THE EFFECT OF *PROBLEM BASED LEARNING* ON LEARNING OUTCOMES ON HUMAN SKELETAL SYSTEM MATERIALS IN GRADE VIII

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ARTICLE INFO: **ABSTRACT**

This research aims to know how the influence of problem-based learning models on student learning outcomes on the Human Skeletal System in grade VIII material of SMP N 14 Medan. This type of research is a quasi-experiment. The population in the study was all students of class VIII semester 1 of SMP Negeri 14 Medan consisting of 6 classes. The sample of this study was taken in two classes, namely VIII-1 as an experimental class of 30 people and class VIII-2 as a control class of 30 people determined by cluster random sampling. The instrument used is a learning outcomes test in the form of multiple choices consisting of 20 items. The hypothesis test used in this study is the t test. Based on the results of data analysis, the average score of the experimental class pretest was 49.0 and the average value of the control class pretest was 44.66 while the average score of the experimental class postest was 71.66 and the control class was 60.66. Based on the results of the t postes test, a calculation of > ttabel = 2,747 > 1,672 with α = 0.05 was obtained so that Ha was accepted and H0 was rejected. So it can be concluded that there is an effect of problem-based learning models on student learning outcomes on human skeletal system material in class VIII SMP N 14 Medan.

INTRODUCTION

Education is one of the important elements in advancing a nation and country. Education is a basic requirement and needed by the children of the Indonesian. This is certainly by the purpose of the country, which is to educate the life of the nation as stated in the opening of the 1945 Constitution. The progress of a nation depends on the quality of its education. Kristiyanto (2020) said the quality of education can be known and measured from student learning outcomes that are manifested in the values obtained by students. The value of learning outcomes is one indicator that can affect the quality of human resources. Improving the quality of education in Indonesia is trying to be pursued by improving the quality of education, one of which is by updating the curriculum.

In this era, Natural Science Education is oriented towards the development of strategies and solutions to solve problems in everyday life and the formation of student character. In the context of natural science subject, the students should be led into science nature as the way to discover knowledge systematically to master, such as: facts, concepts, principles, discovery process and scientific attitude. To reach it, the students have to be involved actively during instruction process. They have to be involved in certain activities, such as: observing, collecting information, identifying, making hypothesis, testing hypothesis and drawing conclusion. By doing those activities, the students can have critical thinking in understanding science concept. In the end, high learning outcome can be achieved (Sarya *et all*., 2019).

Based on the results of initial observations and interviews with one of the Natural Science teachers at SMP Negeri 14 Medan, it is known that the results of the evaluation tests of some students were still below the pass minimum completeness criteria, which was under the grade of 70. Researchers obtained report card data where from 30 students, there were 18 students who had scores below the minimum completeness criteria. Besides that there is one of the problems experienced by learners namely, students are less actively involved in the learning process of Natural Science. Students gain more knowledge delivered by teachers. This can make some students difficult to develop their abilities and cause students to lack understanding of the material delivered during the learning process of Natural Science.

In addition, the responsibility of students in doing the tasks of the teacher is still low. Students are also less interested in the lessons of Natural Science. This can be seen from the active participation of students in learning. What is more, the learning applied in the school uses conventional learning models that the learning done by teachers is still *teacher-centered*. This certainly has an impact on the learning outcomes and motivation of students.

Seeing the influence of passivity, then a teacher must be able to choose the right learning model by the learning material so that the planned learning goals can run optimally. The learning model has advantages and disadvantages therefore teachers must be able to choose the model to be used in accordance with the material taught. Choose an attractive learning model, which can create an atmosphere of student activity and become student-centered. One learning model that can activate students and become student-centered learning in the learning process is the Problem Based Learning (PBL) model. This is supported by Sudini (2018) which says that the PBL learning model can be used for science learning on human respiratory system material to make students can participate more in the learning process so that it has a positive impact on learning outcomes.

Glazer (2001) explained that the PBL learning model is one of the models of solving a problem and finding the right solution to the problem. Problem-based learning is an ideal learning approach that teachers can use to help students determine solutions to non-routine problems (Strobel & van Barneveld, 2009). Sani (2015) also added that the PBL learning model has the characteristics centered on problem solving that students will solve in training them to think critically. PBL has the enigmatic nature of problem drives students' curiosity and learning. In solving problems, students work in groups to discuss and examine the problem; engender learning goals which will be subjected for further investigations; use learning goals to guide them in self-directed learning and in gathering data; and return to their group and analyze and synthesize the gathered information to come up with the best solution (Funa, 2021).

