Exploration of Environmental Literacy for Prospective Biology Teachers to Support the Achievement of Sustainable Development Goals

Iin Murtini [a*], Achmad Yogi Pambudi[b]

[a] Biology Education Study Program, FKIP, Ronggolawe PGRI University, Manunggal no 61 Street, Tuban, Indonesia
[b] Biology Education Study Program, FKIP, Ronggolawe PGRI University, Manunggal no 61 Street, Tuban, Indonesia
[*] Alamat email: iin.moertiny@gmail.com

Abstract

Environmental literacy is one of the important aspects in education, especially for prospective student teachers, because it has an important role in shaping attitudes and behaviours that are responsible for the environment in future generations. The purpose of this study was to identify the environmental literacy of prospective biology teachers. The type of research used is descriptive. The subjects of this study were 30 biology education students. The instrument used in this research is a questionnaire of environmental literacy and knowledge about the environment. The data obtained was then analysed descriptively qualitative. The results showed that students had environmental knowledge with a very high category of 4.3 and the lowest was 2.4 in the moderate category. The attitudes and environmental awareness of prospective biology teachers are in the high category with a percentage of 98.8%. This means that prospective biology teachers at PGRI Ronggolawe University Tuban have high environmental literacy.

Keywords: Environmental Literacy, Biology teacher candidates, Environmental Knowledge

1. Intoduction

Environmental literacy is a conscious attitude to maintain a balanced environment. This literacy refers to the ability of individuals to understand, apply, and participate in complex environmental issues by involving an understanding of environmental concepts and principles, as well as the ability to interpret scientific information related to environmental issues [1]. Environmental literacy includes four aspects, namely environmental competence, environmental knowledge, environmental attitude, and environmental behaviour and responsibility [2]–[5]. Maintaining environmental balance is everyone's responsibility. Therefore, it is natural for everyone to have a good insight into the environment, especially prospective biology teachers.

Prospective biology teacher students learn about environmental conservation through environmental knowledge and conservation courses. Prospective biology teachers are better able to integrate environmental issues into the curriculum and inspire students to take an active role in nature conservation through an understanding of environmental literacy, so as to improve environmental literacy [6]. Environmental literacy is not only about knowledge, but also about how we act and take responsibility for the environment around us [7]. These findings emphasise the need for action to strengthen environmental literacy so that the goals of 'agent of change,' 'agent of development,' and 'agent of modernisation' in students can be achieved [8]. In addition, environmental literacy needs to be strengthened so that prospective teachers can become reliable agents of change in teaching environmental awareness to students [9].

Biology teacher candidates have a crucial role in shaping the attitudes and behaviours of caring for the environment for future generations. Through effective education and learning, they can instil a deep understanding of the concepts and principles of waste management and the importance of maintaining environmental sustainability. By utilising digital technology, biology teacher candidates can disseminate information about environmental issues more widely, encourage the adoption of sustainable lifestyles, and inspire collective action for nature conservation. Prospective biology teacher students have good perceptions of waste management, with the majority showing very strong environmental attitudes and behaviours

that support environmentally friendly practices [10]. Environmental literacy has a very important role in developing awareness and sustainable action in maintaining and preserving the environment [11].

There are several inhibiting aspects that need to be addressed in efforts to improve environmental literacy, including limited resources, lack of public awareness of the environment, a sense of indifference to environmental issues, lack of integration in the curriculum, and paradigm shifts [9]. To overcome these challenges, the government has implemented an environmental education programme. In the context of 21st century education, environmental literacy and environmental awareness have great potential to form a generation that cares about nature and contributes to environmental sustainability [12]. The exploration of environmental literacy can create positive and sustainable changes for the earth. The purpose of the study was to describe the environmental literacy of prospective biology teacher students to support the achievement of sustainable development goals.

2. Research Method

2.1. Type of Research

This type of research is descriptive. Descriptive research aims to provide an overview of the existence of a variable, in the form of field phenomena [13].

2.2 Research subjects

The research subjects were biological education students in the 2021 and 2022 batches who had taken the basics of ecology course with a total of 30 respondents.

