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Enculturation of Lombok Coastal Local Wisdom in PBL as A Conservation Learning Strategy to Improve Students' Environmental Literacy

Akhmad Sukri[1]*

Department of Biology Education, Universitas Pendidikan Mandalika, Indonesia.

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Corresponding Author:
Akhmad Sukri
akhmadsukri@undikma.ac.id

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Abstract: Environmental literacy is essential for students to comprehend environmental issues and sustainable behaviours that can help reduce negative environmental impacts. This research is motivated by the low environmental literacy of students, which is attributed to schools not providing direct learning experiences for students to interact with the environment. This study aims to analyze the effectiveness of students' environmental literacy by applying conservation-based PBL (Problem-Based Learning). The research sample consisted of 104 students from SMAN 1 Lembar selected through purposive sampling. The research method employed a pre-experimental design with a quantitative approach. Environmental literacy tests used test instruments adapted and modified from the Middle Schools Environmental Literacy Survey with indicators of knowledge, cognitive abilities, and attitudes. Data were analyzed using t-test calculations and n-gain. The research results show that conservation-based PBL is efficacious in improving students' environmental literacy based on (1) a significant increase in students' environmental literacy scores at $\alpha = 5\%$, (2) moderate n-gain scores, and (3) there was no difference in n-gain for all groups. Therefore, conservation-based PBL can be considered an alternative for teachers to enhance students' understanding of environmental issues while preparing them to adapt to ongoing climate and environmental changes.

Keywords: Enculturation; Environmental Literacy; Local Wisdom; PBL

Introduction

Globalization is characterized by industrialization and human exploitation through pollution, destruction, and other detrimental actions against natural resources. Environmental degradation issues are increasingly seen as threatening the planet and have become a hot topic in contemporary International Relations studies (Suryawati et al., 2020). This situation has the potential to increase environmental damage and pose a threat to sustainability. For example, as summarized by the Balitbang Provincial Government of West Nusa Tenggara (NTB), seawater intrusion into several coastal areas in southern Lombok Island has been progressively advancing inland. Additionally, the level of coastal erosion in the Lombok Island coastal areas is worrying. The complexity of the environmental problems that occur needs to be addressed wisely by everyone. Anggraini et al (2022) explains that everyone must have environmental literacy to minimize environmental problems wisely.

Environmental literacy is a condition of environmental awareness that enables an individual to be responsible, caring, and conscious of the environment's existence, as well as to understand the complex relationships among humans, the environment, and ecosystems in our surroundings (Ariesandy, 2021; Fitri & Hadiyanto, 2022). This ability includes understanding human impacts on the environment, sustainability, and the skills to make informed decisions in managing natural resources. Based on the descriptions above, it is concluded that environmental

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literacy is not just about reading but also involves students' awareness, actions, and responses to the issues happening in the school environment.

Abdillah's research (2021) found that environmental education in Indonesia is still weak and mainly focuses on knowledge transfer. As a result, students possess limited knowledge about the environment and lack awareness and concern for the environment. Furthermore, information about environmental issues and sustainability is inadequate, affecting students' ability to understand the complexity of the environment and make sustainable decisions. The Ministry of Environment and Forestry stated that Indonesia's Air Quality Index (AQI) increased by 0.91 to 53.53 compared to 2019 but did not meet the target. This indicates that domestic activities are still the predominant source of pollution. Additionally, the Land Quality Index (LQI) decreased by 1.26 to 60.74, representing the increasing conversion of forest areas into land. This demonstrates that public environmental awareness is still low (KLH, 2021).

Rokhmah and Fauziah's study (2021) showed that students' environmental literacy in several aspects remains relatively low, with only 29.3% meeting the environmental literacy assessment standards. These results are consistent with an earlier study conducted in several high schools in West Lombok involving 87 respondents. The study showed that approximately 44.31% of students could explain how human activities affect ecosystems, 25.28% could analyze global environmental issues such as climate change, biodiversity loss, acid rain, and vehicle emissions, 17.24% could provide solutions to environmental problems, and only 12.54% could integrate sustainability principles into long-term environmental impact decision-making. This indicates that students' environmental awareness is still lacking, hindering environmental literacy development. These findings are supported by observations showing that students continue to engage in habits that have the potential to harm the environment, such as improper waste disposal, consumption of packaged fast food, and lack of reusable drink containers. Additionally, the majority of students use motorbikes as their mode of transportation to school. This situation reflects the lack of ecological intelligence demonstrated by environmentally friendly behaviour, which has not yet become part of students' daily lives.