The use of the PBL learning model invites students to be active in learning to contribute to the improvement of students' learning outcomes. A model can be seen from the interrelationship between the learning model applied with the

subject matter. The essence of the Problem Based learning model is to present problems that are authentic and have meaning to students who support students to conduct investigations (Arends, 2012). The essence of the PBL model can show relevance to respiratory system material in humans related to authentic problems around or the daily environment of learners. PBL is student- centered learning (and curricular) approach that empowers students to conduct research, integrate theory and practice, and apply knowledge and skills to develop feasible solution to the specified problems (Savery, 2006).This study aims to determine to find out if there is an effect on the use of problem-based learning models on learning outcomes on human skeletal system materials in class VIII at SMPN 14 Medan

METHOD

This research was conducted at SMP Negeri 14 Medan in the academic year 2022-2023. This research method uses quasi-experiment method with a two-group pretest-postest group design. The population in this study were all VIII (Eight) grade students of SMP Negeri 14 Medan.

The sampling technique in this study used simple purposive sampling as many 60 students with 30 students class VIII-1 as class experiment and 30 students class VIII-2 as class control. The data collection technique used in this study was learning outcomes test with 20 multiple-choice questions as pretest and postest questions which were previously carried out with validation test , realibility test , differentiating power test, and the level of difficulty of the questions

RESULT

This study aims to determine whether or not there is an effect of problem-based learning models on learning outcomes on class VIII human skeletal system material at SMPN 14 Medan. The population in this study were all eighth-grade students of SMP Negeri 14 Medan T.P 2022/2023 which consisted of 6 classes totaling 182 people. Sampling was done by cluster random sampling, that is, each class has the same opportunity to be used as a sample. Of the 6 classes that became the sample of this study, 2 classes, namely 1 experimental class applied Problem Based Learning model and 1 control class applied direct learning.

Before the two samples were given a different treatment, a pretest was given which aims to determine the initial ability of each student in the two classes and to find out that the two classes were normally distributed and homogeneous.

Furthermore, different learning is carried out, namely the learning process using the Problem Based Learning Model in the experimental class and Direct Learning in the control class. At the end of the learning process, a final test (posttest) will be given to determine student learning outcomes after being given treatment. Data from the pretest results of the experimental class and control class are shown in Table 1.

Table 1. Average Pretest Value of Experiment Class and Control Class

Experiment Class				Control Class			
Score	f_i	$\overline{X}$	S	Score	f_i	$\overline{X}$	S
25	4			20	3		
35	1			30	4		
40	3			35	5		
45	4			40	4		
50	7	49.0	13.74	50	4	44.66	15.75
55	5			55	5		
60	3			60	2		
75	2			75	2		
80	1			80	1		
Tota	30			Total	30		

Based on the results of the study conducted, the average score of the experimental class pretest was 49 and the average value of the control class pretest was 47.71. Based on the data of the pretest results of the experimental class students and the control class, the normality test and the homogeneity test of the pretest data were first carried out. The calculation results show that the pretest data is normally distributed and homogeneous, so the data hypothesis test is carried out using the t test. In summary, the hypothesis test of data using the t test can be seen in Table 2.

Table 2. Results of Two-Party t-Test on Pretest

Data	Average	t_{count}	t_{tabel}	Con-clusion
Experimental class pretest	49	1.118	2.002	H_0 Accepted
Control class pretest	44.66			

Based on table 2, it is obtained that for the pretest value $t_{count} < t_{table}$, namely 1.118 < 2.002, it can be concluded that the initial ability of students in the experimental class is the same as the initial ability of students in the control class. The next step

taken by researchers is to provide treatment using a problem-based learning model in experimental classes and conventional learning in control classes. After the two classes were given different treatments, both samples were given postes to see the student's final ability. The results of post-test students in the experimental class and control class are summarized in table 3.

Table 3. Post-test results of students in the experimental class and control class

Experiment Class				Control Class			
Score	f_i	$\overline{X}$	S	Score	f_i	$\overline{X}$	S
30	1			30	2		
40	0			40	3		
45	2			45	0		
50	3			50	5		
60	2			60	5		
65	0	71.66	15.77	65	4	60.66	14.704
70	5			70	4		
75	3			75	3		
80	5			80	3		
85	5			85	1		
90	4			90	0		
Total	30			Total	30		

Based on the results of the postes of the two classes, the normality test and the homogeneity test of the postes data were first carried out. The calculation results showed that the postes data were normally distributed and homogeneous, so a hypothesis test of postes data was carried out using one party's t test to determine the effect after being given different treatment on the two classes. The results obtained are shown in Table 4.

Table 4. Posttest Hypothesis Testing Results

Data	Average	t_{count}	t_{tabel}	Conclusion
Experiment	71.66			
Control	60.66	2.747	1.66	H_a Accepted

Based on table 4. obtained the posttest value $t_{count} > t_{table}$ which is 2.747 > 1.66 then H_0 is rejected and H_a is accepted, in other words, it can be concluded that there is an effect of the PBL model on the learning outcomes of class VIII SMP 14 Medan students on the human skeletal system material.

