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Improving the Scientific Attitude of Elementary School Students Through Problem-Based Learning

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ABSTRAK

Pembelajaran sains di jenjang sekolah dasar (SD) masih menghadapi berbagai kendala sampai saat ini. Kendala yang dihadapi ini disebabkan oleh minat dan motivasi belajar yang masih rendah, aktivitas-aktivitas dalam pemebalajaran masih monoton atau konvensional, dan kendala lainnya. Penelitian ini bertujuan untuk menginvestigasi pengaruh pendekatan pembelajaran berbasis masalah (PBL) terhadap sikap ilmiah siswa di sekolah dasar (SD). Penelitian ini menggunakan desain penelitian eksperimen dengan kelompok kontrol acak. Populasi penelitian ini adalah siswa kelas V. Sampel penelitian terdiri dari 38 siswa yang terbagi menjadi dua kelompok, yaitu kelompok eksperimen dan kelompok kontrol. Data dikumpulkan melalui beberapa metode, yaitu nilai ulangan harian dan angket sikap ilmiah siswa. Analisis data dilakukan dengan menggunakan uji statistik yang sesuai. Untuk membandingkan perbedaan prestasi siswa antara kelompok eksperimen dan kelompok kontrol, nilai rata-rata ulangan harian sebelum dan setelah perlakuan dibandingkan. Sedangkan perbedaan sikap ilmiah antara kedua kelompok dianalisis menggunakan uji ANOVA satu jalur setelah memastikan normalitas sebaran data dan homogenitas varian antar kelompok. Hasil penelitian menunjukkan bahwa siswa yang mengikuti pendekatan PBL memperoleh skor yang lebih tinggi daripada mereka yang mengikuti pendekatan konvensional dalam hal sikap ilmiah. Implikasi penelitian ini adalah memberikan kontribusi dalam pengembangan pembelajaran sains di sekolah dasar dengan fokus pada pengembangan sikap ilmiah, motivasi, kreativitas, dan pemikiran kritis siswa.

ABSTRACT

Learning science at the elementary school level still faces various obstacles. These obstacles are caused by low interest and motivation in learning, activities in learning that are still monotonous or conventional, and other constraints. This study aims to investigate the effect of problem-based learning (PBL) approach on students' scientific attitudes in elementary school. This study used an experimental research design with a randomized control group. The population of this study was grade V students. The research sample consisted of 38 students who were divided into two groups, namely the experimental group and the control group. Data was collected through several methods, namely daily test scores and student scientific attitude questionnaires. Data analysis is carried out using appropriate statistical tests. To compare the difference in student achievement between the experimental group and the control group, the average daily test scores before and after the treatment were compared. Meanwhile, differences in scientific attitudes between the two groups were analyzed using the one-track ANOVA test after confirming the normality of data distribution and homogeneity of variants between groups. The results showed that students who followed the PBL approach obtained higher scores than those who followed the conventional approach in terms of scientific attitudes. The implication of this research is to contribute to the development of science learning in elementary schools with a focus on developing students' scientific attitudes, motivation, creativity, and critical thinking.

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1. INTRODUCTION

Nowdays science learning at the elementary school level still faces various obstacles (Parmiti et al., 2021; Wulandari et al., 2020). This obstacle is caused by low interest and motivation to learn, students are not enthusiastic about participating in science lessons because the teacher is fierce in teaching. Another problem is that the teacher's learning strategies and learning models are not adapted to the needs of students. In addition, learning resources are limited, and activities in learning are still monotonous or conventional (Jumanto & Widodo, 2018; Wakhidah, 2016). This situation needs to be responded to by developing science learning models that are able to motivate students, make them creative, innovative, so that students do not feel compelled to learn but instead enjoy learning which in the end they learn meaningfully. Learning should be able to maintain and even trigger growth and increase in motivation, creativity, discipline, critical thinking, and student science learning outcomes. Learning should be able to involve students in learning (student-centered), and not involve teachers in learning (teacher-centered) (Pradita et al., 2022; Pujawan et al., 2022).

An approach or learning model is needed in order to maximize students in gaining new knowledge in their learning (Hotimah, 2020; Purwoko, 2017). The learning approach is one of the determining factors for student learning success (Gunawan et al., 2019; Kristin, 2016; Syafi'i et al., 2018). For this reason, the teacher's prudence in choosing a learning approach is a must, because there is no best approach, there is an approach that suits the characteristics of students and learning materials (Dewi & Prihartanti, 2014; Muhammad, 2014; Neville & Marlatt, 2022). Learning that can be used as an appropriate choice to answer the above constraints is the problem-based learning (PBL) approach. The problem-based learning approach (PBL) is still very popular throughout the world (Raharjo, 2018; Widiyanto, 2018). PBL is an approach to teaching and learning that forms part of a wider spectrum of techniques known as Inquiry-Based Learning (Charlton-Perez, 2013; Fatati, 2021). Some experts explain that the core characteristics of PBL are: (1) student-centered learning; (2) small group learning, constructive, collaborative and competency based; (3) a tutor/teacher is present as a mentor; (4) real-world contextual problems are presented as triggers for learning; (5) problems are used to achieve the required knowledge and problem-solving skills; and (6) new knowledge obtained through independent learning (Maryati, 2018; Mayasari et al., 2016; Putri & Wardani, 2021).