Students must understand and be prepared to face future environmental problems as the next generation. Environmental literacy helps students understand the root causes of environmental issues and identify sustainable solutions to address them. Febriasari & Supriatna (2017) added that students must understand how to live sustainably to maintain the Earth's sustainability. Students can learn how to maintain ecosystem balance and reduce negative environmental impacts with environmental literacy. Students need to realize human dependency on the environment and how human actions can affect their surroundings. By understanding this, students can learn to appreciate and preserve their environment. Suryawati et al. (2020) explained that environmental literacy could help students develop environmental awareness while improving their analytical and creative abilities to solve environmental problems with creative and innovative solutions. Students with strong environmental literacy can become change agents contributing to environmental sustainability. Understanding the complexity of ecosystems enables individuals to make better decisions in minimizing negative environmental impacts and creating a sustainable future. Therefore, efforts need to build critical attitudes and awareness in understanding various life phenomena that harm the environment through education to sharpen ecological sensitivity and cultivate awareness of the environment as part of environmental literacy. Environmental literacy includes knowledge, cognitive skills, attitudes, and behaviour. Human beings play a significant role in empowering environmental wealth and existence for ecosystem survival and environmental preservation (Bouwma-Gearhart et al., 2018).

One way to enhance environmental literacy through cognitive processes is to select appropriate and innovative school learning strategies, such as integrated local wisdom learning. Previous research on environmental awareness and local wisdom has been conducted using various methods. Integrating local wisdom refers to incorporating local values and knowledge with more general global knowledge to understand environmental issues better. Through integrated local wisdom learning, students can develop environmental awareness and understand how environmental policies can affect society (Hunaepi et al., 2019). Additionally, students can learn how local wisdom can contribute to environmental sustainability and preservation (Ilhami et al., 2019). As explained by Hakam et al. (2020), local wisdom can make individuals wiser in life. However, in the implementation of integrated local wisdom learning models, there are some weaknesses, such as the lack of relevance of specific local knowledge to current scientific knowledge about the environment (Dewi et al., 2021) and the challenges of translating local knowledge into a relevant context (Widyaningrum, 2018). These challenges can create disparities in students' ecological understanding.

This research offers an effort to enhance students' environmental literacy by utilizing local values without neglecting the diversity of local knowledge within them, along with social and cultural changes. Local wisdom is integrated through inculturation that focuses on

internalizing and learning local cultural values, norms, and practices (Mulyani & Julianto, 2018). One strategy with an inculturation approach uses traditional environmental conservation knowledge in Problem-Based Learning (PBL). Through this learning method, students can learn conservation practices within the context of local wisdom. In this regard, Aikenhead explains that through inculturation, students can align the canonical science content from schools with their worldview (Dewi et al., 2021). Science learning is designed to help students integrate scientific content into their way of thinking and perspective. Therefore, scientific thinking skills can colour their everyday thinking.

This research aims to determine the effectiveness of conservation-based PBL through the inculturation of local wisdom in improving students' environmental literacy. The research focuses on the following issues: (1) whether there is a statistically significant improvement in students' environmental literacy before and after the application of conservation-based PBL, (2) the magnitude of the improvement in students' environmental literacy levels before and after the implementation of the learning strategy, and (3) whether there is an average difference in the level of improvement in environmental literacy after learning using conservation-based PBL in the four groups.

Method

This pre-experimental research uses a pre-test and post-test design (O1 X O2) (Fraenkel et al., 2017). Before implementing the conservation-based PBL learning, students were initially assessed using a pre-test (O1). The student groups were then provided with learning related to biodiversity using the conservation-based PBL learning model (X), which was accompanied by teaching materials such as teaching modules and student worksheets that had been validated and found reliable (Dewi et al., 2020). After completing the learning sessions (post-test), all student groups underwent a post-test (O2). The test instrument used was adapted from the Middle Schools Environment Survey/MSELS. This research was conducted in biology classes, specifically covering biodiversity, using the conservation-based PBL learning model. The sample size for this study included 104 10th-grade students from SMAN 1 Lembar. The samples were selected using a cluster random sampling technique (Fraenkel et al., 2017). Students in each school were divided into four groups, namely: group 1 (MIPA1 consisting of 26 students), group 2 (MIPA2 consisting of 27 students), group 3 (MIPA3 consisting of 26 students), and group 4 (MIPA4 consisting of 25 students). Data analysis of the effectiveness of the conservation-based PBL learning model uses: (a) t-tests or non-parametric analysis using the Wilcoxon test (Gibbons & Chakraborti, 2011), (b) calculation of the mean n-gain using the formula: n-gain = (post-test score - pre-test score) / (maximum score - pre-test score), with the following categories (1) high, if n-gain ≥ .70; (2) moderate, if .70 > n-gain ≥ .30; and (3) low, if n-gain < .30 (Hake, 1998).

