



Analysis of the relationship between environmental literacy and pro-environmental attitudes of prospective biology teacher students at UIN Raden Mas Said Surakarta

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Abstract. Every biology teacher should have a pro-environmental attitude to integrate sustainability values into their teaching, but in reality, students do not consistently demonstrate this attitude. The purpose of this study was to determine the levels of environmental literacy and pro-environmental attitudes, and the relationship between these two variables, among biology teacher students at UIN Raden Mas Said Surakarta, class of 2024. A quantitative approach with a correlational method was used to analyze the relationship between the two variables. This study involved 36 participants, biology teacher students at UIN Raden Mas Said Surakarta, class of 2024. Data were obtained via a questionnaire on environmental literacy and pro-environmental attitudes and analyzed using descriptive statistics and inferential correlation tests. The results showed that students' levels of environmental literacy and pro-environmental attitudes were generally positive. The correlation test showed a very strong and significant positive relationship between environmental literacy and pro-environmental attitudes ($r = 0.828$; $p < 0.05$). This finding indicates that the higher students' environmental literacy, the more pro-environmental attitudes they showed. Thus, environmental literacy is an important factor in fostering pro-environmental attitudes among prospective biology teacher students, so its strengthening needs to be integrated continuously into the prospective teacher education process.

Keywords: *Environmental literacy, Pro-environmental attitude, Prospective biology teacher*

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INTRODUCTION

The development of various environmental problems such as pollution, ecosystem degradation, biodiversity loss, and climate change increasingly demonstrates the importance of multi-sector involvement in environmental conservation efforts. In addressing increasingly complex environmental issues, universities are expected to produce graduates who not only possess adequate scientific knowledge but also demonstrate a commitment to environmental sustainability (Karmana, 2026). Specifically, in the Biology Education Study Program, the educational process is not only oriented toward mastering scientific concepts but also directed toward developing values, attitudes, and behaviors that support environmental conservation. Through learning integrated with environmental issues, students are expected to understand various ecological issues and participate in conservation and sustainable development efforts (Anggraini & Nazip, 2022).

One important outcome of environmental education is the development of pro-environmental attitudes. Pro-environmental attitudes are an individual's tendency to respond positively to various actions that support environmental conservation, such as responsible waste management, energy conservation, the use of environmentally friendly products, and participation in conservation activities (Karina et al., 2025). Therefore, developing a pro-environmental attitude is a crucial goal in higher education, particularly in pre-service teacher education programs, which are expected to internalize and implement sustainability values in both academic and professional life.

Ideally, sustainability principles should be integrated into learning practices (Rofi'ah & Chusna, 2022). Armed with biological knowledge, an understanding of ecological and

sustainability concepts, and their role as future educators, pre-service biology teachers are required not only to master environmental concepts but also to demonstrate concern and commitment to preserving the environment through their daily attitudes and behaviors. A pro-environmental attitude is a crucial competency because it can influence how pre-service teachers integrate sustainability values into the learning process and serve as role models for students.

However, empirical evidence suggests that this ideal has not yet been fully achieved. Research by [Asyhuri \(2024\)](#) reported that pro-environmental attitudes among students, including those in science and biology education, remain moderate to suboptimal. Low levels of awareness regarding waste management, wise energy use, environmentally friendly consumption, and participation in conservation activities indicate that mastery of environmental concepts is not always accompanied by the development of attitudes that support environmental preservation. These findings indicate a gap between the academic competencies of prospective teacher students and the implementation of pro-environmental values in their daily lives.

Several factors contributing to this gap include limited supporting facilities, weak social norms that encourage sustainable behavior, academic pressures, and a lack of institutional support for implementing environmentally friendly practices on campus ([Mkumbachi et al., 2020](#)). These findings suggest that the formation of pro-environmental attitudes is a complex process influenced by various factors, including an individual's ability to understand environmental issues comprehensively. Another factor thought to play a significant role in the formation of pro-environmental attitudes is environmental literacy ([Biswas, 2020](#)).

Environmental literacy is an individual's ability to understand environmental concepts and issues, critically analyze problems, and make environmentally responsible decisions and actions. Environmental literacy encompasses not only knowledge but also critical thinking skills, awareness, and the ability to act in response to various environmental issues ([Fang, 2005](#)). Individuals with a high level of environmental literacy tend to understand the ecological consequences of their actions better, thereby more easily developing attitudes that support environmental sustainability. Several studies have shown that improving environmental literacy through integrated curricula, project-based learning, and field activities strengthens pro-environmental attitudes and behaviors ([Rodríguez Pérez et al., 2024](#)). For prospective biology teacher students, environmental literacy is increasingly important because it relates not only to understanding environmental issues but also to integrating them into the learning process at school.

