on the topic of the human respiratory system.
Keywords: Problem Based Learning, Learning Outcomes, Human Respiratory System

1. INTRODUCTION

Education is an activity to optimize the potential, skills, and personal characteristics of students (Silaban et al., 2020). Education has an important goal in developing individual abilities through a planned learning process. Well-designed learning is essential to create a learning atmosphere that encourages students to be active and creative (Gulo, 2022). The success of education in schools can be measured from student learning outcomes, which are the main indicators of the achievement of learning objectives and mastery of material by students (Sihombing, 2024). In the digital era of the 21st century, the demand for critical thinking skills, collaboration, communication, and creativity is increasing. Based on this, Indonesia focuses on education that can improve the learning outcomes of its students so that they are able to master these skills, especially in science education (Suparya et al., 2022).

Based on the results of a preliminary survey through observation and interviews conducted by researchers on science teachers at SMP Imelda Medan, the science learning process, especially

for class VIII, in its implementation, teachers have not made students the center of learning (student-centered). The results of teacher interviews stated that learning was dominated by conventional models with methods such as lectures and questions and answers that were less varied and less effective in helping students face real-life problems, especially in the material on the human respiratory system. This causes student participation to be less active, some students are less focused when the teacher delivers the material, so that student learning outcomes are still low. Only 47% of grade VIII students achieved scores above the Minimum Completion Criteria (KKM) of 70 in the mid-semester exam. Learning outcomes are still far from the Minimum Completion Criteria (KKM). The monotonous and less varied learning process can cause students to become bored and not maximally actively involved during the lesson so that student learning outcomes are still low.

Related to these problems, efforts need to be made to improve innovation in the quality of learning with students as the center of learning (student-centered) (Anwar et al., 2023). This is in accordance with the 2013 curriculum which was designed to encourage students to play a more active role in the learning process, the learning process is no longer focused on the teacher, the teacher acts as a facilitator, so that students are required to be active in the learning process through various sources. Researchers try to apply a learning model that can provide influence in efforts to improve the science learning process. The model is the Problem Based Learning model because this model can encourage students to be actively involved in the learning process and explore knowledge through solving real problems. Problem Based Learning is a model that refers to real-world problems that prioritize active students in their learning process. refers to real-world problems that prioritize active students in their learning process. The use of appropriate and relevant problem-based learning models with subject matter is part of the strategy to encourage the quality of learning and student learning outcomes (Silaban et al., 2021).

By implementing PBL, students are able to train their thinking skills, collect data, collaborate, and find the understanding needed to solve problems. Meanwhile, the teacher functions as a facilitator who helps students (Nasution et al., 2023). The use of the PBL model can be combined with learning media that are in accordance with current technological developments. Media can support the learning process and can attract attention and optimize students in understanding the material being taught. One effective media is animated video. The combination of interesting audio and animation in the video can increase students' enthusiasm and curiosity about the learning material. The use of animated videos accessed through the Youtube platform makes it easier for students to understand concepts that are difficult or too difficult to understand (Rosiana et

al., 2024).

Based on this, the researcher conducted a study with the title of the study The Effect of Problem Based Learning Model Assisted by Animated Videos on Student Learning Outcomes in the Human Respiratory System Material of Class VIII SMP Imelda Medan. With the problem, namely, is there an effect of the PBL model assisted by animated videos on student learning outcomes in the human respiratory system material.

1. Problem Based Learning Model

Learning model is a plan that functions to assist in the preparation of curriculum or long-term learning plan, material design, and management of learning activities. Learning model can be chosen by teachers according to their needs, so that they can determine the most effective model to achieve educational goals (Joyce et al., 2016). The learning model is a framework that provides an overview of learning achievements in order to help students learn in certain goals to be achieved (Simeru, et al., 2023). The learning model can be used by teachers as a way to achieve learning goals, providing flexibility in determining the appropriate learning model that suits students' needs. Thus, teachers can strive to improve learning outcomes. Teachers' efforts to improve low student learning outcomes can be done by choosing a learning model that is appropriate to the material being taught. Choosing a learning model that is relevant to the material can encourage a pleasant learning atmosphere (Silaban et al., 2021). One of the models used in the human respiratory system material is the problem-based learning model. PBL is a model that focuses the learning process on students who start by stating problems, students are faced with real problems that are relevant in everyday life in their learning.

