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The Effect of Problem-Based Learning on Concept Mastery and Scientific Attitudes of Fifth Grade Students

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh pembelajaran berbasis masalah terhadap penguasaan konsep dan sikap ilmiah siswa. Penelitian ini merupakan penelitian quasi eksperimen dengan desain nonequivalent control group design. Populasi dalam penelitian ini merupakan seluruh siswa kelas V SD Aisyiyah Muhammaiyah 3 Makassar. Teknik sampling dilakukan melalui sampling jenuh. Pengumpulan data dilakukan melalui teknik tes, angket, dan observasi. Data dianalisis melalui analisis deskriptif dan inferensial yaitu uji independent t test. Hasil penelitian menunjukkan bahwa pembelajaran berbasis masalah berpengaruh signifikan terhadap penguasaan konsep dan sikap ilmiah siswa kelas V SD Aisyiyah Muhammadiyah 3 Makassar.

Kata Kunci: *pembelajaran berbasis masalah, penguasaan konsep, sikap ilmiah*

Abstract

The purpose of this research was to describe the effect of problem-based learning on students' mastery of scientific concepts and attitudes. This type of research is a quasi experimental research with nonequivalent control group design. The population of this study were 50 students of class V SD Aisyiyah Muhammadiyah 3 Makassar. The sampling technique was carried out through saturated sampling. Data were collected through test, questionnaires, and observation techniques. Data were analyzed through descriptive and inferential analysis, namely the independent t test. The results showed that problem-based learning had a significant effect on the mastery of scientific concepts and attitudes of fifth grade students at SD Aisyiyah Muhammadiyah 3 Makassar.

Keywords*: problem-based learning, concept mastery, scientific attitude*

Introduction

Essentially, learning is not just remembering what is learned but also understanding what is learned. This is called concept mastery. Concept mastery is students' ability to understand concepts after learning activities (Rohani, 2016). Concept mastery can be interpreted as the ability of students to understand meaning scientifically, both in theory and everyday

life. The indicator of concept mastery is that a person can be said to have mastered a concept if that person really understands the concept he is studying, so that he is able to explain it using his own words in accordance with the knowledge he has, but does not change the meaning. Good mastery of concepts enables students to think at a higher level.

Depdiknas (2006) states that there are three abilities in science, namely the ability to know what is observed, the ability to predict what has not happened, and the ability to test follow-up experimental results, as well as the development of scientific attitudes. Thus far, there has been a tendency for teachers to view science learning only as a collection of products and to forget other aspects, one of which is scientific attitude. In fact, in the process of teaching and learning science, concept development cannot be separated from the development of scientific attitudes. In fact, in the process of teaching and learning science, concept development cannot be separated from the development of scientific attitudes. This is because science learning is built based on scientific products, processes and attitudes (Trianto, 2009). Thus, the formation of scientific attitudes is one of the goals of science learning.

A scientific attitude is a way of thinking logically and clearly without distraction, meaning that it does not accept any reality that does not have relevant evidence (Candrasekaran, 2014). A Scientific attitude is defined as a tendency, readiness, willingness, or someone to respond, act, or behave scientifically, and meet the requirements (laws) of science that have been recognized as truth. Scientific attitude is an approach to solving problems and assessing ideas or information to make decisions (Damanik et al., in Bahriah, 2016).

Mastery of scientific concepts and attitudes are two very important elements in science and are interconnected (Pratiwi et al, 2021). The scientific attitude helps the learning process to be more structured so that the knowledge gained is more organized and conceptual (Astalini et al, 2019). Good concept mastery should make it easier for them to achieve the minimum completeness criteria (KKM) that has been set by the school. A person is said to have mastered the concept of material if that person understands well the concept of the material being studied so that he is able to explain it again with his own version in accordance with the knowledge he has. (Virgana, 2018). However, in reality, based on the results of pre-research observations at research locations, many students' science learning outcomes were still under the KKM. This shows that students' mastery of concepts is still low. Judging from a scientific attitude, during learning many students are not interested in asking questions, answering sober questions,

Improving mastery of science concepts can be done by teachers by concocting learning activities that involve students so that students can easily understand the concepts being taught. One way is to apply a problem-based learning model. Problem-based learning is a student's approach to authentic problems so that they can construct their own knowledge, develop science and inquiry skills, build student independence and self-confidence (Arends in Saputra, 2021). Through the problems presented, the teacher directs students to solve these problems so that this model is considered capable of increasing students' mastery of concepts. This is reinforced by several research results which show a positive influence of problem-based learning models on increasing students' mastery of concepts (Nurmantoro et al, 2022; Amrullah, 2017).

The existence of a positive effect of problem-based learning models on students' mastery of concepts makes researchers interested in implementing these learning models in research locations. In addition, the characteristics of the problem-based learning model also seem to be able to influence students' scientific attitudes so

that through this research, researchers will prove the effect of problem-based learning models on students' mastery of scientific concepts and attitudes in science learning.

Method

This research is a quasi-experimental study with a nonequivalent control group design consisting of two groups, namely the experimental and control groups. The research was conducted at Aisyiyah Muhammadiyah 3 Elementary School, Makassar City. The research population is all students of class V, amounting to 50 students. Sampling was carried out by total sampling so that all populations were research samples. the sample in the study was class students. Data collection was carried out through observation, tests, and questionnaires. Data were analyzed descriptively and inferentially, namely the independent sample t test.

Results and Discussion

The problem-based learning model is applied to the experimental group while the control group uses conventional learning methods. However, before the experimental group was given treatment, a pretest was first carried out in both the experimental and control groups. The pretest results are presented in table 1 below.