For prospective biology teacher students, environmental literacy plays a strategic role in their ability to integrate environmental issues into the school learning process ([Rofi'ah & Chusna, 2022](#)). However, most previous research has focused on measuring environmental literacy or pro-environmental attitudes separately, both among students and university students in general. Studies specifically examining the relationship between environmental literacy and pro-environmental attitudes among biology teacher candidates remain relatively limited, despite this group's crucial role as agents of change and as aspiring educators who will shape the environmental awareness of future generations ([Ichsan et al., 2019](#)). This limited information highlights the need for research examining levels of environmental literacy and pro-environmental attitudes among biology teacher candidates, as well as the relationship between these variables.

Based on this description, this study aims to analyze the levels of environmental literacy and pro-environmental attitudes of biology teacher candidates at UIN Raden Mas Said Surakarta, class of 2024, and examine the relationship between these two variables. The results are expected to provide empirical information useful in developing environmental

education strategies to strengthen the competencies and sustainable character of biology teacher candidates.

METHOD

This research is a quantitative correlational study. In this study, a questionnaire was used to explore the relationship between environmental literacy and pro-environmental attitudes among Biology Teacher Candidate students at UIN Raden Mas Said Surakarta, class of 2024. The research was conducted at UIN Raden Mas Said Surakarta, involving 36 Biology Education students from the class of 2024. Data for this study were obtained through two Google Forms questionnaires, each based on indicators for its variable. The indicators for the pro-environmental attitude variable are described in Table 1. Meanwhile, the environmental literacy variable is described in Table 2.

The questionnaire was distributed online to respondents using a Likert-scale instrument with categories of strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). The questions in this questionnaire were adapted from [Nurhasanah et al., \(2025\)](#), the instrument that has been tested for validity and reliability. The collected data were then analyzed descriptively, including the mean, median, mode, and standard deviation, and presented in tables and bar charts to illustrate the variable profiles. After the descriptive analysis, a correlation test was conducted, preceded by a normality prerequisite test. The results of the normality test for both variables indicated that the data were normally distributed, with significance levels of 0.196 (environmental literacy) and 0.127 (pro-environmental attitudes), both > 0.05 . The correlation test was conducted using the Pearson product-moment method.

Table 1. Indicators of Pro-Environmental Attitude Variables

Indicator	Statement		Total
	Positive	Negative	
Energy Conservation Behavior	1.13	23.9	4
Mobility and Transportation Behavior	17.3	22.10	4
Waste Avoidance Behavior	19.5	14.24	4
Recycling Behavior	2.12	20.4	4
Environmentally Friendly Consumerism Behavior	16.21	7.18	4
Environmental Conservation Behavior	11.8	6.15	4
Total			24

In Table 1, the Pro-Environmental Attitude Indicators, the second questionnaire was used to measure students' pro-environmental attitudes with the same item composition, namely 24 statements, arranged based on six indicators of ecological behavior, namely energy conservation, environmentally friendly mobility and transportation, waste avoidance, recycling, ecological consumerism, and participation-based conservation and social influence.

Table 2. Environmental Literacy Indicators

Indicator	Statement		Total
	Positive	Negative	
<i>Environmental Issue Knowledge</i>	1,2,5,7	3,4,6,8	8
<i>Environmental Action Knowledge</i>	9,10,11,16	13,12,14,15	8
<i>Environmental Behavior Knowledge</i>	18,19,22,21	17,20,23,24	8
Total			24

Sumber: (Nurhasanah et al., 2025)

In Table 2. Environmental Literacy Indicators. The initial questionnaire was used to assess environmental literacy and consisted of 24 statements based on three main indicators:

Environmental Issue Knowledge, Environmental Action Knowledge, and Environmental Behavior Knowledge.

