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Environmental Literacy and Learning Independence of Students

Efendi[1*], Riana Nurhayati[2], Elsa Ferella[1]

[1] Master of Biology Education, Faculty of Mathematics and Natural Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.
[2] Department Philosophy and Sociology of Education, Faculty of Education, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia.

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Corresponding Author:
Efendi
efendi.2022@student.uny.ac.id

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Abstract: This study aims to describe the environmental literacy and learning independence skills of students at SMA Negeri 3 Banjarbaru, South Kalimantan. Using a quantitative descriptive approach, data were collected from the research subjects, namely all 11th grade students enrolled in the even semester at SMA Negeri 3 Banjarbaru, through environmental literacy tests and independent learning questionnaires. Environmental literacy assessment covers three domains: knowledge, attitude, and competence, while self-directed learning is measured through eight indicators. The results show that students achieved the highest scores in environmental literacy in identifying environmental issues (78.7%) and understanding social, cultural, and political systems (74%), both of which fall into the "adequate" category. However, they scored lowest in proposing alternative solutions (36.1%) and making personal assessments of environmental issues (50%). In terms of self-regulated learning, students demonstrated the highest competency in selecting and applying learning strategies (59.2%), while the lowest was in diagnosing learning needs (32.4%). This study highlights the importance of active learning strategies such as problem-based learning and metacognitive training to develop environmental awareness and self-directed learning among students.

Keywords: Environmental literacy; High school students; Problem-based learning; Science education; Self-regulated learning.

Introduction

Environmental literacy and self-regulated learning are two interrelated constructs that play a crucial role in 21st-century education. Today, the world is grappling with significant environmental challenges, including greenhouse gas emissions, which contribute to global climate change and trigger extreme events such as prolonged droughts and severe flooding (Jahangir et al., 2022). Early personal awareness of environmental changes is essential, and environmental education plays a vital role in promoting the sustainable development and growth of a nation (Law et al., 2023). Therefore, it is necessary to cultivate not only theoretical knowledge of environmental issues but also the ability to respond effectively and proactively to environmental problems in everyday life. Environmental literacy encompasses students' knowledge, awareness, attitudes, and engagement with environmental issues, ultimately fostering responsible and sustainable behavior (Lestari et al., 2024; Ahmadi, 2022).

The importance of environmental literacy lies not only in understanding material concepts but also interpreting the state of the environment and taking action to maintain or restore the state of the environment (Agustina, et.al., 2022). Environmental literacy involves understanding environmental issues, challenges faced by the environment, and solutions that can be implemented to overcome these problems. This is in accordance with the current environmental conditions

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that have decreased in quality due to various human activities that pay less attention to environmental behavior or ethics that cause various environmental damage (Permatasari et.al., 2023). There are five main components in environmental literacy, namely: behavior, knowledge, involvement, attitude, and awareness of the environment (Amran et al., 2019).

The concept of environmental literacy is emphasized by the Environment Education and Training Partnership (EETAP) which states straightforwardly that an environmentally literate person knows what he will do for the environment and how to do it (Nurwidodo, et.al. 2021). Environmental literacy in individuals includes subjective knowledge of environmental issues, environmental attitudes (grouped as concern for the environment, self-efficacy, importance of environmental education, and value of nature, verbal commitment to actions that support the environment, environmentally responsible behavior (Jincera, et.al., 2023).

Overall, environmental literacy serves as a critical foundation for developing knowledgeable and competitive human resources. As emphasized by Lee and Nguyen (2024), a comprehensive understanding of environmental issues and pollution—particularly within ecosystems—is essential. This includes not only scientific knowledge but also an awareness of the origins, impacts, and the broader cultural, political, and social contexts in which these issues exist. However, in practice, students' environmental literacy levels in Indonesia remain relatively low.

Several factors contribute to the low level of environmental literacy among students in Indonesia. These include evaluation and learning activities that do not effectively promote the development of environmental literacy, suboptimal infrastructure that fails to support learning processes, and the inappropriate selection of teaching models, approaches, or strategies. According to Zahrani et al. (2024), students' low environmental literacy is evident in their limited environmental knowledge and awareness. This is reflected in everyday behaviors, such as the excessive use of plastic during snacking and a lack of awareness in waste disposal. In addition, teaching materials that fail to support environmentally oriented learning processes can hinder students' exploration and engagement with environmental knowledge (Saragih & Tanjung, 2023).