PBL is a model that requires students to be independent in the learning process, solving problems using their experience and knowledge so that students become active and skilled in solving a problem (Putra and Daulae, 2023). PBL is a student-centered learning model that offers a systematic framework to encourage active learning. PBL has a syntax that needs to be understood. Syntax is the stage of implementing activities carried out by teachers and students. The stages of the PBL model according to (Arends, 2012) are:

Phase 1: Orienting students to the problem, namely the teacher discusses the objectives of the lesson, motivates and guides students to engage in problem-solving activities. The teacher provides problems through pictures and news about the Covid-19 pandemic as a stimulus for

students regarding the human respiratory system, then an animated video is Phase 2: Organizing students to learn, the teacher helps students to learn by defining and organizing tasks related to the problem. The teacher forms student study groups consisting of 4-5 people.

Phase 3: Guiding individual and group investigations, at this stage the teacher guides group investigations by carrying out problem-solving activities according to the LKPD instructions regarding the human respiratory system, Covid-19 cases.

Phase 4: Developing and presenting artifacts, teachers assist students in planning and preparing appropriate artifacts such as reports, videos, models and so on. Students develop the results of observations by answering several questions in the LKPD related to the human respiratory system.

Phase 5: Analyze and evaluate the problem-solving process, the teacher helps students to reflect on the investigation and evaluate the problem-solving solutions. Students are given the opportunity to convey the results of their group discussions, then the teacher and other groups respond to the results of the group discussions that are presented.

2. Animation Video

Learning media such as animated videos are one of the supporting factors to achieve the success of the learning process. The success of learning is greatly influenced by two main factors, namely good interaction between teachers and students, and the use of effective learning media, such as animated videos. Animation aims to bring static elements to life with sound, complemented by video or film (Andrasari, 2022). With the existence of learning media, teachers can convey information more effectively, create a pleasant learning atmosphere and prevent students from getting bored during the learning process (Ndraha, et al., 2024). Animated video media can make the process of delivering learning materials easier for students. In addition, animated media can also increase students learning motivation to meet the expected learning objectives. With the existence of learning media, teachers can convey information more effectively, create a pleasant learning atmosphere and prevent students from getting bored during the learning process (Ndraha, et al., 2024). Animated video media can make the process of delivering learning materials easier for students. In addition, animated media can also increase students' learning motivation to meet the expected learning objectives.

3. Learning Outcomes

Learning outcomes are the scope of attitudes, values, and skills possessed by students which are expected to reflect new abilities acquired by students after participating in the learning process

in the classroom (Magfirah and Ngitung 2023). So it can be concluded that learning outcomes are knowledge acquired by students through the teaching and learning process that can be measured and observed. Bloom-Revised cognitive domain levels according to Anderson and Krathwohl (2001) are ranked from the lowest to the highest, namely 1) Remembering (C1) related to authentic knowledge, students can recognize and remember information; 2) Understanding (C2) students can understand the meaning of information and express information with the understanding they have; 3) Application (C3) is the ability to apply information that has been learned to new situations; 4) Analyzing (C4) is the ability to break information into small parts in order to understand the relationship between the parts; 5) Evaluating (C5) is making judgments based on standards and criteria; 6) Creation (C6) is the ability to integrate elements together to form a functional and coherent whole, and reorganize elements into a new pattern structure (Djulia et al., 2020).

4. Human Respiratory System Material

The human respiratory system is a system that is responsible for taking oxygen (O_2) from the air and releasing carbon dioxide (CO_2) as a waste product of the body's metabolism. This process is very important for providing energy and maintaining human survival. The respiratory system consists of major organs such as the nose, pharynx, larynx, trachea, bronchi, bronchioles, and lungs that function as airways and gas exchange sites.