DISCUSSION

The average value of the initial test (pretest) of students in the control class was 44.66 and in the experimental class was 49. Based on the results of the normality test calculations and the results of the homogeneity test calculations, data was obtained that the two samples were normally distributed and had homogeneous variances. Then the pretest t-test analysis was carried out with $t_{count} < t_{table}$ (1.118 < 2.002), and it was concluded that the initial abilities of the two classes were the same before being given treatment.

In carrying out the research, researchers followed the phases of the PBL model which were in the core learning activities proposed by Rusman (2014) which consisted of 5 phases, namely (1) student orientation to problems, and (2) organizing students to learn. (3) assisting individual group investigations (4) developing and presenting the work; and (5) analyzing and evaluating the problem-solving process.

The use of the PBL model during the learning process certainly has a good impact or influence on students' abilities, because each stage or phase of the problem-based learning model can foster and develop skills in observing, collecting and processing data, formulating explanations, making and testing hypotheses, designing experiments and conclude.

This then supports the ability of students who use the PBL model better than direct learning. It can be seen that the student's final learning outcomes or posttests in the experimental class were higher than the control class. In short, the experimental class learning outcomes obtained an average post-test score of 71.66 and an average post-test score of 60.66 for the control class. Through the results of the t-test calculation, it was obtained that there was a significant difference in the average posttest value with t_{count} 2.747 and t_{table} 1.672 because $t_{count} > t_{table}$ (2.747 > 1.672) which means that there are differences in student learning outcomes due to the influence of problem-based learning models on the subject matter of the human movement system. in class VIII SMP Negeri 14 Medan. This research is supported by the research of Irwanuddin and Dwikoranto (2017), which states that student learning outcomes are better by applying the PBL model because it can make students more active in learning.

Judging from the Minimum Completeness Criteria (KKM) set by the school, which is 70, 73.33% in the experimental class has reached the KKM while in the control class it is only 36.66%. and more precisely, students are not used to learning independently. In addition to learning and

independent learning models, some factors influence student learning outcomes, including intelligence, readiness, memory, scientific attitudes, health, fatigue, and the environment (Slameto, 2010). This statement is also supported by the research of M. Andi Tiadarma (2017) which says that the value of student learning outcomes that have not reached the KKM is due to the learning that has been running so far generally still being dominated by teachers while learning using the PBL model encourages students to study independently so that for some students it will be difficult to adapt to independent learning.

The PBL model is a model in which students focus on presenting a real problem related to everyday life (Arends, 2008) Students are required to solve the problem by conducting a series of research and investigations based on theories, concepts, principles of the human skeletal system independently or in collaboration and cannot be separated from the direction of the researcher. Therefore, students have developed critical thinking skills and honed their skills in solving real problems. This is evident from the increased activity of students in asking questions. answer questions during learning and improve student learning outcomes. The research of Putra Irawan, *et al* (2017) and Purnomo (2019) supports this research by stating that the use of the PBI model. in presenting a problem with events in everyday life can bring students interested in solving the problem, making it easier for students to understand a concept.

During the study, the PBL model was very helpful for students in accepting and understanding science lessons because the PBL model was a learning approach where students worked on problems related to everyday life with the intention that students easily understand the material this is in line with Zakaria's opinion (2019) PBL has a positive impact on education and can be used as an alternative method at every level of education. However, there are still obstacles in applying the PBL model in this study which causes the achievement of learning outcomes to be less than optimal. These constraints, such as 1) lack of experience of researchers in managing time so that there is a shortage of time. This can be seen in the third phase where the lack of time for the implementation of the practicum is not following the expectations of the researchers so it affects the fourth phase when the implementation presents the results of the discussion which can only show 3

groups of 6 groups. 2) Students are still a bit awkward in learning seen at the first meeting and are still less active than the next meeting. Therefore, the researchers tried to overcome this by appointing students to provide opinions or questions. 3) Students lack confidence in their abilities so students tend to ask researchers. This is because students are used to the lecture method, where the teacher is the main source of knowledge gained by students. 4) Less conducive school conditions are caused by school rehabilitation activities that it interferes with student focus when studying.

Based on these obstacles, it is suggested to further researchers make plans as clearly as possible and prepare the devices to be used, can make the class conducive when learning takes place in a more assertive way in directing students, and use the PBL model to increase students' memory of the material. being taught, and because of the large number of students and activities to be observed, it is advisable to have one observer for each study group to be effective.

CONCLUSIONS

Based on the results of research and discussion It can be concluded that There is an effect of the Problem Based Learning learning model on student learning outcomes on the material of the human skeletal system in class VIII of SMP Negeri 14 Medan.

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