Results and Discussion

The indicators of environmental literacy in this study, adapted from McBeth & Volk (2009), include: 1) knowledge, with sub-indicators of ecological knowledge and issue identification; 2) cognitive abilities, with sub-indicators of issue analysis and planning; 3) attitudes, with sub-indicators of verbal commitment, sensitivity, and actual commitment (Rokhmah & Fauziah, 2021). Figure 1 illustrates students' environmental literacy based on observations conducted before and after implementing the conservation-based PBL learning model for all groups. The blue columns represent the average environmental literacy scores before the learning, while the orange columns represent the average environmental literacy scores after the teaching.

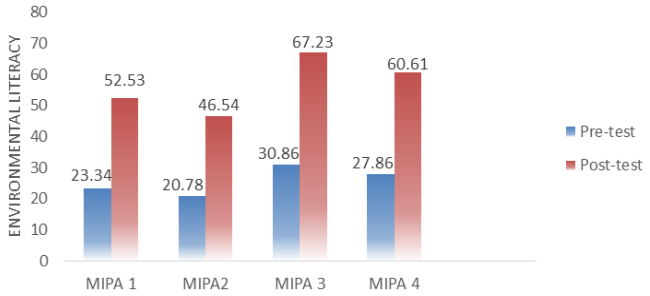

Figure 1. The average students' environmental literacy scores before and after implementing the conservation-based PBL learning model for all groups.

The average scores of students' environmental literacy before and after the implementation of conservation-based PBL learning, as shown in Figure 1, indicate an improvement in environmental literacy for all groups. To determine whether there is a significant improvement, an analysis of environmental literacy scores before and after the application of conservation-based PBL was conducted, as seen in Table 2 and Table 3.

Table 2. Normality and homogeneity tests of mean pre-test and post-test scores of students' environmental literacy.

Group	Score	The number of students	Average	Std. Dev	Normality, α = .05		Homogeneity, α = .05	
					Asymp. Sig (2-tailed)	Normally distributed	Asymp. Sig (2-tailed)	Homogeneous
MIPA 1	Pre-test	26	24.24	12.27	.181	Yes	.532	Yes
	Post-test	26	54.55	20.31	.068	Yes		
MIPA 2	Pre-test	27	20.78	10.33	.161	Yes	.739	Yes
	Post-test	27	46.54	17.70	.511	Yes		
MIPA 3	Pre-test	26	32.05	11.08	.709	Yes	.739	Yes
	Post-test	26	69.81	11.73	.284	Yes		
MIPA 4	Pre-test	25	28.97	12.02	.084	Yes	.550	Yes
	Post-test	25	63.03	18.26	.264	Yes		

Table 3. Results of the paired t-test analysis on the mean pre-test and post-test scores of students' environmental literacy.

Group	Score	The number of students	Average	t	Sig .(2-tailed)	Paired t-test, α = .05 Decision
MIPA 1	Pre-test	26	23.34	-10.08	.000	Ho is rejected
	Post-test	26	52.53			
MIPA 2	Pre-test	27	20.78	-8.92	.000	Ho is rejected
	Post-test	27	46.54			
MIPA 3	Pre-test	26	30.86	-9.01	.000	Ho is rejected
	Post-test	26	67.23			
MIPA 4	Pre-test	25	27.86	-9.56	.000	Ho is rejected
	Post-test	25	60.61			

Table 1 presents the results of the normality and homogeneity tests of the mean pre-test and post-test scores of students' environmental literacy. The test results were then used to determine whether there was a difference between the pre-test and post-test scores among the four groups, as indicated in the data analysis presented in Table 2 and Table 3. The paired t-test results (since the homogeneity requirements were met) on the mean pre-test and post-test scores show a p-value of < 0.001 for all groups. These results indicate a significant difference between the pre-test and post-test scores, rejecting the null hypothesis (Ho). The post-test scores are higher than the pre-test scores, indicating a significant improvement in students' environmental literacy after implementing conservation-based PBL at the α = 5% significance level. Furthermore, an analysis of the improvement in students' environmental literacy using n-gain for each environmental literacy indicator was conducted for all groups, as shown in Table 4.