Organs of the Respiratory System: nose as a place for air to enter, functions to filter, warm, and humidify the air, pharynx connecting groove between the nasal cavity and throat, larynx: Located above the trachea, functions as a place for the vocal cords, trachea as the main airway to the lungs, then the bronchi branches from the trachea that lead to the lungs, onchioles are small branches of the bronchi, and the lungs are the main organ where gas exchange occurs in the alveoli.

Human respiration consists of two main processes, namely inspiration (inhaling air) and expiration (exhaling air). There are two breathing mechanisms, namely chest breathing and abdominal breathing. In chest breathing, the ribs are lifted so that the chest cavity enlarges and air enters the lungs. In abdominal breathing, the diaphragm contracts so that the chest cavity enlarges and air enters the lungs. Gas Exchange. Gas exchange occurs in the alveoli, where oxygen from the air enters the blood vessels and carbon dioxide from the blood is released into the air. This process is very important to provide oxygen to the entire body and remove metabolic waste in the form of CO_2.

Diseases characterized by viral, bacterial, or fungal infections in the upper respiratory

system, including infections of the nose, sinuses, pharynx, and larynx are called Acute Respiratory Tract Infections (ARI). There are types of ARI including influenza, tonsillitis, pharyngitis, laryngitis, rhinitis, and sinusitis. Viruses, bacteria, or fungi. ARI can also infect the lower respiratory system, known as Lower Respiratory Tract Infection. These infections include pneumonia, tuberculosis, asthma, lung cancer, and bronchitis, Covid-19 (Zubaidah et al., 2017).

2. RESEARCH METHODS

The method used in this study is a quasi-experimental study with a *Pretest-Posttest Nonequivalent Control Group Design* consisting of an experimental class and a control class. This research was conducted at Imelda Medan Private Junior High School located on Jalan Bilal, No. 24 Medan, Pulo Brayan Darat I, Medan Timur District, in the 2024/2025 academic year. The population in this study were all students of class VIII of Imelda Medan Junior High School totaling 109 students.

The sample in this study was determined through simple random sampling technique. Simple random sampling is a sampling technique by selecting samples from the population randomly. The sample used was two classes where the number of samples consisted of 52 students. The reason for taking samples using simple random sampling is because the average cognitive abilities of students are homogeneous. The sample of this study was all students in class VIII-B as an experimental class totaling 26 students and VIII-A as a control class totaling 26 students.

3. RESULTS AND DISCUSSION

Science learning outcomes for the Human Respiratory System material for the experimental and control classes

The data in this study were obtained from the results of the pretest tested before the learning process in both sample groups (experimental class and control class), as well as the results of the posttest tested after learning. In the experimental class, learning used the Problem Based Learning model assisted by animated videos, while the control class used the conventional model. The use of the pretest was to see the homogeneity of the two sample groups and sample determination. Meanwhile, the use of the posttest was to see the learning outcomes of each after being treated on the sample.

After the initial test (pretest) was conducted on the experimental class and the control class, the learning process was then carried out in each class. It can be seen that the average pretest score

for the experimental class was 34.04 and the average pretest for the control class was 30.77. The pretest scores for both classes have not yet reached the KKM, which is 70. Then the experimental class was taught using the Problem Based Learning model assisted by animated videos, while the control class used the conventional model. The use of the PBL model, in this case the author before starting the learning first gives questions to stimulate the students' knowledge, then gives a problem about Covid-19 at the beginning of learning the respiratory system material. Then students are shown animated videos related to the human respiratory system. The videos shown in the learning process in the classroom make students interested in the material being studied, so that students tend to understand the material being studied better.

