



## Examining the relationship between environmental ethics literacy and environmental awareness characteristics

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ARTICLE INFO	ABSTRACT
<p><b>Article history</b> Received: 04 August 2023 Revised: 11 December 2023 Accepted: 26 January 2024</p> <p><b>Keywords:</b> Awareness Biology education Ethics literacy Environmental</p>	<p>Behavior that damages the environment can be changed through knowledge, because knowledge can influence a person's attitude in protecting the environment. This research aims to analyze the relationship between environmental ethics literacy and environmental awareness in prospective biology teacher students. The research was conducted on Biology Education students at "X" University, Malang City. The research sample was taken randomly from the population and the sample in this study was 74 prospective biology teacher students in semester V of the 2020/2021 academic year, and semester VII of the 2019/2020 academic year. Sample selection was based on all students who had taken and passed ethics and ecology courses. The instruments used to collect data were test questions and attitude observation sheets with Likert scales and Guttman scales. Data were analyzed using the Pearson Product Moment correlation test with data processing using the SPSS 24 for Windows program. The research results show that (1) the environmental ethics literacy of prospective biology teacher students is in the medium category; (2) environmental awareness of prospective biology education teacher students in the good category; (3) there is a relationship between environmental ethical literacy and environmental awareness character, because the results of correlation analysis with the Pearson Product Moment correlation show a significance value of <math>0.000 &lt; 0.05</math>. The results of this research show that environmental ethics literacy has a positive relationship with environmental awareness, so to foster environmental awareness it is necessary to continuously increase environmental ethics literacy.</p>

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## INTRODUCTION

The issues faced by both developed and developing countries, including Indonesia, currently revolve around environmental degradation (Rusdina, 2015; Winarno, 2017; Galina, 2022). Environmental degradation in Indonesia is indicated to be on the rise, with the level estimated to reach 40-50% in each region (Yulianto, et al., 2022). Susilawati (2021) states that the accumulation of environmental damage in Indonesia increases annually and tends to be uncontrollable. Various types and forms of environmental problems, leading to numerous natural disasters, are prevalent (Widayatun, 2013; Utama, Gunawan, Marfai 2020; Elyawati and Fatmawati, 2021).

Common types and forms of environmental degradation in Indonesia include water and soil pollution, erosion, forest fires, coral reef damage, and floods (Efrodina, 2015; Arisman, 2020; Oktarina, 2015; Nirwan, 2017). The major causes of environmental degradation broadly refer to two factors: natural factors and human activities (Asri, 2018; Nurhayati, ummah, and shobron, 2018; Ratnasari & Chodijah, 2020).

Destructive environmental behavior can be transformed through knowledge (Mustafa, 2012; Lange & Dewitte, 2019) as an individual's knowledge influences their attitude towards environmental conservation (Azhar, Basyir, and Alfitri, 2015; Darmawan, 2016). Literacy skills can be enhanced through ethics, as ethics involve analyzing and applying concepts such as right, wrong, good, bad, and responsibility (Sandi, 2016; Chowdhury, 2016; Pujanarko, 2018). Ethics aids individuals in taking appropriate actions and making decisions in all aspects of life, including environmental conservation (Nurkamilah, 2018; Faizah, 2020).

Based on observations conducted in November 2022 through interviews with several students, data was obtained indicating that the level of environmental awareness among prospective biology education teachers at the University "X" in Malang is still low. The low level of environmental awareness is not only evident among students but also within the wider community (Gabriella and Sugiarto, 2020; Islamiah, Ni'mah, Susanto, and Fitriah 2022; Abdullah, Daud, Darwia, Muhiddin, and Arifin 2023). The low environmental awareness among student respondents is attributed to the presence of students displaying indifferent environmental behaviors, such as littering without regard for the surrounding environment. Observations are supported by the results of literature studies conducted by researchers, indicating limited research on environmental ethics (Murti, 2021).

Environmental degradation has become a serious issue in Indonesia (Awaluddin, and Hidayat, 2018; Zahroh, and Najicha, 2022), and one of the efforts to address environmental damage is through environmental ethics literacy. Environmental ethics literacy can influence understanding and awareness of environmental conservation (Hudha, Husamah, and Rahardjanto, 2019; (Pratama, Marpaung, and Yolida 2020). Understanding environmental ethics literacy is expected to be applied in tangible forms, such as individual or group participation in addressing environmental issues.

