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Implementation of problem based learning model to improve students' understanding of reforestation and disaster mitigation

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ABSTRACT

This study aims to determine students' understanding of greening and disaster mitigation through the application of problem-based learning model. This research is a quantitative descriptive research. This research was conducted in grade 7 of SMP Negeri Poopo, Rayonapo District, South Minahasa Regency. The results showed that students' understanding of reforestation and disaster mitigation with respondents who became sample members as many as 42 students, as many as 11 students (26%) in the very good category, 20 students (48%) in the good category, 10 students (24%) in the good enough category, 1 student (2%) in the less good category. This means that with problem-based learning, students have a very good understanding of reforestation and disaster mitigation.

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INTRODUCTION

Environmental problems are complex and require serious attention from the entire world community. These environmental problems need to be addressed in a holistic way and involve the participation of the entire world community. Possible solutions include adopting green technology, promoting the use of renewable energy, reducing waste and rubbish, maintaining land and forests, and introducing strict and effective environmental policies. Environmental learning and disaster mitigation are studied in Natural Science subjects which are also related to natural phenomena. Natural Science subjects are a vehicle for students to study the surrounding nature, as well as prospects for further development in applying it in everyday life. Natural Science learning emphasises students to find out and do so that it can help students to gain a deeper understanding of themselves and the natural world (Gultom dkk., 2023; Nuris, 2022).

Environmental stewardship is the awareness and concern of individuals or communities for the condition of the surrounding environment that affects the quality of human life. This concern includes efforts to protect and improve environmental conditions to make them better, healthier, and more sustainable. The relationship between humans and the environment, because according to this view the environment functions as an object and humans as subjects, causes the

environment to be explored and exploited for human interests. If the environment is damaged, it will cause natural disasters. So in the learning process, it is necessary to increase knowledge about disaster mitigation (Anazifa & Hadi, 2016).

Disaster mitigation is an activity carried out before a disaster occurs and which focuses on reducing the impact, as well as preparedness and efforts to reduce the impact of long-term disasters. The importance of increasing knowledge about disasters must be socialised, especially children in adolescence who still do not understand what they should do if a disaster comes. With education, it is also expected that the character of empathy and willingness to protect the environment will develop.(Hayudityas, 2020; Mahulae & Sirait, t.t.).

Environmental awareness is very important in maintaining and improving the quality of the environment through reforestation. Efforts in environmental awareness can help reduce environmental pollution, increase the availability of natural resources, increase public awareness of the importance of the environment, and maintain environmental sustainability. One way to increase awareness of the environment is through education. The role of education in overcoming environmental damage is indispensable. Efforts in the field of education to reduce and prevent environmental damage are by implementing environmental education in learning. Environmental education can be integrated in the subjects taught at school, especially in the learning of Natural Sciences in Junior High School (Dewi dkk., 2023; Fitriati dkk., 2019).

The results of the researcher's interview with the science teacher at SMP Negeri 2 Poopo obtained information that the teacher had never implemented problem-based learning or carried out learning activities in the surrounding environment. Learning is limited to teaching and learning activities at school. This is unfortunate considering that the environment around Poopo Village is very supportive for problem-based learning. Science learning activities at SMP Negeri 2 Poopo still often use lecture and discussion methods, the teacher still acts as a source of information and the centre of learning (teacher centered), the activity of students in teaching and learning activities is still relatively low so that they are less enthusiastic in learning.

These problems in science learning must be overcome so that learning objectives can be achieved. One of the ways that can be taken is by applying a creative and fun learning model. Nowadays, a learning approach is needed that is in accordance with the stages of students' intellectual development and can provide meaning to students. Learning does not always have to be done in the classroom, sometimes learning can also occur outside the classroom, and in the environment.

Environmental education has the following strategies; 1) providing hands-on learning experiences through project-based activities, 2) developing knowledge, understanding, and appreciation of the environment. Environmental education can be implemented outside the classroom (Amini & Munandar, 2010). Environment-based learning for students aims to help students understand the importance of the environment and how to protect it. With environment-based learning, students learn not only by listening to the teacher's explanation, but also by seeing, touching, feeling, and following the whole process of each lesson (Primayana dkk., 2019).