Table 3. Table of correlation coefficients and strength of the relationship between Environmental Literacy and Pro-Environmental Attitudes

Koefisien (R)	Relationship Strength
0.00	No relationship
0.01 – 0.09	Less significant relationship
0.10 – 0.29	Weak relationship
0.30 – 0.49	Moderate relationship
0.50 – 0.69	Strong relationship
0.70 – 0.89	Very strong relationship
> 0.90	Near-perfect relationship

Sumber: (de Vaus, 2014)

Table 3 presents the correlation coefficient (R) to assess the strength of the relationship between environmental literacy and pro-environmental attitudes. Based on the table, the value of the correlation coefficient was grouped into several levels, ranging from the absence of a relationship ($R = 0.00$), a less significant relationship ($0.01-0.09$), a weak relationship ($0.10-0.29$), a moderate relationship ($0.30-0.49$), a strong relationship ($0.50-0.69$), a very strong relationship ($0.70-0.89$), to an almost perfect relationship ($R > 0.90$). This classification serves as a reference for interpreting the results of the correlation analysis, making it easier for researchers to assess the strength of the relationship between environmental literacy and pro-environmental attitudes using the coefficient values obtained.

RESULTS AND DISCUSSION

The results of this study are presented to describe the levels of environmental literacy and pro-environmental attitudes among prospective biology teacher students, and to examine the relationship between the two variables. The analysis begins with descriptive statistics to provide an overview of the data's characteristics, then continues with an analysis of each indicator that constitutes the research variables. Next, a correlation analysis was conducted as the final step to examine the relationship between the two variables in this study.

Descriptive Analysis of Environmental Literacy and Pro-Environmental Attitudes

The results of the descriptive analysis of environmental literacy variables and pro-environmental attitudes are shown in Table 4.

Table 4. Quantitative Descriptive Analysis of Environmental Literacy and Pro-Environmental Attitudes

Variable	Mean	Median	Modus	Standar Deviasi
Pro-Environmental Attitude	3.1325	3.1700	3.21	0.15303
Environmental Literacy	3.1175	3.1700	3.17	0.14328

Based on Table 4, the pro-environmental attitude variable has a mean value of 3.1325 with a standard deviation of 0.15303. Meanwhile, environmental literacy has a mean value of 3.1175 with a standard deviation of 0.14328. The median values for both variables, 3.1700, indicate that most respondents have scores around that value. The low standard deviation indicates a tendency for homogeneous data from respondents.

Student Environmental Literacy Profile

The profile of Environmental Literacy students of prospective biology teachers of UIN Raden Mas Said Surakarta is described through an average analysis of each indicator of environmental literacy attitudes. The data is described in Table 5.

Table 5. Average Environmental Literacy Indicators

Indicator	Mean
Knowledge of environmental issues	2.93
Knowledge of environmental actions	3.25
Environmental behavioral knowledge	3.17

From Table 5, the average picture of environmental literacy indicators is displayed visually in Figure 1.

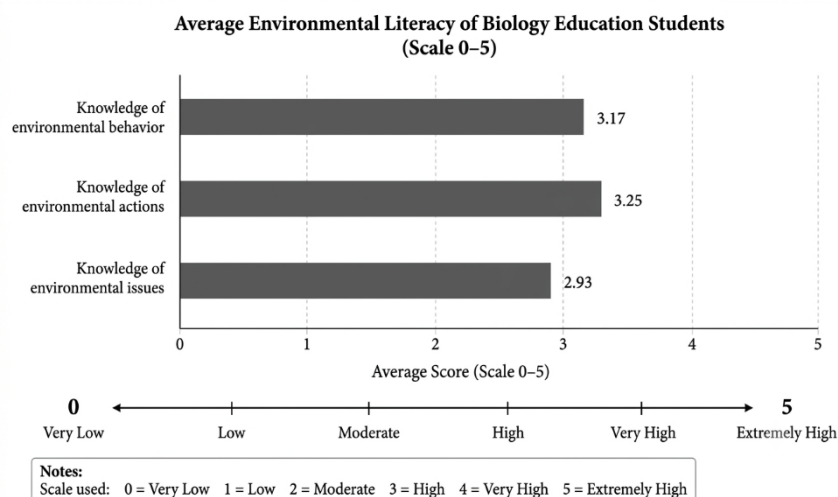


Figure 1. Environmental Literacy Diagram

Figure 1 shows that the average scores for the three environmental literacy indicators ranged from 2.93 to 3.25. The indicator of knowledge about environmental actions ($M=3.25$) had the highest average score, while knowledge about environmental issues ($M=2.93$) had the lowest.

Profile of Student Pro-Environmental Attitudes

The profile of the pro-environmental attitudes of prospective biology teacher students at UIN Raden Mas Said Surakarta was described using an average analysis of each pro-environmental attitude indicator. The data are described in Table 6.