An individual with good environmental ethics literacy is considered to have good environmental awareness. Therefore, the integration of ethics and environmental literacy must be pursued through education. The integration of ethics and environmental literacy will impact the development of conceptual understanding of environmental ethics (Karataş, 2014; Faizah, 2020) as it builds environmental awareness and responsibility (Omoogun, Egbonyi, and Onnoghen 2016).

Strengthening environmental ethics literacy is crucial, as many studies have focused on improving environmental literacy among learners, while research related to environmental ethics literacy is still limited (Suharko, 2014; Maesaroh, Bahagia, & Kamalludin, 2021). What is innovative in this research is the lack of data indicating the literacy skills and environmental awareness among the studied students. Therefore, the issues that arise are (1) the categorization of the level of environmental ethics literacy among prospective biology education teacher students; (2) the categorization of the level of environmental awareness among prospective biology education teacher students; and (3) the relationship between environmental ethics literacy and the characteristics of environmental awareness among prospective biology education teacher students at the University 'X' in Malang. Therefore, this research aims to analyze environmental ethics literacy, environmental awareness literacy, and the relationship between environmental literacy and the characteristics of environmental awareness among prospective biology education teacher students at the University "X" in Malang, Indonesia.

## METHODS

### Research Design

This research employs a descriptive research design as it aims to understand the relationship between two or more variables without making any changes (Creswell, 2012; Sugiono, 2013). The selected research type is qualitative-quantitative descriptive research. As stated by Kurniasari (2022), qualitative descriptive research involves analysis techniques for collecting, processing, analyzing, and presenting data descriptively. Qualitative data can be presented in graphical forms, such as plots or images, and also in numerical forms, such as average calculations or standard deviations. Quantitative descriptive analysis is a technique used for testing, measuring, and hypothesis testing based on mathematical and statistical calculations. The intended research variables are environmental ethics literacy and environmental awareness characteristics among prospective biology teacher students. The approach utilized in this research is quantitative because the research outcomes are numerical.

### Population and Samples

The population in this study consists of prospective biology teachers in the Biology Education Program of the Faculty of Education at the University "X" in Malang, Indonesia, who have taken the ethics and ecology courses in the seventh semester of the academic year 2019/2020, totaling 49 individuals. In the fifth semester of the academic year 2020/2021, there were 25 individuals, making the total population 74 people. The sample for this study includes students from the fifth semester of the academic year 2020/2021 and the seventh semester of the academic year 2019/2020 who have already taken or are yet to take the ethics and ecology courses, amounting to 74 individuals. The sampling technique employed in this study is probability sampling.

### Instrument

The instrument used to measure environmental ethics literacy (knowledge, attitudes, and behaviors) employs a questionnaire that adopts and modifies the Middle School Environmental Literacy Instrument (MSELI) assessment standards (McBeth and Volk, 2010). MSELI is considered suitable for assessing students' environmental literacy and is used as a benchmark for environmental literacy assessments in many countries. Before the MSELI test questions were administered, language translation and adaptation were conducted. The measurement framework for environmental ethics literacy based on MSELI is outlined in Table 1.

**Table 1.**

Measurement Framework for Environmental Ethics Literacy

Dimension	Indicator	Type of Instrument	Number of Items
Knowledge	a. Ecological Knowledge	Multiple Choice	3 items
	b. Causes of Pollution and Environmental Damage	Multiple Choice	3 items
Attitude	a. Verbal Commitment	Likert Scale	3 items
	b. Environmental Sensitivity	Likert Scale	2 items
	c. Feelings toward the Environment	Likert Scale	2 items
Cognitive Skills	a. Issue Identification	Essay	3 items
	b. Issue Analysis	Essay	3 items
	c. Action Plan	Essay	2 items
Moral Norms Behavior	a. Respecting Nature	Likert Scale	2 items
	b. Caring for the Environment	Likert Scale	3 items
	c. Simplicity in Utilizing Nature	Likert Scale	2 items
	d. Responsible behavior towards the environment	Likert Scale	3 items
<b>Total</b>			<b>30 items</b>

The results from the MSELS/I questionnaire were processed using a Likert scale with a range of 5 scores, namely: score 5 (Strongly Agree); score 4 (Agree); score 3 (Neutral); score 2 (Disagree); score 1 (Strongly Disagree).

