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THE EFFECT OF PROBLEM BASED LEARNING MODEL WITH SCIENTIFIC LITERACY ON STUDENTS COGNITIVE LEARNING OUTCOMES IN CLASS VII ECOLOGY MATERIAL AT SMP NEGERI 12 MEDAN

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ABSTRACT

The Study aims to determine the effect of the problem based learning model with scientific literacy on students cognitive learning outcomes in ecology material. Population in the study were all students of class VII of SMP Negeri 12 Medan consisting of 9 classes with a total of 284 students. The Sample was taken from one class, namely the experimental class VII-2 with a total of 30 students. Type of research is quantitative research with pre experimental and research design used is one group pre-test and post-test design. Data analysis technique used the paired sample t-test hypothesis test using SPSS Statistics 25 software. Average and standard deviation pretest is 39.06 ± 8.77 and the posttest is 86.63 ± 7.22. Results of the hypothesis test obtained results with Sig. value data (2-tailed) of 0.000<0.05, the hypothesis Ha is accepted and H0 is rejected. The conclusion is that the problem based learning model with scientific literacy has an effect on students cogntive learning outcomes in the ecology material of class VII at SMP Negeri 12 Medan.

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INTRODUCTION

Science learning is learning that can encourage students' thinking skills towards an attitude of curiosity regarding living creatures, other objects around them and new problems that occur by knowing the causes and effects and finding solutions through appropriate procedures. In science, the process of solving problems using the scientific method is also studied, which includes formulating hypotheses, designing experiments, evaluating, measuring and drawing conclusions. The products of this process are facts, principles, theories. How to apply science by implementing scientific methods and science concepts in everyday life is something that is very necessary in science (Indrawati and Nurpatri, 2022: 226).

Learning outcomes are changes in an individual's abilities that are observed by measuring the results obtained in learning by producing changes in insight, attitudes and skills. The aim of obtaining student learning outcomes is to find out the abilities they have through the process of learning activities in the classroom which includes insights, attitudes and skills possessed and mastered by students (Marwah et al., 2021: 43). According to Suparya et al (2022: 156), students' scientific literacy abilities have a positive influence on students' cognitive abilities. Learning using scientific literacy has an influence on increasing student learning outcomes. Nugraha (2022: 157) reports that there is a relationship between scientific literacy skills and students' science learning outcomes of 0.937 with very strong criteria, so that scientific literacy skills are directly proportional to students' science learning outcomes.

Interviews with science subject teachers at SMP Negeri 12 Medan revealed that the Problem Based Learning model had not been implemented well. The learning methods used by teachers still lack variety, meaning learning outcomes and students' interest in participating in science learning are still low. Students have never been involved and interacted directly with the environment. Students more often discuss assignments from printed books in class, memorize material and the learning process still places the teacher as the center. The learning model used by teachers is still not oriented towards improving learning outcomes. The factors behind the low learning outcomes are the lack of student learning resources, facilities and infrastructure as well as minimal learning models and methods that increase students' interest when studying. Science learning tends to center on textbooks which describe science as a collection of information, facts, generalizations that require memorization (Broderick, 2023: 4). Students in Indonesia are only able to memorize material without applying it, making students' scientific literacy low (Rohmah and Hidayati, 2021: 364).

In class VII, ecological material is one of the materials that raises problems in the environment around students, which can be applied to the PBL model which uses environmental learning resources to improve students' skills when solving problems. The learning process in this material involves students memorizing many concepts so that they are less able to make students active and feel happy in the learning process (Sary et al, 2023: 348). This material requires real objects from the environment as a source of experience to explore learning. Students are actively involved in learning and understand concepts in ecological material (Kurniatin, 2021: 77). According to Robiyanto (2021: 119) PBL is able to develop students' skills when solving real problems faced by students in everyday life, which can increase students' interest in learning the material being studied and can improve students' cognitive learning outcomes. . Based on this description, this research aims to determine the effect of the Problem Based Learning model with scientific literacy on students' cognitive learning outcomes in class VII ecology material at SMP Negeri 12 Medan.

