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Development of Science Student Worksheet Based on Mangrove Environmental Resources to Improve Critical Thinking Skills

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Abstract: Innovation in the learning process needs to be carried out, especially in the development of student worksheets. Mangrove environmental resources can be developed into science learning resources, one of which is student worksheets. This research was conducted to determine the effectiveness of natural resource-based science student worksheet in the mangrove environment to improve the critical thinking skills of Coastal Middle School students in East Lombok Regency. The type of research is development research using a one group pre-test post-test design. The research results showed that the LKPD science based on mangrove environmental resources that was developed was effective in improving the critical thinking skills of West Lombok Coastal Middle School students in the medium category (0.61%). Critical thinking skills indicators 1, 2, and 3 are in the high category while indicators 4 and 5 are in the medium category. In conclusion, the science worksheet based on mangrove environmental resources is effective in improving students' critical thinking skills.

Keywords: critical thinking, mangrove environment, student worksheet.

INTRODUCTION

Mangroves are very beneficial for the coastal communities of West Lombok. Mangroves have benefits in various aspects such as economics, ecology and education. From an ecological aspect, mangroves function as a foraging place, protection, nursery area and spawning area (Idrus et al., 2019a; Idrus et al., 2019b; Hutchison et al., 2014). Mangroves also make a good contribution to the communities on the coast of West Lombok. This is because people can sell marine biota to help improve their economy (Idrus et al., 2019). The advantage of developing LKPD based on mangrove environmental resources is that it can connect students directly with nature (Susanti, 2021; Rimbun et al., 2018) and make learning more interesting (Restu et al., 2017). Apart from that, the use of mangrove learning can increase learning efficiency (Surjanti et al., 2020; Irwandi, 2019). Studying the mangrove ecosystem can protect the mangrove ecosystem (Aprilia and Suryadarma, 2020). Teachers and students are directly involved with the surrounding environment and are contextual (Rimbun et al., 2018) and unite students directly with the environment (Susanti, 2021). Utilizing the mangrove biological system as learning capital will be more interesting if it can further develop students' critical thinking abilities.

Critical thinking skills can provide students with opportunities to learn to solve problems (Fahmi et al., 2019), and students' experiences of critical thinking from the learning process can be an indicator of achieving learning completeness (Sulistyowarni et al., 2019). An indicator that students have critical thinking skills is that they enable someone to evaluate or investigate the evidence, assumptions and logic underlying other people's ideas (Putra, 2015). Student-centered learning can improve critical thinking skills (Sujatmika et al., 2019; Afdareza et al., 2020). One of the problems in science learning is the lack of use of mangroves as a learning resource. The research results of Santoso et al., (2022) and Syukur et al., (2021) found that science learning comes from textbooks. The books used do not contain mangrove material, so students are less familiar with the environment around their school (Syukur et al., 2021; Santoso et al., 2022). This becomes an obstacle for teachers in creating an ideal learning climate. Teachers in the West Lombok region still have difficulty integrating mangroves into learning. The rich fauna and diversity of mangroves can be

used as a science learning resource. Mangroves are an important part in conveying messages, strengthening the thoughts, sentiments and will of educators and students to create educational experiences.

Utilizing mangrove areas as a science learning asset can be an appropriate technique for preserving sustainability (Idrus et al., 2018). The existence of the mangrove ecosystem is very important and useful as a science learning resource. However, science teachers have not utilized the existence of the mangrove ecosystem as a science learning resource. This research has an element of novelty because it uses mangrove forests as a science learning resource. Furthermore, from the information above there are main parts that have not been done and are urgent problems that need to be implemented. This is related to the development of science worksheet worksheets based on mangrove environmental resources to improve the critical thinking skills of coastal junior high school students in West Lombok Regency. This research is important to carry out to develop natural science worksheet based on mangrove environmental resources that is suitable for use.

METHODS

Time and place of research

The research was carried out at coastal schools in West Lombok Regency, namely SMP 1 Sheet and SMP 5 Sheet in September – October 2023. The selection of these two schools.

Types of research

This research is development research (Research and Development). This research aims to produce a new product in the form of LKPD based on mangrove environmental resources that is suitable for improving students' critical thinking skills. This design will be used to determine the effectiveness of the product in its use. This research design involved a group that was observed at the pre-test stage (O1). Then proceed with certain treatment (X1) and post-test (O2) (Table 1).

Table 1. One group pre-test post-test test design

Group	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_2

Data analysis

Analysis of the effectiveness of LKPD consists of analysis of improving critical thinking skills. The improvement analysis uses normalized N-gain values. This analysis aims to determine the increase in students' pre-test and post-test critical thinking skills scores. The N-gain value is calculated using the equation 1 formula (Hake, 2002). The criteria for obtaining N-gain are presented in Table 1.

$$N-gain = \frac{Skor\ Posttest - Skor\ Pretest}{Skor\ Maksimal - Skor\ Pretest} \text{ x } 100\% \ (\mathbf{1})$$

Table 1. Criteria for obtaining N-gain

Percentage (%)	Tafsiran
N- *gain* ≤ 0,3	Low
0,7 ≥ N-*gain* > 0,3	Currently
N-*gain* > 0,7	High

FINDINGS AND DISCUSSION

The results of the effectiveness of increasing students' critical thinking skills in general

The average pre-test score for Pesisir Middle School students in West Lombok Regency was 39.50 (table 2). After students carried out learning using LKPD based on mangrove environmental resources, they obtained a post-test score of 76.98. The average value was then calculated using the N-gain equation to obtain an average value of 0.61 (Table 2). This value indicates that students' critical thinking skills have increased in the medium category.