Several studies have proven the success of the problem-based learning model. The results of research conducted by (Lidyawati, 2021) showed that ethnoscience-based problem-based learning model can improve students' learning activities and concept understanding. Similarly, Sarifah Nur Isra Jairina showed that the Problem Based Learning model is effectively used to improve students' problem solving skills (Jairina dkk., 2020).

According to (Lidyawati, 2021) Problem-based learning model can facilitate learners to accommodate and build their own knowledge. Learners can construct their own concepts, principles and rules into new knowledge. Learners are required to use all their potential to solve problems in completing tasks. The ability to solve problems can be divided into five stages. problem identification, including the ability of students to identify cases; problem description, including the ability of students to frame cases into questions; develop alternative solutions;

determine alternative solutions and draw conclusions. (Diana & Makiyah, 2021; Sujiono dkk., 2018).

Based on the things that have been described previously, the researchers are interested in conducting research by applying problem-based learning models to science learning on reforestation material as a disaster mitigation effort. Therefore, it is necessary to conduct research to determine students' understanding of reforestation and disaster mitigation efforts through the application of problem-based learning models. This research is an interesting study to examine the application of problem-based learning models in the classroom, whether problem-based learning models can improve students' understanding of greening and disaster mitigation or problem-based learning models have no impact on increasing students' knowledge. This research can help teachers at SMPN Poopo to improve the quality of learning in the classroom.

RESEARCH METHODOLOGY

The research method used is descriptive quantitative. In this study there is a treatment given, namely problem-based learning. The sample is part of the number and characteristics of the population (Sugiyono, 2019). Sampling in this study used total sampling where all populations were sampled. The sample of this study amounted to 42 respondents consisting of students of SMP Negeri 2 Poopo.

The data collection technique in this study used was in the form of multiple choice questions which were carried out at the end of the lesson. The data analysis technique used in this research is quantitative descriptive analysis where the research method is descriptive with a quantitative approach. Quantitative descriptive data analysis with a percentage using the formula (Sugiyono, 2019):

$$\%=F/N\times100$$

Description: % = Percentage
F = Frequency (number of respondents' answers)
N = Number of respondents

To make it easier to identify data, the ideal mean (Mi) and ideal standard deviation (Si) are used using a scale. Guidelines for determining criteria or classification are as follows:

Above Mi + 1.5 Si = Very Good
Mi s.d < Mi + 1.5 Si = Good
Mi - 1.5 Si s.d < Mi = Good enough
Below Mi - 1.5 Si = Less Good

Description:
Mi = 1/2 (Highest score - Lowest Score)
Si = 1/6 (Highest score - Lowest Score)

RESULTS AND DISCUSSIONS

Research results on greening material in science subjects obtained through test instruments are shown with quantitative data in the following table:

Table 1. Frequency distribution of student understanding

Category	Frequency	%
Very good	11	26
Good	20	48
Good enough	10	24
Not good	1	2
Total	42	100

The data in table 1 above, obtained an overview that the respondents who became sample members as many as 42 students, as many as 11 students (26%) in the very good category, 20 students (48%) in the good category, 10 students (24%) in the good enough category, 1 student (2%) in the less good category. The results of research on reforestation material and disaster mitigation efforts in science subjects obtained through test instruments are shown with quantitative data in the figure below:

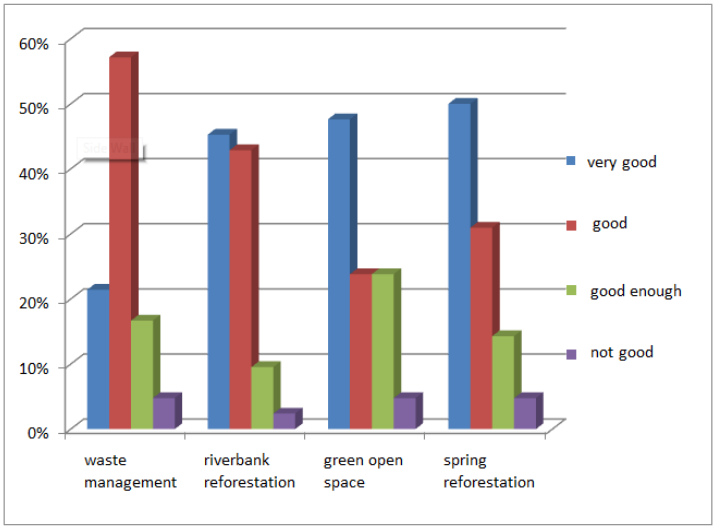

Figure 1. Diagram of students' understanding of disaster mitigation efforts

Based on Figure 1, it can be seen that students' understanding of greening and disaster mitigation with problem-based learning is on average in the very good and good categories. In collecting data, researchers conducted a multiple choice test which was divided into 4 sections. In the first part of the learners' understanding of waste management, most are in the very good and good categories, namely with a percentage of 78%.

In the second section on students' understanding of greening riverbanks, most are in the very good and good categories with a percentage of 88%. In the third part of the learners' understanding of green open spaces, most are in the excellent and good categories with a percentage of 72%. In the fourth section, students' understanding of the greening of springs, most are in the excellent and good categories with a percentage of 81%.

Based on the data above, it can be concluded that the level of understanding of students about greening and disaster mitigation through the application of problem-based learning models is mostly in the good (48%) and very good (26%) categories. This is due to students' learning activities that are in direct contact with nature.

This means that with problem-based learning, students have a very good understanding of greening and disaster mitigation. This is in accordance with research (Nurdyansyah, 2018) and (Mahulae & Sirait, t.t.) which states that the application of problem-based learning can improve students' thinking skills. It can be seen as a solution to change the way students think based on the cognitive level of the students. Next (Primayana dkk., 2019) in his research states that the learning outcomes of students who follow learning with environment-based contextual learning models and students who follow conventional learning in science subjects are significant differences.

Nurhamidah explained that problem-based learning can motivate and assist students in learning through groups and solving problems. Students can also design their own individual

learning strategies or collaborate in teams. So that students as learners can liven up the classroom atmosphere in terms of discussion. (Nurhamidah, 2022).

Next (Nurmiati & Hasan, 2020) He stated that environment-based learning can be used to improve students' skills and learning outcomes because it can create a learning atmosphere that is more fun, more interactive, less boring, effective, and efficient and can foster a sense of love for the environment for greening. This is in line with research (Sahronih dkk., 2020) explained that the learning outcomes of students using environment-based interactive learning media were higher than the learning outcomes of students who studied using non-interactive learning media. This is in line with what was revealed (Arga & Rahayu, 2019) that learning by utilising the environment as a learning resource is better than conventional learning.

The application of problem-based learning assisted by learning resources in the form of student worksheets strengthens students' environmental literacy in identifying, analysing, evaluating, and planning actions and sensitivity to local and global environmental problems. This encourages an increase in students' understanding of reforestation as an effort to prevent natural disasters. With problem-based learning, students understand the importance of preserving the surrounding environment and the environmental conservation efforts they can make to prevent natural disasters. (Dwijayanti & Andri Nugroho, 2023; Niswara dkk., 2019; Suryawati dkk., 2020)

CONCLUSION

Based on the results of research and discussion, it can be concluded that students' understanding of reforestation and disaster mitigation through the application of environment-based problem-based learning models is in the very good and good categories. The highest category of students' understanding level is in the good category. With the problem-based learning model, students have a very good understanding of greening and disaster mitigation. The average percentage results of students' understanding of reforestation and disaster mitigation, most of them have a very good understanding. The results of this study are expected to be used as a basis for further research by exploring more deeply what factors affect the level of understanding of students. This research is still limited to students' understanding of reforestation and disaster mitigation, so it is recommended to other researchers to expand research on concept understanding and critical thinking of students. The contribution of this research is that the results of this study can be a reference for teachers in improving the learning process in the classroom. This research also contributes to the scientific literature by providing insight into the use of learning models in improving student understanding in the classroom.

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