Table 4. Mean scores of students' environmental literacy before and after the implementation of conservation-based PBL, n-gain for each environmental literacy indicator in all groups.

Group	Score	Indicators of environmental literacy							n-gain
		A (Knowledge indicators)		B (Cognitive Ability)			C (Attitude)		
		1	2	3	4	5	6	7	
MIPA 1	Pre-test	28.85	24.36	43.1	19.25	38.46	37.2	34.6	0.48
	Post-test	62.80	55.74	64.4	44.23	73.1	76.9	75.6	
	n-gain	0.47	0.41	0.37	0.30	0.56	0.63	0.62	
MIPA 2	Pre-test	30.90	17.28	41.4	13.55	32.10	43.2	30.9	0.42
	Post-test	62.98	39.52	64.7	36.42	64.20	79.0	65.4	
	n-gain	0.46	0.26	0.39	0.26	0.47	0.63	0.49	
MIPA 3	Pre-test	32.05	33.97	44.5	28.20	21.79	38.5	24.4	0.47
	Post-test	71.16	73.70	57.9	64.74	48.70	78.2	56.4	
	n-gain	0.57	0.60	0.24	0.50	0.34	0.64	0.42	
MIPA 4	Pre-test	32.65	55.1	28.0	25.30	18.67	36.0	21.3	0.42
	Post-test	65.33	70.1	73.35	54.66	34.70	74.7	50,7	
	n-gain	0.48	0.33	0.62	0.39	0.19	0.60	0.37	
Average n-gain		0.49	0.40	0.40	0.36	0.39	0.62	0.47	
			0.44		0.38			0.49	

Notes : 1 (Ecological knowledge), 2 (Identify issues), 3 (Issue analysis), 4 (Planning), 5 (Verbal commitment), 6 (Sensitivity), and 7 (Actual commitment).

Table 4 presents the results of the calculation of environmental literacy improvement (n-gain) for all groups. Each environmental literacy indicator shows an increase in n-gain scores for all groups, sequentially 0.48, 0.42, 0.47, and 0.42, categorized as moderate. The indicators of knowledge, cognitive abilities, and attitudes fall into the moderate category.

Based on the results of environmental literacy observations during the implementation of conservation-based PBL learning, as seen in Figure 1, it indicates an improvement in students' environmental literacy for all groups. The average environmental literacy scores for all groups before the implementation of conservation-based PBL were in the category of "poor" (≤ 40). This may be because students could not engage in real environmental conservation actions during the learning process. As a result, students' awareness of the importance of environmental conservation and the impact of their actions on the environment remained low. A similar situation was mentioned by Aini et al. (2021), stating that the low level of students' environmental literacy was not due to a lack of environmental literature in schools but rather the absence of an environment in schools that could provide direct learning experiences for students to interact with the environment. After implementing PBL-based conservation learning, there was an increase in environmental literacy. Students in groups 1 through 4 had environmental literacy scores in the categories of "fair" (41-60) and "good" (61-80).

The implementation of conservation-based PBL on students' environmental literacy was carried out by analyzing the n-gain of environmental literacy for each indicator: knowledge, cognitive abilities, and attitudes. Based on the data from environmental literacy observations, as shown in Table 4, it can be observed that there is an improvement in environmental literacy after the implementation of conservation-based PBL. Environmental literacy before using conservation-based PBL was mostly in the low criteria. This is likely due to the learning process not paying enough attention to environmental education, resulting in students not gaining sufficient knowledge about environmental issues. In line with the opinions of Bahari et al. (2018) and Mardiani et al. (2021), the lack of an environment in schools that can provide direct learning experiences for students to interact with the environment can result in students having inadequate environmental literacy skills. After learning with conservation-based PBL, there was a varied improvement in environmental literacy. These results indicate that conservation-based PBL is effective in developing environmental literacy. In accordance with the views of Saltan et al. (2017), environmental education activities are essentially carried out to improve students' environmental literacy.