Table 1. Results of Pretest Analysis of Mastery of Concepts

Score Range	Experiment		Control		Categori
	F	(%)	F	(%)	
90 - 100	0	0	0	0	Very High
80 - 89	0	0	0	0	High
70 - 79	0	0	0	0	Moderate
60 -69	5	20	4	16	Low
0 - 59	20	80	21	84	Very Low
Total	**25**	**100**	**25**	**100**	

Based on table 1, it can be seen that the pretest results of the experimental group were not much different from the control group. Neither students in the experimental nor control groups were in the medium, high, and very high categories. While the percentage of students in the very low category is very large, around 80%. The results of the analysis at the posttest stage can be seen in table 2 below.

Table 2. Posttest Analysis Results Mastery of Concepts

Score Range	Experiment		Control		Categori
	F	(%)	F	(%)	
90 - 100	10	40	3	12	Very High
80 - 89	9	36	7	28	High
70 - 79	3	12	5	20	Moderate
60 -69	2	8	7	28	Low
0 - 59	1	4	3	12	Very Low
Total	**25**	**100**	**25**	**100**	

Based on table 2, the posttest results showed an increase in both groups. However, the increase in the experimental group was more significant than the control group. The percentages in the very high category and the high category in the experimental group were greater than in the control group. While the percentages in the moderate, low and very low categories in the experimental group were smaller than the control group.

Next, the results of the pretest and posttest analysis of students' scientific attitudes were presented which were collected through a questionnaire technique. The results of the pretest stage analysis are presented in table 3 below.

Table 3. Results of the Pretest Phase Scientific Attitude Questionnaire Analysis

Scpre Range	Experiment		Control		Categori
	F	(%)	F	(%)	
86 - 100	0	0	0	0	Very High
76 – 85	4	16	2	8	High
60 – 75	21	84	23	92	Moderate
55 -59	5	20	0	0	Low
≤ 54	0	0	0	0	Very Low
Total	**25**	**100**	**25**	**100**	

The results of the pretest stage scientific attitude questionnaire analysis in table 3 show that the scientific attitudes of

students in the control group are not much different. The percentage of scientific attitude in the medium category is much larger, around 80 to 90%, than the percentage in the high category. There are no students who are in the very high, low, or very low categories.

Tabel 4. Results of Posttest Stage Scientific Attitude Questionnaire Analysis

Scpre Range	Experiment		Control		Categori
	F	(%)	F	(%)	
86 - 100	17	68	3	12	Very High
76 – 85	8	32	22	88	High
60 – 75	0	0	0	0	Moderate
55 -59	5	20	0	0	Low
≤ 54	0	0	0	0	Very Low
Jumlah	**25**	**100**	**25**	**100**	

The posttest scientific attitude questionnaire analysis showed an increase in both groups. However, the increase in the experimental group was different from the control group. The increase in scientific attitude in the experimental group was more significant than in the control group. The percentage in the very high category of the experimental group was 68%, far greater than the control group, which was 12%. Meanwhile, in the high category, only 32% remained in the experimental group and 88% in the control group.

Normality Test

The results of the normality test for mastery of the concept through Kolmogorov Smirnov in the experimental group obtained a significant value of 0.85 and the control group obtained a significant value of 0.200. The two significant values are greater than 0.05 so that the mastery of the concept data is normally distributed.

Furthermore, the results of the normality test of students' scientific attitude data in the experimental and control groups obtained a significant value of 0.200 > 0.05 and were declared normally distributed.

Homogeneity Test

Homogeneity test was carried out through the Levene Statistical test. The control and experimental group's conceptual mastery data obtained a significant value of 0.172 while the scientific attitude data obtained a significant value of 0.318. The two significant values of conceptual mastery and scientific attitude data are > 0.05 so that the data is declared homogeneous.

Independent Sample t Tes

Based on the independent t test data mastery of the concept obtained a significance value of 0.002 <0.05 so that it was stated that there was an effect of problem-based learning on students' mastery of concepts. The scientific attitude data obtained a significance value of 0.00 <0.05 so that it was stated that there was an influence of problem-based learning on students' scientific attitudes.

The results showed that the application of a problem-based learning model could improve the mastery of scientific concepts and attitudes of fifth grade students at SD Aisyiyah Muhammadiyah 3 Makassar. The results of this study support several relevant previous studies, that problem-based learning has a significant effect on students' mastery of concepts (Nurmantoro et al, 2022; Amrullah, 2017).

There is a significant influence of problem-based learning on students' mastery of concepts and scientific attitudes apparently due to the problem-based learning model requiring students to be able to understand and solve problems. Students try to find their own answers to the problems they face so that the answers to these problems will be memorable in the students' memory.

The problem-based learning model is an instructional method that challenges students to learn, working with groups to find solutions to real problems. This problem is used to relate the curiosity and

skills possessed by students in solving the problems they face. The problem-based learning model prepares students to think and be analytical as well as their skills in finding and finding solutions using appropriate learning resources.

This is in line with constructivism theory that students are able to create meaning from what they learn (Hill in Suparlan 2019). Furthermore Shymansky (in Suparlan, 2019) also explains that students will be able to apply the concepts they acquire in everyday life if they understand the things they learn. Therefore, problem-based learning not only improves students' mastery of concepts but also students' scientific attitudes.

Conclusion

Based on the results of the study it can be concluded that the problem-based learning model can improve students' mastery of scientific concepts and attitudes significantly.

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