Table 6. Average Pro-Environmental Attitude Indicators

Indicator	Mean
Energy Conservation Behavior	3.94
Waste Avoidance Behavior	3.44
Conservation Behavior	3.24
Recycling Behavior	2.92
Consumer Behavior	2.78
Mobility and Transportation	2.67

From Table 6, the average image of the next environmental literacy indicator is visually shown in Figure 2.

Figure 2 shows that the energy conservation indicator obtained the highest score ($M = 3.94$), followed by avoiding waste ($M = 3.44$), conservation ($M = 3.24$), recycling ($M = 2.92$), and consumerism ($M = 2.78$). The lowest indicators were mobility and transportation ($M = 2.67$).

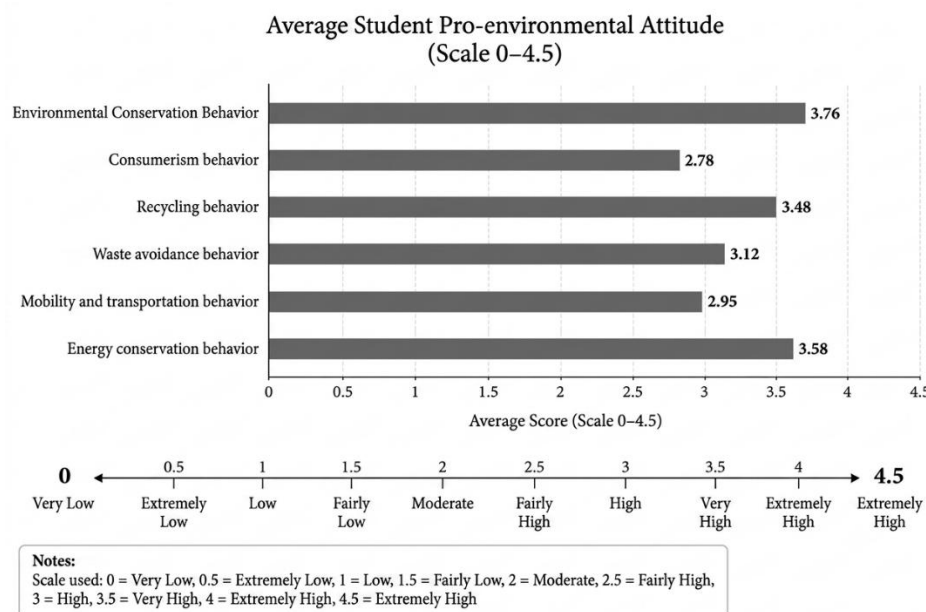


Figure 2. Pro-Environmental Attitude Diagram

The Relationship between Environmental Literacy and Pro-Environmental Attitudes

The results of the data analysis on the relationship between the two research variables, namely environmental literacy and pro-environmental attitudes, are presented in Table 7.

Table 7. Results of the Correlation Test of Environmental Literacy and Pro-Environmental Attitudes

Variable	Sig. (2-tailed)	R
Environmental Literacy and Pro-Environmental Attitudes	0,000	0,828

Based on Table 5, a significance value of 0.000 ($p < 0.05$) indicates a significant relationship between environmental literacy and pro-environmental attitudes. The correlation coefficient of 0.828 indicates a positive relationship in the very strong category.

Discussion

This study aims to analyze the levels of environmental literacy and pro-environmental attitudes, and the relationship between the two variables, among prospective biology teacher students at UIN Raden Mas Said Surakarta, class of 2024. Descriptive analysis results indicate that both environmental literacy and pro-environmental attitudes have average scores in the positive range with relatively low standard deviations. This indicates that most respondents have relatively uniform perceptions and tendencies toward environmental issues. The homogeneity of these scores may indicate that students receive relatively similar learning experiences and exposure to environmental information throughout their education, resulting in levels of understanding and attitudes that do not differ significantly between individuals (Al-Hilmiyah & Suhartini, 2024).

The analysis of environmental literacy indicators shows that the highest score is in the knowledge of environmental actions indicator, while the lowest is in the knowledge of environmental issues indicator. These findings indicate that prospective biology teacher students have a relatively good understanding of concrete actions to mitigate environmental damage. This high achievement is due to the learning process in the biology education study program, which not only emphasizes conceptual mastery but also provides learning experiences that enable students to apply real-world actions in everyday life (Welerubun et al., 2022). On the other hand, the indicator for knowledge of environmental issues received

the lowest average score. This indicates that students' understanding of various environmental issues still needs strengthening. Environmental issues are generally complex because they involve ecological, social, economic, and policy dimensions (Ke et al., 2023). This complexity requires students to analyze cause-and-effect relationships and evaluate various alternative solutions based on scientific evidence, making them more difficult to develop than practical actions.