2.3 Time and Place of Research

This research was conducted in May-June 2023 at PGRI Ronggolawe University Tuban.

2.4 Research Instruments

This research instrument uses a 10-item esay test question about ecological knowledge and uses a questionnaire sheet containing indicators of environmental awareness, environmental literacy attitudes, habits of protecting the environment.

2.5 Data collection and analysis techniques

Data collection techniques by distributing questionnaires and questions about ecological knowledge. The data analysis technique was carried out by calculating the results of the environmental literacy test assessment and environmental awareness questionnaire sheet. The ecological knowledge test was calculated using the following formula [14].

$$\text{environmental literacy} = \frac{\text{Number of correct answers}}{\text{the total of all correct answers}} \qquad (1)$$

Table 1. Range of environmental literacy

Range of environmental literacy	Information
3.21-4.00	Very high

2.41-3.20	Tall
1.61-2.40	Currently
0.81-1.60	Low

$$\text{Environmental Awareness}(\%) = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100\% \quad (2)$$

Table 2. Average Score

Average score %	Category
85-100	Very Positive
70-84.9	Positive
55-69.9	Quite Positive
40-54.9	Less Positive
25-39.9	Not Positive

3. Result and discuss

3.1 Environmental knowledge

Environmental literacy includes understanding environmental concepts and principles and the ability to interpret scientific information related to environmental issues [15]. This environmental literacy component has five indicators, namely (1) interest in the environment, (2) sensitivity or concern for the environment, (3) locus of control, (4) responsibility for environmental balance, and (5) intention to act in maintaining environmental balance [16]. The results of the environmental literacy test consisting of aspects of ecological knowledge in accordance with the indicators of ecological knowledge are presented in Figure 1.

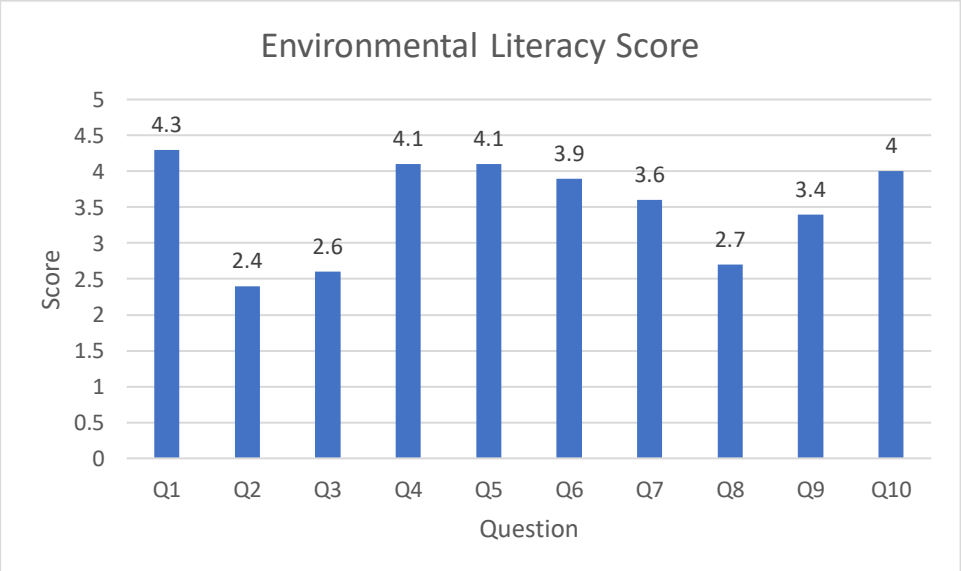

Fig. 1. Environmental Knowledge Test Results

Based on Figure 1, it is known that the results of the student environmental literacy test show that the highest score is 4.3 which means students have very high knowledge, and the lowest score is 2.4 which means students have moderate knowledge. The ecological knowledge indicator has a high value. This is due to learning by focusing activities on the actual conditions around students, it can open up a variety of student ideas to solve a problem [17]. Hands-on learning experiences allow students to interact with the environment. Practical activities such as environmental projects and fieldwork, or conservation-related activities, can both be undertaken. This provides an immersive experience and allows students to connect concepts with the real world [18].In addition, students gain direct learning experience from the environment so that they can improve environmental behaviour [19].