The applied learning program, namely conservation-based PBL, has influenced the improvement of students' environmental literacy. The implementation of conservation-based PBL trains students to broaden their thinking perspectives to solve problems according to their abilities when performing specific tasks in learning about biodiversity and its connection to the local wisdom of the local community. The direct learning experiences received by students from their environment can help improve environmental behaviour Ardianti et al. (2017). Understanding the ecological system, the cause-and-effect relationship between human attitudes and behaviors towards the environment, and cultivating responsible environmental behaviour are influential in enhancing students' environmental literacy. Teachers foster environmental literacy by presenting environmental phenomena related to local wisdom values. Students are asked to engage in exploration activities to discover forms of local wisdom through interviews with the community. In conservation-based PBL, students engage in collaborative exploration activities with their groups (using the experiences of others as a resource). Investigative activities can serve as stimuli for environmental literacy in the learning process Suryawati, (2020), in this case, direct exploration of local wisdom forms. Through conservation-focused PBL, students are required to solve environmental problems using the concepts or knowledge they possess. PBL stimulates students to be active and critical in finding solutions to their problems. Teaching students to think critically about the environment can help develop students' cognitive skills, which is one of the domains of environmental literacy. These findings are supported by previous research findings stating that awareness generated by education, both in the learning process and from students' academic behaviours towards the environment, can make students environmentally literate Putra et al (2021). In line with the research conducted by Alatas et al. (2020), PBL can enhance students' literacy in terms of competence, knowledge, context, and attitudes. Through their research, Santoso et al. (2021) added that students who participate in social or environmentally literate-based activities and conservation actions, understanding their meaning through transformative internalization processes, can lead to positive changes and development.

The research data presented in Table 4 shows an increase in n-gain for all indicators of environmental literacy. After learning with conservation-based PBL, the indicators of knowledge, cognitive abilities, and

attitudes fall into the moderate category, indicating an increase in scores for all indicators of environmental literacy following the implementation of conservation-based PBL. This is likely due to the fact that students were able to complete the tasks. The tasks successfully completed include 1) the ability to identify forms of local wisdom of the Sasak community through exploration activities, 2) the ability to raise current environmental issues through orientation activities, 3) the ability to gather information from various learning sources about current environmental issues and their connection to local community wisdom through elaboration, 4) the ability to share information (articulation) obtained with other groups, and 5) the ability to confirm what students have learned through the learning experience. This success is supported by the student's prior knowledge and a reasonably good understanding of the concepts. Students who are already familiar with environmental concepts in ecosystem materials will feel more confident in their ability to study biodiversity and relate it to local wisdom. Authentic experiences are formed when students have mastered the necessary content for further learning (Fitria & Indra, 2020). Authentic experiences have the most direct influence on the development of environmental literacy because they provide the most concrete and objective evidence of success. The experience of success has the most significant impact on an individual's environmental literacy because it is based on authentic experiences. The concept of environmental literacy is emphasized by the Environment Education and Training Partnership, which clearly states that an environmentally literate person knows what to do for the environment and how to do it (Santoso et al., 2021).

The research data presented in Table 4 shows that the scores for the ecological knowledge indicator, especially the environmental issue sub-indicator, are below 50. This is possibly due to the fact that the students at the school are not familiar with environmental issues in their surroundings. The teachers have not incorporated environmental issues into every learning activity, especially in science lessons, so the students lack sufficient environmental knowledge. After the implementation of conservation-based PBL, the average n-gain for the ecological knowledge indicator in groups 1 (MIPA 1), 2 (MIPA 2), 3 (MIPA 3), and 4 (MIPA 4) showed moderate improvement. According to (reference), ecological knowledge is information related to the natural world and ecology that a person possesses. The increase in scores for the ecological knowledge indicator is due to the use of traditional issues of the Sasak community in the coastal 'Nyale Tradition' area to explain efforts to conserve biodiversity. Problem-solving activities can build environmental literacy and conservation actions within students through continuous interaction with objects, phenomena, experiences, and the student's environment.

In practice, conservation-based PBL learning with an approach to local wisdom enculturation contributes to Vygotsky's social constructivism learning theory. In terms of learning, Vygotsky proposes principles: 1) social learning, where students learn through interaction with knowledgeable adults or more capable peers; 2) Zone of Proximal Development (ZPD), where students can learn concepts well when they work on problem-solving with the assistance of knowledgeable adults (teachers) or peers; 4) scaffolding, where students are presented with complex, difficult, and realistic problems and are gradually given assistance to solve them (Moreno & Park, 2010). This has implications for the learning process that facilitates the development of students' thinking skills. Using conservation-based PBL encourages students to actively ask questions, express ideas, engage in discussions, give opinions, contextualize based on Lombok's local wisdom, and relate it to the material/concepts of biodiversity through the learning process.