In its implementation, the results of the study show that there is an effect of the use of PBL on learning outcomes in the material for identifying spatial properties in class V SD (Nofziarni et al., 2019; Novita et al., 2016). Student learning outcomes achieved with the PBL approach are in very high criteria. Previous research has also shown that PBL can improve student academic achievement (Rahmat, 2018; Suarni, 2017). Although there was no difference between the experimental and control groups before treatment, students who participated in problem-based learning scored much higher than those who participated in traditional learning in terms of academic achievement and performance skills. Meanwhile, similar research shows that PBL can increase elementary school students' scientific literacy (Aiman & Ahmad, 2020; Mundzir et al., 2017). From the analysis of the resulting data, the PBL model obtains increased results compared to expository learning. The difference between the two models means that the PBL model has a major effect on students' scientific literacy (Aiman & Ahmad, 2020). Similar studies have found that PBL can effectively increase students' motivation to learn science (Suari, 2018; Yasmini, 2021). The positive effects of implementing PBL are also being able to improve students' critical thinking skills, increase students' creativity, and improve students' literacy and numeracy (Haryanti & Febriyanto, 2017; Masliah et al., 2023; Natty et al., 2019; Saputri, 2020).

Although several studies have been conducted on the effectiveness of PBL for various purposes, none of these studies have specifically examined the effects of PBL on scientific attitudes of elementary school students. The purpose of this study was to analyze the effect of PBL on increasing the scientific attitude of elementary school students; evaluating the effectiveness of PBL in increasing student motivation and interest in learning; identify changes in students' attitudes towards science before and after implementing PBL; provide recommendations for teachers and schools in implementing PBL in science learning; improve understanding of the importance of students' scientific attitudes and their influence on science learning outcomes. This research is expected to help understand the influence of PBL on the scientific attitude of elementary school students; reveal the benefits and effectiveness of PBL in increasing student motivation and interest in learning; demonstrate the role of PBL in enhancing students' creativity and critical thinking; reveal the increased understanding of students' scientific concepts through PBL; describe students' responses to the use of PBL in science learning; identify challenges and obstacles in the implementation of PBL in elementary schools; provide useful recommendations for educators and policy makers in the development of science learning in elementary schools.

2. METHOD

This study used an experimental design with a randomized control group. The class involved in this study was randomly divided into two groups, namely the experimental group and the control group. The participants in this study were fifth grade students from six elementary schools located in Marga. The total number of participants was 38 students, with 12 male students and 26 female students. These students were divided into

two groups randomly. Two learning approaches are used in this study, namely the problem-based approach (PBL) and the conventional approach. The experimental group received learning with the PBL approach, while the control group received learning with the conventional approach. The material studied in this study is related to theme 7, namely Events in Life. This material is integrated with the subjects of Indonesian Language, Social Sciences, Natural Sciences, and Citizenship Education in accordance with the number of basic competencies determined. This research was conducted in the Gusus 3 Marga elementary school which consisted of 6 schools, namely: SD Negeri 2 Marga, SD Negeri 3 Marga, SD Negeri 1 Marga Dauh Puri, SD Negeri 1 Marga Dajan Puri, SD Negeri 2 Marga Dajan Puri, SD Negeri 1 Kuwum, SD Negeri 2 Kuwum.

Data was collected through several methods, including: (1) Daily Test Scores: Data on students' average daily test scores before treatment were collected as an initial indicator of student achievement; (2) Scientific Attitude Questionnaire: The researcher developed a student scientific attitude questionnaire consisting of 40 statements with 4 indicators. This questionnaire was tested for validity and reliability before being used. The experimental group received learning with the PBL approach, while the control group received learning with the conventional approach. These classes receive the same material each week over a four-week period. The collected data will be analyzed using appropriate statistical methods. To test differences in student achievement, the average value of daily tests before and after treatment will be compared between the experimental group and the control group. In addition, data from students' scientific attitude questionnaires will be analyzed using a one-way ANOVA test to see differences in scientific attitudes between the two groups.

Meanwhile, the student's scientific attitude questionnaire was developed by the researcher taking into account related literature. The questionnaire consists of 40 statement items, with 4 indicators. Before scientific attitude questionnaire are used, experts in science education and measurement were consulted to determine logical validity using Gregory's approach and a value of 0.968 was obtained. After revising the expert's improvement, it is continued by conducting empirical trials to determine the validity and reliability coefficients. The test results show that all statement items are in the valid category and have a reliability coefficient of 0.886 in the very high category. To test the null hypothesis which states that there is no difference in scientific attitude between students who take PBL learning and students who follow the conventional approach are tested with one-way ANOVA, which has previously been tested for normality of data distribution and homogeneity of variance between groups. Where each positive statement item the choice is Strongly Agree = score 5, Agree = score 4, Neutral = score 3, Disagree = score 2, and Strongly Disagree = score 1. Meanwhile for negative statements the opposite applies.