A students' basic ecological knowledge scores were achieved [20]. The high ability of students can be influenced by the cognitive level of students and concepts that have been taught by teachers. Environmental knowledge should also develop an understanding of ecosystems and the causal relationship between human attitudes and behaviour towards the environment [21], [22]. Environmental literacy and environmental awareness have the potential to develop an understanding of the environment, be sensitive to environmental issues and have awareness in contributing to protecting the environment [23]. Students who get good environmental education tend to have a better understanding of the importance of protecting the environment and the impact of individual actions on the environment [24]. The curriculum and facilities and infrastructure need to support the programme to improve the environmental literacy of prospective science teacher students.

3.2. Environmental attitudes and awareness

The data from the analysis of the environmental attitude and behaviour questionnaire was tested using an attitude test consisting of 16 items in accordance with the environmental attitude indicators. From the results of this environmental attitude, students obtained the value of students' environmental attitudes which can be presented in Figure 2 below:

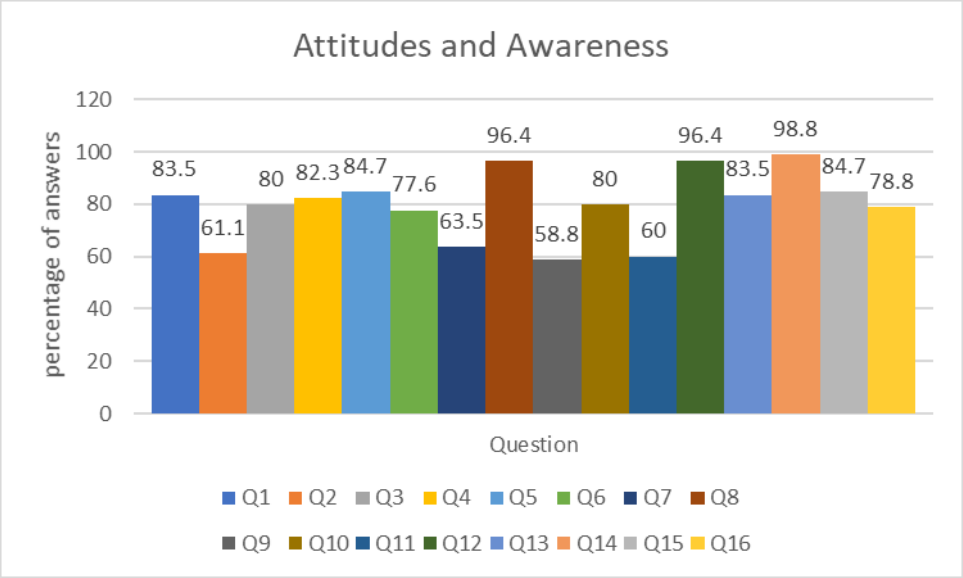

Fig. 2. Environmental Knowledge Test Results

Based on Figure 2 above, it can be seen that environmental knowledge can improve students' environmental literacy. Behavioural indicators have an average percentage in the positive category. This is because students during lectures are also familiarised with the attitude of caring for the environment. One of them is throwing garbage in its place, maintaining class cleanliness, maintaining plants in the greenhouse and planting mangrove trees on the beach. An integrated increase in student knowledge can affect their attitude towards the environment achieved through an action or behaviour that supports the environment [20]. Environmental care attitude is one of the important indicators used to measure and determine a person's level of environmental literacy [25].

The attitude indicator has the lowest value of 58.8% with a fairly positive caterogy. This is related to the habits that students do in everyday life. There are many factors that can influence students‘ attitudes towards the environment such as parents, school curriculum, and students’ home habits [3]. Other factors that affect environmental awareness are ignorance, poverty, humanity, and one's lifestyle [26]. A students' environmental skills are still low, the low level may be because the school does not have an environment that is able to provide this . These students have the same ability to identify, analyse, use, and evaluate evidence and make decisions to address environmental problems and student grade level has no significant effect on environmental literacy outcomes [8]. The attitude of prospective teacher students is still negative, indicating that education related to the environment that takes place during lectures still does not support prospective students' attitudes towards the environment [27].