The measurement instrument for environmental awareness character utilizes four components based on Sanchez & Lafuente's (2010) framework, which are (1) general beliefs or values; (2) information or knowledge; (3) personal attitudes; and (4) pro-environmental behavior, as presented in Table 2.

**Table 2**

Question and Statement Framework for Environmental Awareness Character

Dimension	Indicator	Number of Items
General belief/ values	Level of agreement with statements related to environmental concern.	2 items
Information/ knowledge	Individual's knowledge specifically related to the environment.	2 items
Personal attitudes	Level of agreement with statements related to an individual's attitude toward the environment.	2 items
Pro-environmental behaviour	a. Engagement in low-cost individual behavior.	2 items
	b. Engagement in pro-environmental actions.	2 items
<b>Total</b>		<b>10 items</b>

This table outlines the question and statement framework for environmental awareness character, including dimensions, indicators, and the number of items for each category

### Procedure

The preparatory stage is a series of activities before data collection and processing. At this stage, activities must be carried out to streamline preparation in planning. The stages in research preparation include the identification and data collection of students of the Biology Education Study Program Faculty of Teacher Training and Education University "X" in Malang City in the fifth semester of the 2020/2021 class year and the VII semester of the 2019/2020 class year through student representatives, conducting literature searches in various sources of literature (books, research reports, journals). Manage research permits at the Faculty of Teacher Training and Education office of the University of Muhammadiyah Malang to conduct research in the Biology Education Study Program Faculty of Teacher Training and Education University "X" in Malang City. Prepare research proposals by determining the population and research sample according to the variable criteria used then prepare a draft questionnaire to be used via Google Form.

### Data Analysis Techniques

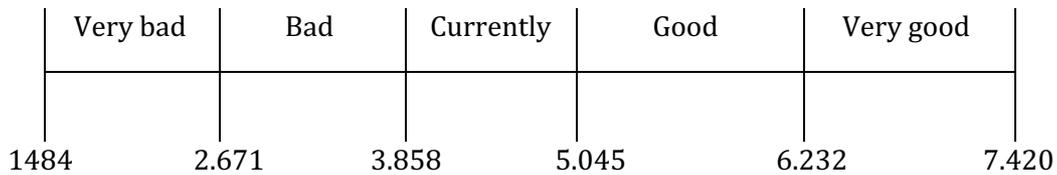
The data analysis technique used in this study uses quantitative descriptive statistics and is adjusted to the criteria of environmental ethics literacy and environmental awareness. The results of the environmental ethics literacy and environmental awareness questionnaire determined the criteria based on the results of the percentage formula as shown in Table 3.

**Table 3**

Scoring Criteria for Environmental Ethics Literacy and Environmental Awareness

Percentage (%)	Criteria
81-100	Very good
61-80	Good
41-60	Currently
21-40	Bad
<20	Very bad

To conclude the continuous calculation results of environmental ethics literacy and environmental awareness, adjustments are made according to the continuum line for the variables of environmental literacy and environmental awareness, as illustrated in Figure 1.



**Figure 1.** Continuum Line of Environmental Ethics Literacy Variable

The data obtained was then tested with the normality test to see whether the data obtained was normally distributed or not and the ANOVA test to determine whether the data was linear or non-linear. If the data is sufficient, then it is continued with a hypothesis analysis test using the Pearson Correlation Product Moment test to determine whether there is a correlation between environmental ethics literacy and environmental awareness character which is then processed using the SPSS 24 for Windows program.

## RESULTS AND DISCUSSION

The data regarding environmental ethics literacy and environmental awareness from the respondents are sequentially presented in Tables 4 and 5. The following is the data regarding Environmental Ethics Literacy shown in Table 4.