After learning was carried out in each class for three meetings related to the material of the human respiratory system After all the materials were finished being taught, it was closed by giving the same questions or called giving a posttest. From the results of the posttest, it can be seen that the average score of students in the experimental class was 83.46 and the control class was 46.15. Based on these results, it shows that the average value of student learning outcomes taught with the PBL model assisted by animated videos is higher than students who are taught with the conventional model.

The posttest results of the experimental class had the lowest score of 65 and the highest score of 95 with an average of 83.46 while the posttest results in the control class had the lowest score of 25 and the highest score of 65 with an average score of 46.15. The data can be seen in Figure 1 below:

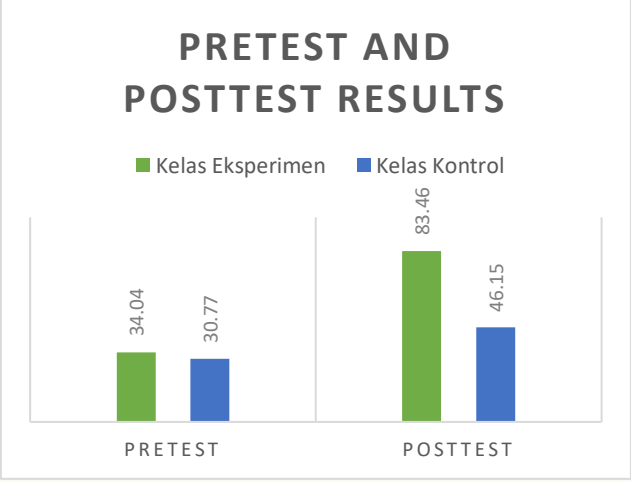

Figure 1. Average Pretest and Posttest Scores

1. Normality Test

Normality test is conducted to determine whether the data obtained from both pretest and posttest are normally distributed or not. In this study, the normality test used is the Shapiro-Wilk test using SPSS software version 21. The test criteria are if the significance value Sig. > (α) where (α) = 0.05. Decision making guidelines according to (Sugiyono, 2021) are:

a. If the significance value > 0.05, then the data is normally distributed
b. If the significance value < 0.05, then the data is not normally distributed.

The results of the pretest and posttest data normality tests can be seen in Table 1 below:

Table 1. Results of the pretest and posttest data normality tests for the experimental and control classes

Study groups		Shapiro-Wilk		
		Statistic	df	Sig.
Learning outcomes	Experiment Pretest	0.953	26	0.276
	Posttest Experiment	0.923	26	0.053
	Pretest Control	0.954	26	0.292
	Posttest Control	0.953	26	0.266

Based on the Table 1. it shows the normality test of the pretest data of the experimental class using the Problem Based Learning model assisted by animated videos obtained a significance result of 0.276 > 0.05, the posttest data of the experimental class obtained 0.053 > 0.05 so that the pretest and posttest data of the experimental class using the Problem Based Learning model assisted by animated videos were normally distributed. In the table, it can be seen that the normality test of the control class pretest data using the conventional model obtained a significance result of 0.292 > 0.05 and the control class posttest data obtained a significance result of 0.266 > 0.05 so that the control pretest and posttest data were normally distributed. So, it can be concluded that the pretest and posttest data of the experimental class and control class came from normally distributed samples.

2. Homogeneity Test

After the data is normally distributed, it is continued with a homogeneity test. The basis for data collection is if the sig value > α (0.05) then it is homogeneous, conversely if the sig value < α (0.05) then the data is not homogeneous. The homogeneity test of the pretest and posttest can be seen in Table 2 below:

Table 2. Homogeneity Test of Learning Outcomes

No.	Class Data	*Leaven Test*				Conclusion
		Statistics	df 1	df 2	Sig.	
1.	Pretest experimental and control classes	3.503	1	50	0.067	Homogeneous
2.	Experimental and control class posttest	3.316	1	50	0.075	Homogeneous

Based on Table 2. in the homogeneity test, it can be seen that the significance value for the pretest between the experimental class and the control class is 0.06 > 0.05, while for the posttest between the experimental class and the control class is 0.075 > 0.05. So, it can be concluded that the data is homogeneous. The homogeneity test uses *SPSS software version 21.*