Table 2. N-gain test results of critical thinking skills

School	Pre-test	Post-test	N-Gain%	Kategori
SMPN 1 Lembar	42.00	79.25	0.63	Currently
SMPN 5 Lembar	37.00	74.70	0.59	Currently
Average %	**39.50**	**76.98**	**0.61**	**Currently**

Results of the effectiveness of increasing students' critical thinking skills for each indicator

The critical thinking skills indicator consists of 5 indicators. KBK-1 is giving a simple explanation and gets a score of 0.85%, KBK -2 is building basic skills and gets a score of 0.75%. Then, KBK-3, namely concluding, obtained a value of 0.74%, KBK - 4, namely making further explanations with a value of 0.68%, and KBK -5,

namely arranging strategies and tactics, obtaining a value of 0.64%. Critical thinking skills indicators 1, 2, and 3 are in the high category, while 4 and 5 are in the medium category.

Discussion

General critical thinking skills

The average pre-test score of students at SMPN Pesisir West Lombok Regency was 39.50 (Table 2). The low pre-test score is because students have not received material learning about the mangrove ecosystem. After learning using resource-based student worksheets, the mangrove environment experienced changes. It can be seen from the average post-test score of students at SMPN Pesiris West Lombok Regency of 76.98 (Table 2). Furthermore, the results of the N-gain analysis obtained a value of 0.61%. This value indicates an increase in students' critical thinking skills even though they are in the medium category.

Improving critical thinking skills occurred because students' worksheets based on mangrove environmental resources included problem-based learning using real problems in everyday life. These problems come from the environment around students so that they can organize their own knowledge in solving problems and finding solutions. Based on these activities, students can practice their critical thinking skills. Handouts based on the local potential of mangrove forests can improve critical thinking skills (Santoso et al., 2022). Student worksheets based on mangrove environmental resources have a problem-based learning syntax that empowers critical thinking skills.

Problem-based learning activities cause thinking and learning processes to occur. Problem-based learning can develop critical thinking skills and help overcome deficits in critical thinking (Ismail et al., 2018). The syntax description of problem-based learning empowers critical thinking skills is explained further. Phase 1 (reviewing and presenting the problem), where the teacher communicates related to learning. Then, build students' positive attitudes towards lessons. Next, the teacher presents issues that are unclear and require alternative solutions. Students will be given the opportunity to contribute to problem solving and express their ideas. Activities in this phase can arouse students' curiosity and passion for investigation. The emergence of students' curiosity can empower their thinking skills by providing simple explanations.

Phase 2 (developing strategies), students are trained to research where the teacher develops collaboration skills among students. This can help them to solve problems together. The collaboration skills possessed by students can build the basic skills in the critical thinking skills indicators (Astuti et al., 2019). Phase 3 (applying strategies), students investigate problems with small groups. This activity is the core of problem-based learning. This phase allows the process of thinking and exchanging information to find solutions to problems. Indicators of critical thinking skills seen in this phase provide further explanation and organize strategies and tactics. Providing further explanation means that students develop a hypothesis accompanied by reasons. Organize strategies and tactics by means of students providing solutions to problems that occur.

Phase 4 (discussing and evaluating the results), students will prepare the results of the discussion to be presented. Presentation activities are carried out to increase self-confidence to be able to join in problem-based learning. Evaluating results is carried out to evaluate students' thinking processes. This process consists of problem-solving and intellectual skills used by students. Intellectual skills relate to choosing the right solution in solving problems. This can empower indicators of critical thinking skills to conclude.

Critical thinking skills can experience significant improvement in PBL learning (Suryawati et al., 2020). The research results of Harun et al., (2012) found that students' learning motivation can be increased through problem-based learning. In addition, problem-based learning can empower critical thinking skills because students do not only think concretely. However, students will think about abstract and complex ideas (Sadler, 2014). Critical thinking skills must be trained continuously and accompanied by providing suggestions and improvements to students' critical thinking results (Shaw et al., 2020).

Critical thinking skills for each indicator

The KBK-1 value provides a simple explanation and is in the high category at 0.84%. This is because students have been trained to collect problems found in LKPD. The KBK-2 indicator is building basic skills at 0.75% in the

high category (Table 3). The high level of KBK-2 is due to students being able to provide reasons in solving problems in the questions. The KBK-3 indicator is concluded at 0.73% in the high category. This value indicates that students are able to analyze as shown by giving correct and complete reasons and can provide appropriate assessments. In general, the three indicators of critical thinking skills are in the high category. This is supported by Gojkov et al., (2015) where students with indicators of high critical thinking skills are 60%. Students are able to solve problems accompanied by reasons that support the answers. In line with Saregar et al., (2018) where students who have knowledge can find solutions to solve problems and are able to reanalyze the arguments given.

The KBK-4 indicator is to make a further explanation of 0.68%. Furthermore, the KBK-5 indicator is managing strategies and tactics at 0.64% in the medium category. This value indicates that students in each indicator are able to solve problems without reasons. Students are less able to use the ability to analyze, evaluate and review problems to find solutions. The results of this research are in line with Saregar et al., (2018) that students with moderate critical thinking skills can be seen as achieving imperfect indicators. Apart from that, Gojkov et al., (2015) stated that a moderate level of critical thinking has an average indicator value of 38%.

CONCLUSION

The science worksheet based on mangrove environmental resources which was developed is effective in improving the critical thinking skills of medium category students at Pesisir Junior High School, West Lombok Regency.

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