Another factor that is often overlooked by teachers in the learning process is students' learning independence. Learning independence refers to the ability to seek out learning resources and develop the necessary skills to learn autonomously. A learning environment that fosters independence can enhance students' motivation, as they are more likely to take responsibility for their own learning—choosing topics of interest without relying on others—and demonstrating self-discipline and organizational skills, which are hallmarks of learning maturity (Dewi et al., 2020; Sulistyowati & Roshayanti, 2022). This autonomy, in turn, strengthens their confidence in developing new skills and acquiring knowledge.

Concern for the environment is a fundamental aspect in preventing various forms of environmental degradation, particularly those resulting from human activities. However, the level of environmental concern—an indicator of the environmental literacy of Indonesian society—remains relatively low (Santoso et al., 2021). This condition contributes to numerous environmental issues stemming from public indifference. Understanding students' environmental literacy and their attitudes toward the environment from an early age is crucial, as it can foster a deeper appreciation of nature and promote awareness of the importance of preserving Indonesia's abundant natural resources.

One of the main challenges in enhancing environmental literacy is the lack of student interest in science subjects, which are often perceived as irrelevant to their daily lives. As a result, students are less motivated to engage with environmental issues from a scientific perspective and ultimately show low enthusiasm for learning. This challenge, however, can be addressed by strengthening students' learning independence. Learning independence refers to an individual's ability to take initiative in the learning process, including planning, implementing, and evaluating learning outcomes. It plays a crucial role in the context of literacy development, as individuals with strong learning independence are better equipped to stay informed about current developments and adapt their understanding to new information. By fostering independent learning, students are encouraged to actively seek out information and make meaningful connections between scientific content and their personal experiences. This, in turn, can enhance their interest and motivation to engage more deeply with scientific concepts.

This study was conducted to describe the science literacy skills and learning independence of students of SMA Negeri 3 Banjarbaru, South Kalimantan. Based on observation, it was found that no preliminary research has been conducted in describing science literacy skills and learning independence at SMA Negeri 3 Banjarbaru. This research is expected to provide insights and recommendations for educators and policy makers in creating a more effective and competitive learning environment.

Method

This research uses descriptive research with a quantitative approach. This research was conducted in the even semester at one of the schools in South Kalimantan, namely SMA Negeri 3 Banjarbaru. The research subjects were all 11th grade students enrolled in the even semester of SMA Negeri 3 Banjarbaru. The research subjects consisted of 108 out of 3 XI classes (A,B,C/ MIPA) with 36 students each.

Data in this study were collected using environmental literacy test questions and learning independence questionnaires. Details of the science literacy test questions used are adapted from the North American Association for Environmental Education (2011) which is divided into domains, namely 1) knowledge (environmental knowledge); 2) dispositions (attitudes towards the environment); and 3) competencies (environmental competence) are as follows.

Table 1. Domain Knowledge

Aspect	Number of items
Physical and ecological systems	3
Social, cultural and politicalsystems	3
Environmental Issue	3
Multiple solutions	2
Citizen participation and action strategies	4

Table 2. Domain Dispositions

Aspect	Number of items
Sensitivity	2
Attitudes, concern,and worldview	2
Personal responsibility	2
Self-efficacy/locus of control	2
Motivation and intentions	2

Table 3. Domain Competencies

Aspect	Number of items
Identify environmental issues	2
Ask relevant questions about environmental conditions and issues	2
Analyze environmental issues	2
Investigate environmental issues (scientific and social aspects of issues using primary and secondary sources)	2
Evaluate and make personal judgments about environmental issues (the interaction between environmental conditions and sociopolitical systems)	2
Use evidence and knowledge toselect and defend one's own position(s) to resolve issues	2
Create and evaluate plans at various scales/levels to resolveenvironmental issues	2

The calculation of scores on science literacy questions is as follows.

$$\text{Final score} = \frac{score\ obtained}{maximum\ score} \times 100 \quad (1)$$

The criteria for determining environmental literacy levels are presented in the table below.

Table 4. Criteria for Environmental Literacy Level

Percentage	Criteria
90-100	A (Excellent)
80-89	B (Good)
70-79	C (Fair)
0-70	D (Poor)

(Aini, et al, 2021)

The details of the learning independence questionnaire used are as follows.