RESEARCH METHODS

This research was carried out at SMP Negeri 12 Medan. Jalan MH Thamrin no. 52, Pasar Center, Medan Kota District, Medan City, North Sumatra 20212. The research was conducted in May-June, Even Semester of the 2023/2024 Academic Year. The entire population of class VII Even Semester of SMP Negeri 12 Medan for the 2023/2024 academic year is distributed into 9 different classes consisting of 284 students. The sample in this research was class VII-2 consisting of

30 students. This type of research is quantitative research with pre-experimental research and the research design is One Group Pre-test and Post-test Design. In this design, it is carried out twice, namely before treatment (O1) called pre-test and after treatment (O2) called post-test.

The research was carried out following the following procedures:

a. Preparatory stage

In the preparatory stage carried out in January 2024, a preliminary study was held at SMP Negeri 12 Medan by conducting interviews with class VII science subject teachers. Researchers compiled teaching modules according to the independent learning curriculum that was being implemented at the school, Student Worksheets (LKPD), and research instruments including test questions validated by experts. Researchers prepared instruments in the form of questions in Class VII science learning in accordance with learning outcomes in ecological material. Researchers validated or tested test instruments on students other than the experimental class in class VIII to determine the validity, reliability, level of difficulty of the questions and the differentiating power of the test items that had been created.

b. Implementation Stage

At the implementation stage carried out in the Even Semester of the 2023/2024 Academic Year, experimental class students were given an initial test (pretest) before being given treatment using the Problem Based Learning model with scientific literacy in the experimental class. The test questions consist of learning outcomes tests on ecology material for Class VII middle school science lessons. After conducting a pretest in the experimental class, the researcher obtained the test results in the sample class. At the next meeting, the researcher provided learning treatment for the experimental class using the PBL model with scientific literacy. The researcher provided treatment or learning activities in 3 meetings in the sample class. When learning using models in experimental classes, researchers use PBL syntax by utilizing the environment as a source of student learning. At the end of the meeting a final test (posttest) was given to measure student learning outcomes in the experimental class. The posttest questions given by the researchers were in the form of test questions on learning outcomes of ecological material that had been created previously to measure students' cognitive learning outcomes.

c. Final Stage

In the final stage the pretest and posttest data are processed to determine student learning outcomes through the Problem Based Learning model with scientific literacy. The students' pretest and posttest scores were checked and the data analyzed by the researcher. Researchers analyzed the data using prerequisite tests, such as normality and homogeneity tests and hypothesis tests were carried out to determine whether there was a significant effect when given pretest and posttest treatment to be able to reject the null hypothesis.

Data analysis in this research consists of prerequisite tests, namely the normality test used is the Shapiro-Wilk test with the help of SPSS Statistics 25 software and the homogeneity test used is the ANOVA (Analysis of variance) test with the help of SPSS Statistics 25 software and the hypothesis test used in This research is a Paired Sample t-test. To test the hypothesis, a significance level of $\alpha = 0.05$ is used. Hypothesis testing is carried out with the help of SPSS Statistics 25 software. The criterion is that if the sig (2-tailed) value is <0.05 then H0 is rejected and Ha is accepted.

RESULTS AND DISCUSSION

Data on students' cognitive learning outcomes before (pre-test) and after (post-test) learning using the Problem Based Learning model with scientific literacy is shown in Figure 1. Students' cognitive learning outcomes increased significantly after learning using the Problem Based Learning model with scientific literacy.

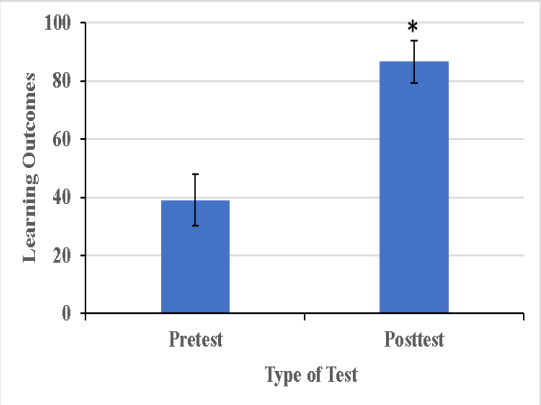

Figure 1. The effect of the PBL model with scientific literacy on students' cognitive learning outcomes (mean ± SD). The sign (*) indicates a significant difference compared to the pretest (paired t-test, $p < 0.05$).