**Table 4**

Responses of Biology Education Program Students at University "X" on Environmental Ethics Literacy

No	Dimension	Total Score	Ideal Score	Percentage
1	Knowledge	0.318	1.590	20%
2	Attitude	0.989	1.590	62%
3	Cognitive Skills	1.202	1.855	65%
4	Moral Norms	1.105	1.590	70%
5	Behavior	0.520	0.795	65%
<b>Total</b>		4.134	7.420	56%
<b>Average</b>		1.653	1.484	11%

Table 4 shows that overall, the environmental ethics literacy variable's position can be determined based on the scores obtained from the data recapitulation. This recapitulation can assess the extent of environmental ethics literacy among prospective biology education teachers at University "X" in Malang. The environmental ethics literacy score results indicate a total score of 4.134, meaning that environmental ethics literacy is in the moderate category. Next, the data presentation regarding the environmental awareness of prospective biology teacher students is presented in Table 5.

Table 5 shows that overall, the Environmental Awareness variable's position can be determined based on the scores obtained from the data recapitulation. This recapitulation can assess the extent of environmental awareness among prospective biology education teachers at University "X" in Malang. The environmental awareness score results indicate a total score of 1.893, meaning that environmental awareness is in good condition.

**Table 5**

Responses of Biology Education Program Students at University "X" on Environmental Awareness

No	Dimension	Total Score	Ideal Score	%
1	General belief/value	0.336	0.530	63%
2	Information/knowledge	0.430	0.530	81%
3	Personal attitudes	0.358	0.530	67%
4	Pro-environmental behavior	0.769	1.060	72%
<b>Total</b>		1.893	2.650	71.4%
<b>Average</b>		473.2	662.5	17.8%

**Results of Linearity Test**

The linearity test is employed to assess whether the model specifications used are correct or not (Ghozali, 2018). According to Priyatno (2016), the linearity test aims to determine whether two variables, subjected to the procedure of correlational statistical analysis, exhibit a linear relationship or not. The results of the linearity test for environmental ethics literacy and environmental awareness character are presented in Table 6.

**Table 6**

Linearity Test

		Sum of Squares	Df	Mean Square	F	Sig.
Environmental Between Awareness Character*	Between (Combined)	2521.621	26	96.985	9.962	.009
Environmental Ethics Literacy	Linearity	1884.137	1	1884.137	193.525	.066
	Deviation from Linearity	637.485	25	25.449	2.619	.549
	Within Groups	253.133	26	9.736		
	Total	2774.755	52			

Based on Table 6 it is known that the results of the linearity test obtained results of  $0.549 > 0.05$ . These results indicate that the data is linear so that there is a linear relationship between environmental ethics literacy and environmental awareness character. That is why environmental awareness is closely related to aspects of knowledge, attitudes and behaviour (Varoglu, Temel and Yilmaz 2018; Bashirun and Norance 2020).

**Correlation Test Results**

The correlation test used is the Pearson Correlation product moment with the testing criteria if the value (Sig.2-tailed)  $> 0.05$  then the hypothesis is not correlated (H0) whereas if the value (Sig.2-tailed)  $< 0.05$  then the hypothesis is correlated (H1).

**Table 7**

Pearson Correlation Test

	Environmental Ethics Literacy	Environmental Awareness Character
Environmental Ethics Literacy	Pearson Correlation	1
	Sig. (2-tailed)	.824**
	N	53
Environmental Awareness Character	Pearson Correlation	1
	Sig. (2-tailed)	.824**
	N	53

\*\*Correlation is significant at the 0.01 level (2-tailed)

Based on [Table 7](#) it is known that the results of the analysis of the relationship between environmental ethics literacy and the character of environmental awareness show that the research hypothesis H1 is accepted or correlated because the value  $000 < 0.05$ . The results of this study are in line with research conducted by Azhar et al (2015) and Fridayati (2020) which shows that there is a relationship between knowledge of environmental ethics and attitudes and behavior in protecting the environment.

Environmental literacy is one of the essential components for students to master in understanding environmental issues. Possessing environmental literacy competence enables individuals to behave more responsibly in efforts to protect the environment. As stated by McBeth and Volk (2010), there are twelve factors to enhance environmental literacy skills, including: (1) Environmental knowledge; (2) Causes of pollution and environmental damage; (3) Verbal commitment; (4) Environmental sensitivity; (5) Feelings towards the environment; (6) Issue identification; (7) Issue analysis; (8) Action plans; (9) Respecting nature; (10) Caring for the environment; (11) Simplicity in utilizing nature; (12) Responsibility towards the environment. Environmental literacy skills undoubtedly support the formation of environmental awareness in individuals, including students and the wider community. According to Sanchez and Lafuente (2010), there are four components of environmental awareness character: (1) General beliefs or values; (2) Information or knowledge; (3) Personal attitudes; and (4) Pro-environmental behavior.