3. Hypothesis Test

After the data distribution of normality and homogeneity is known, a hypothesis test is carried out using a statistical test, namely a one-tailed t-test at the α = 0.05 level. This test is to determine whether the hypothesis in this study is accepted or rejected. Testing criteria if the significance value of the t test < 0.05 then H_0 is rejected and H_a is accepted, meaning that there is an influence between the independent variable and the dependent variable, if the significance value of the t test > 0.05 then H_0 is accepted and H_a is rejected, meaning that there is no influence. The data from the hypothesis test results can be seen in Table 3. below:

Table 3. Hypothesis Test

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Results	Equal variances assumed	3.316	0.075	-15.422	50	0.000	-7.462	0.484	-8.433	-6.490
	Equal variances not assumed			-15.422	45.288	0.000	-7.462	0.884	-8.436	-6.487

Hypothesis test (Table 3) calculations can be seen that the Sig. (2.tailed) value is 0.000. Thus it can be stated that 0.000 < 0.05 so that it can be decided that H_0 is rejected and H_a is accepted. So,

it can be concluded that the Problem Based Learning model assisted by animated videos in class VIII of SMP Imelda Medan has an effect on student learning outcomes in the human respiratory system material. Hypothesis test calculations can be seen that the Sig. (2. tailed) value is 0.000. Thus it can be stated that 0.000 < 0.05 so that it can be decided that H_0 is rejected and H_a is accepted. So it can be concluded that the Problem Based Learning model assisted by animated videos in class VIII of SMP Imelda Medan has an effect on student learning outcomes in the human respiratory system material. Hypothesis test calculations can be seen that the Sig. (2. tailed) value is 0.000. Thus it can be stated that 0.000 <0.05 so that it can be decided that H_0 is rejected and H_a is accepted. So it can be concluded that the Problem Based Learning model assisted by animated videos in class VIII of SMP Imelda Medan has an effect on student learning outcomes in the human respiratory system material.

Based on the results of the study, it can be seen that the learning outcomes of the experimental class by implementing the Problem Based Learning model assisted by animated videos are higher than those of the control class. This can be proven by the results of the experimental class posttest, which is 83.46. This is in accordance with research (Prastiyo et al., 2023) that the application of the PBL model assisted by video media on the human respiratory system material can improve the completeness of student learning outcomes.

In this study, the learning outcomes of students who used the PBL model assisted by animated videos showed greater development compared to students who used the conventional model. This is because the PBL model encourages students to be actively involved in the learning process. By following the steps in the PBL model, students become enthusiastic about learning and make students who were previously passive become active in learning. In addition, students are encouraged to explore their abilities, both in terms of communication and in improving their thinking skills to solve problems, so that their understanding of the material becomes deeper and more meaningful. In addition, the use of animated videos as supporting media helps students understand concepts more clearly and interestingly.

Although this study succeeded in improving student learning outcomes, in terms of individual completeness, it cannot be said to be 100% complete because there were several students (control class) whose posttest scores had not reached the KKM score of 70 for science subjects at the school. This is due to the use of conventional learning models in the control class, which makes the teacher the center of learning and makes students tend to be passive in learning. Learning in the control class only uses media in the form of science textbooks. As a result, there is a lack of

interaction that is exchanged between students towards the cognitive level they have, so that the knowledge they have is still not deep enough. On the other hand, in the experimental class that uses the PBL model assisted by animated videos, students are more active and involved in learning. This model helps students understand the material better and improves learning outcomes compared to the control class. Thus, PBL assisted by animated videos has a positive influence in improving student learning outcomes.

4. CONCLUSIONS AND SUGGESTIONS

CONCLUSIONS

Problem based learning model using animated videos can improve science learning outcomes in the human respiratory system material.

SUGGESTIONS

Problem based learning model using animated videos can be used to improve science learning outcomes in the human respiratory system material.

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