3. RESULT AND DISCUSSION

Result

The average score and standard deviation of scientific attitudes for the experimental group and the control group are presented in Table 1.

Table 1. Average Score and Standard Deviation of the Two Groups

Scientific Attitude	Experiment Group		Control Group	
	Mean	SD	Mean	SD
	85.722	5.22	72.500	5.18

Based on the results of the analysis of the average score and standard deviation of the two groups presented in Table 1, it states that each group has an average daily repetition that is not different (6.6 for the experimental group and 6.8 for the control group). However, students in the experimental group could be better at scientific attitudes compared to the control group. Overall, students in the experimental group are better at learning science, starting to identify what they know, using, integrating, and interpreting relevant information when providing answers to the problems given compared to students in the control group. They can make better interpretations based on the authentic evidence available. Therefore, it is natural that the average score of the scientific attitude of the experimental group students is higher than the average score of the scientific attitude of the control group.

For greater assurance, a scientific attitude questionnaire was administered to students in the experimental group and the control group to determine whether there was a statistically significant mean difference between the two groups, with respect to their scientific attitudes. The results of the One-Way Analysis of Variance (Anova) revealed that there was a statistically significant average difference between the two groups with respect to the dependent variable scientific attitude with a value of F (1.36) = 2.198; F = 61.179; p = 0.001. It can be said that there is an influence of the application of PBL on the scientific attitude of Class V Elementary School students in Cluster 3 Marga, Tabanan, Bali.

Discussion

The results of this data analysis show that the advantages of PBL have been tested experimentally which has led to significantly better scientific attitudes of students than the scientific attitudes of students who follow conventional approaches. Students who take PBL seem to be more proficient in solving a problem systematically through scientific steps that do not know despair and with persistence as well as openness in the use and organization of relevant information, in construction (Guswita et al., 2018; Ulfa, 2016, 2018). Other research shows that students who have relatively less knowledge with PBL will be able to remember more and apply it more efficiently (Astuti et al., 2019; Karmila & Abidin, 2022). Likewise, the results of similar studies state that PBL outperforms conventional approaches on elements that require higher-order thinking skills and can better use relevant information in solving problems, interpreting information and using principles to assess objectively (Budiarsa, 2020; Mutallib, 2014; Sari et al., 2015). The same results also report that PBL improves critical thinking skills, problem solving skills, and decision making skills (Fakhriyah, 2014; Simanjuntak & Sudibjo, 2019). So it is not surprising that the results of this study also show the advantages of PBL compared to conventional approaches in its effect on students' scientific attitudes.

In its implementation, the results of the study show that there is an effect of the use of PBL on learning outcomes in the material for identifying spatial properties in class V SD (Nofziarni et al., 2019; Novita et al., 2016). Student learning outcomes achieved with the PBL approach are in very high criteria. Previous research has also shown that PBL can improve student academic achievement (Rahmat, 2018; Suarni, 2017). Although there was no difference between the experimental and control groups before treatment, students who took problem-based learning scored much higher than those who took traditional learning in terms of academic achievement and performance skills. Meanwhile, similar research shows that PBL can increase elementary school students' scientific literacy (Aiman & Ahmad, 2020; Mundzir et al., 2017). From the analysis of the resulting data, the PBL model obtains increased results compared to expository learning. The difference between the two models means that the PBL model has a major effect on students' scientific literacy (Aiman & Ahmad, 2020). Similar studies have found that PBL can effectively increase students' motivation to learn science (Suari, 2018; Yasmini, 2021). The positive effects of implementing PBL are also being able to improve students' critical thinking skills, increase students' creativity, and improve students' literacy and numeracy (Haryanti & Febriyanto, 2017; Masliah et al., 2023; Natty et al., 2019; Saputri, 2020).

The main principle that distinguishes PBL from other approaches, especially the conventional approach is how PBL can position students as learning centers by providing problems that are appropriate to the lives of students related to the material provided. As stated by previous researchers that in PBL the focus is on students as knowledge constructors, in a context they will use this knowledge (Gula, 2017; Rusliah, 2021). In PBL it allows students to interact with the learning environment and other learning resources including friends in class, work in small groups cooperatively, academics sharing, construct new knowledge independently through authentic problems given, and desire to solve problems. It is this indicator that allegedly causes students' scientific attitudes to be better with PBL compared to the conventional approach.

4. CONCLUSION

The results of this study further confirm the advantages of PBL compared to conventional approaches in its effect on students' scientific attitudes. PBL is a learning approach that positions students as learning subjects not as learning objects, meaning that students learn cooperatively, examine authentic problems, construct knowledge independently, and train higher-order thinking skills. For this reason, it is recommended that the PBL approach which is able to train students' higher-order thinking skills be integrated into the curriculum and starts from the lower grade level so that students' higher-order thinking skills develop early.

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