The normality of learning outcome data was tested using the Shapiro-Wilk test. The test results show that both the pretest value (0.225 > 0.05) and the post-test value (0.72 > 0.05), are both normally distributed. The homogeneity test shows that both the pre-test scores and post-test scores are homogeneous. From the hypothesis test it can be concluded that the Problem Based Learning model with scientific literacy influences students' cognitive learning outcomes in class VII ecology material at SMP Negeri 12 Medan.

Students' cognitive learning outcomes were obtained through students' posttest scores after learning in a PBL model class with scientific literacy. Giving a pretest produces low results because students do not understand the material to be studied. It can be seen that when working on the LKPD by carrying out experiments, practicums were carried out in groups, and learning was carried out using the PBL model with scientific literacy in accordance with the learning that had been arranged in the RPP. In improving the cognitive domain of student learning outcomes, there is a significant effect of increasing problem-solving abilities.

The learning process using the PBL model with scientific literacy applied by researchers includes problem orientation, organizing students to learn, guiding investigations, developing and presenting results, analysis and evaluation. The first phase is that the researcher orients students towards the problems presented in the form of problems that students often encounter in everyday life. In the first meeting, the researchers presented a problem in the form of a discourse on food chains in a rice field ecosystem, the second meeting discussed how a plant photosynthesis process can produce oxygen and in the third meeting a picture was given regarding a personal, local and global problem regarding the ecosystem. Students will formulate the problems that occur in the discourse. Students are enthusiastic when presented with problems that are relevant to their lives and the surrounding environment, so that students are able to develop an analysis of the problems given and can build problem-solving abilities. The PBL model conveys learning by presenting a problem, asking questions, and facilitating investigations (Zulfa et al., 2023: 2099).

In the second phase, namely organizing students to learn by bringing students in groups out of the classroom into the environment or school field, students will work on LKPD containing 3 aspects of scientific literacy that have been given with their group friends. The third phase is guiding the investigation of students who experience difficulties in working on the LKPD, and students can ask questions if they find things that the students do not or do not understand. The fourth phase is developing and presenting the results with students formulating the results of the discussion and drawing conclusions from the results of the investigation that has been carried out, as well as representatives of one group of students to present the results of the discussion in front of another group. The final phase is analyzing and evaluating with other groups responding to the results of the group discussion presentation, and jointly concluding the results of the discussion.

The PBL model is a learning model that is designed based on problems that exist in real life and is able to develop students' interests and cognitive abilities and is able to provide students with opportunities to learn in real life surroundings. The results of this research are in accordance with the research results of Sutrisna & Sasmita (2022: 37) concluding that the PBL model is able to provide learning that begins with concrete problems, so that it is able to attract students' attention to learn in class and outside the classroom by implementing contextual problem-based learning. The application of the PBL model in learning activities is not carried out only to transfer knowledge, but is a process that students will experience and construct their own knowledge through the problems they face so that students learn more meaningfully and are able to solve the problems they face (Noviana et al., 2023: 120).

The success of the PBL model is very suitable to be applied in the science learning process because it is able to make students actively involved in the teaching and learning process, so that science learning objectives can be achieved in

solving problems that exist in everyday life contextually. The PBL model is also able to make learning in the classroom student-centered so that students are active, more skilled and creative in searching for and collecting their own information and are able to determine the information that must be studied to help students in the learning process.

Based on the research results, it was found that the PBL model with scientific literacy had an effect on students' cognitive learning outcomes obtained from the results of the hypothesis test that Ha was accepted. This is in accordance with the research results of Elmanazifa & Syamsurizal (2018: 56) concluding that the PBL model with scientific literacy is a learning model that provides problems directly related to real life, so that students are able to be active, have good scientific literacy skills, and have the ability to think. who are critical and have high learning outcomes. The learning process in class that applies the PBL learning model with scientific literacy uses Student Worksheets (LKPD) which is a group exercise technique that is equipped with three aspects of scientific literacy, namely the first meeting contains the knowledge aspect, the second meeting contains the competency aspect, The third meeting contains context aspects. The most important thing in scientific literacy is that students not only know scientific concepts but also can apply scientific skills in solving scientific problems and are able to draw conclusions.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the Problem Based Learning model with scientific literacy has an influence on students' cognitive learning outcomes in class VII ecology material at SMP Negeri 12 Medan. For this reason, science subject teachers are advised to use the Problem Based Learning model with scientific literacy as a learning alternative to help students become more active in class.

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