The knowledge dimension is crucial when associated with environmental literacy, even becoming a study to connect environmental knowledge and values with environmental education (Alauya-Dica, 2022). In relation to the importance of knowledge, Parni (2017) states that physiological factors, psychological factors, social environmental factors, and instrumental factors (teachers, facilities, assessment policies, curriculum, and learning materials) influence the level of knowledge. Regarding environmental literacy issues, Ariyani and Wangid (2016) and Bahij et al. (2022) state that an individual's knowledge of the environment is influenced by several factors, such as environmental education effectiveness, the effectiveness of environmental teaching materials, and factors such as teachers, curriculum, and facilities.

Environmental literacy is a conscious effort to encourage individuals to have awareness of the importance of enhancing knowledge, skills related to environmental values and norms, and actions that prioritize environmental sustainability (Awaludin et al., 2024; Nuri et al, 2023). The ability of environmental literacy and the formation of environmental awareness will lead to positive behavior. This is emphasized by Darmawan (2016), stating that customs, attitudes, emotions, ethical values, power, persuasion, and genetics will influence an individual's behavior. Therefore, environmental consciousness does not arise spontaneously; it emerges due to stimuli received by individuals from within themselves or externally. Hence, environmental awareness is closely related to knowledge, attitudes, and behavior aspects (Varoglu, Temel and Yilmaz, 2017; Bashirun and Norance, 2020).

Environmental awareness will result in increased attention to the causes of environmental issues, whether related to moral education to shape environmentalism (Begum et al, 2022), forming attitudes towards the environment (Rahardjanto et al., 2022), and the impact of environmental education on knowledge and attitudes towards the environment (Erhabor and Don, 2016). In this context, it can be associated with prospective biology teacher students. By considering and analyzing the implications of their behavior towards the environment, achieving a balanced and harmonious life among all elements with full awareness of the importance of the environment is eventually attainable. Creating environmental awareness among the community, especially prospective biology teacher students, is the best way, as they are the future leaders, planners, policymakers, and environmental educators.

Environmental ethics literacy is classified as an endogenous factor that can influence environmental awareness, and environmental awareness influences behavior. Therefore, the research results indicate that environmental ethics literacy can impact an individual's environmental awareness. Environmental awareness is closely related to the aspects of knowledge, attitudes, and behavior (Azrai et al., 2017). Having awareness of the environment brings more attention to the causes of environmental issues. Therefore, students will consider and analyze the implications of their behavior on the environment, ultimately achieving a balanced and harmonious life among all elements.

Creating environmental awareness among the community, especially students, is the best way to shape environmental literacy because they are future leaders, planners, policymakers, and environmental educators (Dasrita et al, 2015).

Students with high environmental knowledge will have awareness to preserve and protect their environment (Rokhmah and Fauziah 2021). According to Azrai et al. (2017), students' environmental awareness will shape responsible environmental attitudes and behavior. Referring to the research by Aminrad et al. (2013), there is a positive correlation between students' awareness and attitudes toward the environment. Therefore, when students have extensive knowledge about environmental issues, they become more aware of ongoing environmental issues, and this awareness motivates them to act responsibly towards the environment.

Hence, behavior correlates positively with environmental knowledge and attitudes (Spínola, 2020). However, these factors are not the only ones that can influence environmental awareness. There are still many endogenous factors not discussed in this study that can affect environmental awareness, making it a recommendation for further research.

## CONCLUSION

Based on the research findings, it is revealed that (1) the environmental ethics literacy of prospective biology teacher students is in the moderate category; (2) the environmental awareness of prospective biology education teacher students is in the good category; (3) there is a relationship between environmental ethics literacy and environmental awareness character. The results of this study indicate that environmental ethics literacy has a positive relationship with environmental awareness. Therefore, to cultivate environmental awareness, there is a need for continuous improvement in environmental ethics literacy. Consequently, environmental ethics literacy becomes a competency that must be developed and enhanced in higher education institutions, specifically so that students with low environmental ethics and awareness can be improved in an integrated and sustainable manner.

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