The data in Table 4 indicates that the average n-gain scores for cognitive abilities are the lowest among the other indicators. Cognitive ability indicators include issue analysis and the ability to plan environmental problem-solving actions. Suppose the environmental knowledge indicator involves information students possess about the natural world and ecology. In that case, cognitive ability is the application of environmental knowledge after going through a reasoning process. As stated by (Abdillah et al., 2021), cognitive abilities are related to information processing, the application of knowledge, and mental activities involving reasoning, problem-solving, and the formation of knowledge concepts. Low cognitive abilities may also be due to students' lack of learning experience, as they may have limited opportunities to interact directly with environmental issues in their surroundings. However, generally, after the implementation of conservation-based PBL for the cognitive ability indicator in all groups, there is an improvement with n-gain scores in the moderate category. This is because of worksheets integrated with local wisdom, which includes activities to train the ability to identify analyze problems and plan actions related to environmental issues. Based on the research of Suryawati et al. (2020), implementing problem-based worksheets integrated with ethnoecology is highly effective in improving students' environmental literacy.

Furthermore, the teacher's role is essential in supporting and encouraging students to complete their assignments. Observations show that students can communicate effectively with the teacher during

learning. This is evident in how the teacher responds to students' questions and opinions, provides guidance to students in need, appreciates students when they can present their arguments, and pays attention when students provide incorrect answers and correct those answers. The appreciation and feedback provided by the teacher influence students' confidence and motivation to learn. These findings align with the opinion of Maulah (2023), which states that teachers play the most critical role in influencing students' environmental literacy through verbal persuasion. Support and encouragement for students to complete their assignments can also come from their peers. Observations during the learning process show that students interact with their group mates, work collaboratively in investigative activities, and engage in discussions to formulate arguments and address tasks. In this process, students who better understand the material offer support and encouragement to their peers. Peer interactions during the learning process are also evident in students communicating their research findings and responding to presentations from other groups. These activities allow students to learn more from the ideas or concepts expressed by their peers.

Attitude is a combination of opinions and beliefs about a relatively stable object or situation, accompanied by certain feelings that form the basis for determining responses or behaviours (Hunaepi et al., 2019). The average n-gain scores for the attitude indicator in all groups show the highest scores among the other indicators. This is because students use relevant knowledge information to determine their attitudes toward the environment. Any inconsistent attitudes and behaviours may be influenced by additional environmental knowledge obtained from external sources. In addition, students can conclude and pay attention to the feedback provided by the teacher. The teacher's task should be to provide specific and timely feedback on achievements, as this can build environmental literacy confidence and, ultimately, enhance academic performance. This demonstrates that the teacher has created a conducive learning environment for developing environmental literacy. Bandura stated that creating a positive learning environment can help alleviate emotional and psychological responses for students who lack confidence in their abilities (Moreno & Park, 2010). In assessing their abilities, students may rely on their physiological and emotional state, ultimately affecting their attitudes toward the environment. Safitri et al. (2020) stated that students' environmental care attitudes can develop through habituation.

Each environmental literacy indicator has interrelationships and influences on one another. The knowledge indicator is related to cognitive abilities. The research results show that students' knowledge of the environment is quite good, but their cognitive abilities are not as good. According to Hollweg, cognitive abilities are related to reasoning about applying the student's knowledge (Rokhmah & Fauziah, 2021). Lidia et al. (2018) added that someone with the ability to reason can apply knowledge to specific issues. Students with high levels of knowledge do not necessarily have high cognitive abilities because cognitive ability involves the process of reasoning to apply the knowledge that students possess, and not all students can apply their knowledge effectively.

The knowledge indicator can influence the attitude toward the environment by mediating environmental awareness. Students with high environmental knowledge will have an awareness to preserve their environment (Munawar et al., 2019). Students' environmental awareness will shape responsible environmental attitudes and behaviours. Based on the research results (Rokhmah & Fauziah, 2021), there is a positive correlation between students' awareness and attitudes toward the environment, so if students have a lot of knowledge about environmental issues, they will become more aware of the ongoing environmental issues, and this awareness drives them to act responsibly towards the environment. Knowledge-based behaviour tends to be more sustainable (Martini, 2019).

Conclusion

The results of the research and discussions outlined can be summarized as follows: biology learning on biodiversity, when implementing conservation-based PBL, can be summarized as follows: 1) there is a significant increase in environmental literacy at a 5% level of significance, 2) the average n-gain is categorized as moderate, 3) The average n-gain acquisition does not differ for each group. Developing students' environmental literacy through conservation-based PBL teaching is expected to support students in achieving future success. This research implies that students can be more responsible, caring, and aware of the environment. The learning process should introduce students to hands-on experiences in the environment, where they can observe environmental issues and behaviours that can positively impact the environment.

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