Table 5. Aspects of Learning Independence Questionnaire

Aspect	Number of items
Taking the initiative to learn	2
Diagnosing individual learning needs	2
Setting clear and measurable learning goals	2
Monitoring, organizing, and regulating learning performance	4
Viewing difficulties and obstacles as learning challenge	2
Seeking out and utilizing relevant learning resources effectively	3
Selecting and applying appropriate learning strategies	2
Evaluating the learning process, assessing outcomes, and reflecting on self-concept	3

(Agung, 2019)

The score calculation on the learning independence questionnaire is as follows.

$$\text{Final score} = \frac{score\ obtained}{maximum\ score}\ x\ 100\%$$

The criteria for the level of learning independence are outlined in Table 6.

Table 6. Criteria for Learning Independence

Score Achievement Interval	Score Criteria
80 <%X ≥ 100	Excellent
60 < %X ≤ 80	Good
40 < %X ≤ 60	Fair
20 < %X ≤ 40	Deficient
0 < %X ≤ 20	Very Deficient

(Agung 2019)

Result and Discussion

Environment Literacy
Domain Knowledge

Table 7. Domain Knowledge

Aspect	Percentage	Criteria
Physical and ecological systems	51,8%	Poor
Social, cultural and politicalsystems	74,0%	Fair
Environmental Issue	75%	Fair
Multiple solutions	36,1%	Poor
Citizen participation and action strategies	73,1%	Fair

Based on Table 7, the highest-scoring domain among students is the *social, cultural, and political systems* aspect, with a score of 74%, categorized as sufficient. This result is supported by learning experiences that expose students to the legal frameworks and regulations governing environmental protection, including customary laws that remain in effect in certain regions. An example is the forest conservation practices rooted in local wisdom among the Dayak Kotabaru indigenous community in South Kalimantan, such as *Palalian*, *Palinuhan*, and *Bahuma* (Mahyuni, 2023). In contrast, the lowest-performing aspect is *multiple solutions*, which scored 36.1%. This can be attributed to the predominant use of instructional methods that emphasize rote memorization rather than encouraging flexible thinking or problem-solving. As noted by Merta et. al. (2020), students who are frequently exposed to memorization-based questions and rarely encounter discourse-based or analytical tasks tend to exhibit lower levels of scientific literacy.

Domain Dispositions

Table 8. Domain Dispositions

Aspect	Percentage	Criteria
Sensitivity	63,8%	Poor
Attitudes, concern,and worldview	67,5%	Poor
Personal responsibility	72,2%	Fair
Self-efficacy/locus of control	69,4%	Poor
Motivation and intentions	61,1%	Poor

Based on Table 8, the highest aspect within the dispositions domain is personal responsibility, with a score of 72.2%, categorized as sufficient. This outcome is closely associated with learning approaches that not only emphasize classroom-based material comprehension but also promote students' engagement in real-world experiences. Such experiences include activities like tree planting within the school environment and recycling household plastic waste. As highlighted by Hayati (2020) and Miterianifa & Mawarni (2024), experiential learning methods that involve direct participation in environmental actions foster a more holistic understanding and enable students to make tangible contributions to environmental conservation in their daily lives.

Conversely, the lowest-scoring aspect is motivation and intentions, at 61.1%, which falls into the poor category. This may be attributed to the limited emphasis in current learning practices on stimulating students' interest in local environmental issues. Hudha et al. (2021) note that many students exhibit a low level of concern for environmental matters, which diminishes their motivation to learn or engage in related activities. This lack of interest is a key contributing factor to low levels of environmental literacy.

Table 9. Domain Competencies

Aspect	Percentage	Criteria
Identify environmental issues	78,7%	Fair
Ask relevant questions about environmental conditions and issues	63,8%	Poor
Analyze environmental issues	72,2%	Fair
Investigate environmental issues (scientific and social aspects of issues using primary and secondary sources)	69,4%	Fair
Evaluate and make personal judgments about environmental issues (the interaction between environmental conditions and sociopolitical systems)	50,9	Poor
Use evidence and knowledge toselect and defend one's own position(s) to resolve issues	58,3%	Poor
Create and evaluate plans at various scales/levels to resolveenvironmental issues	63,8%	Poor

Table 9 shows that the highest aspect within the competency domain is the ability to identify environmental issues, with a score of 78.7%, classified as sufficient. This result is largely attributed to the implementation of the Problem-Based Learning (PBL) model, which encourages students to initiate learning through real-life environmental problems. By engaging with issues such as soil and water pollution, students are guided to think critically and conduct simple investigations or field experiments to analyze root causes and scientifically assess the impacts. The integration of PBL has been shown to effectively strengthen students' skills in recognizing environmental problems (Siddiq et al., 2020; Maulina et al., 2021).