These findings align with research by Safitri et al. (2025), which stated that biology students generally possess a good level of environmental awareness and concern, but this has not yet been fully internalized into a deep understanding of behaviors that impact the environment. These findings also reinforce those of Orbanić & Kovač (2019) and Kalaycı (2020), which indicate that prospective teachers tend to have a high level of environmental awareness due to their science education background. Therefore, strengthening environmental literacy in prospective biology teachers needs to be directed not only at improving conceptual knowledge and environmental solutions, but also at fostering a more reflective understanding of the ecological consequences of every human action.

For the pro-environmental attitude variable, the energy conservation indicator scored highest, while the mobility and transportation indicator scored lowest. These findings indicate that students exhibit a more positive tendency toward behaviors that are relatively easy to implement in everyday life compared to behaviors that require changes in habits or specific facilities. Energy conservation, such as turning off lights when not in use, reducing the use of electronic devices, or conserving water, is a set of behaviors that can be implemented independently and do not require additional costs or complex infrastructure support (Shafira & Suratsih, 2023). Therefore, these behaviors are more easily accepted and implemented by students.

Conversely, low scores on the mobility and transportation indicators indicate that students still face various barriers to adopting more environmentally friendly transportation behaviors. Low use of public transportation, the habit of using private vehicles, and limited access to sustainable transportation modes can be contributing factors (Huang, 2026). These findings demonstrate that the formation of pro-environmental attitudes is influenced not only by internal factors such as knowledge and awareness, but also by external factors such as the availability of facilities, social conditions, and institutional support. These results support Kohaupt-Cepera's (2025) view that environmentally friendly transportation behavior is among the most difficult aspects of pro-environmental behavior to achieve, as it is heavily influenced by social context and available infrastructure.

The analysis results show that environmental literacy has a very strong positive relationship with students' pro-environmental attitudes. These results indicate that students with a high level of environmental literacy tend to exhibit more positive attitudes toward environmental conservation efforts. This finding aligns with the Environmental Literacy Framework, which places environmental knowledge as a key component in building awareness, concern, and an individual's tendency to act responsibly towards the environment (Maryland State Department of Education, 2023). Understanding various environmental issues, including their causes, impacts, and alternative solutions, provides a stronger foundation for positively addressing various environmental issues (Putra & Suhartini, 2025).

The strength of the relationship indicates that environmental literacy is strongly associated with pro-environmental attitudes among prospective biology teachers. Based on the coefficient of determination (r^2), approximately 68.6% of the variation in pro-environmental attitudes is explained by variation in environmental literacy levels. In comparison, the remaining 31.4% is suspected to be related to other factors, such as experience interacting with the environment, personal values and beliefs, social influences, and student involvement in various activities that support environmental conservation

(Hastuti et al., 2024). These results indicate that various factors influence the development of pro-environmental attitudes, so environmental literacy cannot be viewed as the sole factor.

The findings of this study have implications for the implementation of biology teacher education. Environmental literacy development should be directed not only at mastering concepts but also at providing learning experiences that connect knowledge with real-world practice. Implementing project-based learning, conservation activities, service learning, and participation in sustainable campus programs can be alternatives to strengthen understanding and foster environmental awareness. With this approach, students are expected not only to possess academic competence in the field of environmental studies but also to internalize sustainable values and apply them in their roles as educators.

CONCLUSION

Based on the research results, prospective biology teacher students from UIN Raden Mas Said Surakarta, class of 2024, showed a positive level of environmental literacy and pro-environmental attitudes. In the environmental literacy aspect, the knowledge about environmental actions indicator had the highest score, while knowledge about environmental behavior had the lowest. Meanwhile, regarding pro-environmental attitudes, the energy conservation indicator had the highest score, while the mobility and transportation indicator had the lowest. Correlation test analysis showed a very strong and significant positive relationship between environmental literacy and pro-environmental attitudes ($r = 0.828$; $p < 0.05$). This finding indicates that students with better environmental literacy tend to show more positive pro-environmental attitudes. Therefore, strengthening environmental literacy should be an important part of the education of prospective biology teachers to foster attitudes and commitment to environmental sustainability.

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