In contrast, the lowest-scoring aspect is the ability to evaluate and make personal judgments about environmental issues, which stands at 50%. According to Arifin and Rachmawati (2021), although PBL is effective in promoting problem identification, it does not

sufficiently foster evaluative thinking, which requires deeper personal reflection and value-based judgment. This limitation may be due to the lack of structured opportunities in school learning for students to connect environmental issues with their own values and daily experiences. To address this gap, complementary instructional approaches such as Socio-Scientific Issues (SSI)-based learning can be employed to enhance students' evaluative competencies (Zint et al., 2019; Sadler et al., 2017).

Learning Independence

Table 10. Percentage Criteria for Learning Independence

Indicators	Percentage	Criteria
Taking the initiative to learn	50,9%	Fair
Diagnosing individual learning needs	32,4%	Deficient
Setting clear and measurable learning goals	58,3%	Fair
Monitoring, organizing, and regulating learning performance	36,1%	Deficient
Viewing difficulties and obstacles as learning challenge	34,2%	Deficient
Seeking out and utilizing relevant learning resources effectively	58,3%	Fair
Selecting and applying appropriate learning strategies	59,2%	Fair
Evaluating the learning process, assessing outcomes, and reflecting on self-concept	57,4%	Fair

Table 10 reveals that the highest indicator of learning independence is the ability to choose and apply learning strategies, with a score of 59.2%, categorized as sufficient. This outcome is influenced by the implementation of the Problem-Based Learning (PBL) model, which presents students with open-ended problems that require them to select suitable strategies to construct understanding. Additionally, the availability of diverse learning resources—such as textbooks, instructional videos, and articles—provides students with the autonomy to select resources that align with their preferences. Teachers also incorporate self-reflection activities, allowing students to assess the effectiveness of the strategies they employ. As noted by Fitriani et al. (2022), when students are given the flexibility to determine their own learning approaches, their level of independence in this area tends to improve.

Conversely, the lowest-scoring indicator is diagnosing learning needs, which recorded a percentage of 32%. This low score may be attributed to students' limited experience in reflecting on their own learning progress, such as recognizing what they have mastered, identifying areas of difficulty, and determining what requires further exploration. In essence, students may not yet be equipped to critically evaluate their own learning processes. Addressing this issue requires the development of students' metacognitive skills, which are essential for fostering critical thinking, enhancing self-awareness in learning, and improving the regulation of learning strategies (Febrina & Mukhidin, 2019).

Conclusion

The results of the study demonstrate notable variations across domains. In the knowledge domain, students showed the strongest understanding in the area of social, cultural, and political systems, with a score of 74%. In contrast, the aspect of generating multiple solutions received the lowest score at 36.1%, indicating a need for further development in creative and divergent thinking. Within the dispositions domain, personal responsibility stood out as the most developed aspect (72.2%), suggesting that students are relatively aware of their roles in addressing environmental issues. However, motivation and intentions appeared to be less developed, scoring only 61.1%. In the competency domain, students performed best in identifying environmental issues (78.7%), reflecting the effectiveness of learning approaches that emphasize problem recognition. On the other hand, the ability to evaluate and make personal judgments was relatively weak, with a score of 50%. Finally, in the area of learning independence, students demonstrated greater competence in selecting and applying appropriate learning strategies (59.2%), whereas diagnosing their own learning needs remained the most underdeveloped skill, with a score of just 32%.

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Author Contributions

Conceptualization was carried out by Efendi and Riana. Methodology was designed by Efendi. Data and findings validation was conducted by Efendi, Riana, and Elsa. Formal analysis was performed by Efendi. Field research was conducted by Efendi and Elsa. Data curation was managed by Riana. The original draft was written by Elsa, while the review and final editing were completed by Efendi.

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Conflicts of Interest

The authors declare no conflict of interest

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