Environmental literacy can instil awareness and form a person who loves the environment. In addition, having environmental literacy has great potential in changing the order and mindset towards the environment and as an effort to solve existing environmental problems [23], [28]. In addition to having the potential to build real actions to care for the environment, environmental awareness also has the potential to maintain the sustainability of the next life [29]. By having strong environmental literacy skills, prospective biology teachers are expected to be able to make decisions based on scientific knowledge and take positive actions related to environmental issues.

4. Conclution

Based on the results of the study, students' environmental knowledge was in the very high category of 4.3 and the lowest category of 2.4 was in the moderate category. The attitude of prospective biology teachers and environmental awareness is in the high category at 98.8%. This means that prospective biology teachers at PGRI Rongolawe University Tuban have a high level of environmental literacy. Increased environmental literacy can help prospective teachers as a whole to be more concerned about environmental issues and contribute to nature conservation and sustainable development. Thus, this scientific article can provide further insight into the importance of environmental literacy for biology teacher candidates and how their role in maintaining environmental sustainability.

Acknowledgements

The author would like to express his gratitude to those who helped in this research, especially to Uniersitas PGRI Ronggolawe for providing a place for research.

References Use

[1] I. D. Pursitasari, E. Suhardi, D. Ardianto, and A. Arif, "Pengembangan Bahan Ajar Bermuatan Konteks Kelautan," *JIPI (Jurnal IPA dan Pembelajaran IPA*, vol. 3, no. 2, pp. 88–105, 2019, doi: 10.24815/jipi.v3i2.14847.

[2] G. Teksoz and E. Sahin, "Modeling Environmental Literacy of University Students," *J Sci Educ Technol*, no. March 2011, pp. 157–166, 2014, doi: 10.1007/s10956-011-9294-3.

[3] F. Maulidya, A. Mudzakir, and Y. Sanjaya, "Case Study the Environmental Literacy of Fast Learner Middle School Students in Indonesia," *Int. J. Sci. Res.*, vol. 3, no. 1, 2014.

[4] K. S. Hollweg, J. Taylor, L. L. C. R. W. Bybee, and T. J. Marcinkowski, "Developing a Framework for Assessing Environmental Literacy : Executive Summary," *North Am. Assoc. Environ. Educ.*, 2000.

[5] H. Aprilanti, M. Qurbaniah, and N. D. Muldayanti, "Identifikasi Miskonsepsi Siswa Pada Materi Sistem Ekskresi Manusia Kelas Xi Mia Sma Negeri 4 Pontianak," *J. Bioeducation*, vol. 3, no. 2, pp. 63–77, 2016, doi: 10.29406/188.

[6] F. Yusup, "Profil Literasi Lingkungan Mahasiswa Calon Guru Ipa Environmental Literacy Profile of Science Teacher Candidates," *QUANTUM J. Inov. Pendidik. Sains*, vol. 12, no. 1, pp. 128–135, 2021.

[7] F. Nugraha, A. Permanasari, and I. D. Pursitasari, "Disparitas Literasi Lingkungan Siswa Sekolah Dasar di Kota Bogor Pendahuluan," *J. IPA dan Pembelajaran IPA*, vol. 5, no. 1, pp. 15–35, 2021, doi: 10.24815/jipi.v5i1.17744.

[8] H. Irawati, N. Aprilia, and M. F. Saifuddin, "Literasi lingkungan mahasiswa keguruan environmental literacy of teaching students," *Didakt. Biol. J. Penelit. Pendidik. Biol.*, vol. 7, no. 2023, pp. 91–97, 2024.

[9] R. S. Hayati, "Pendidikan lingkungan berbasis experiential learning untuk meningkatkan literasi lingkungan," *Humanika, Kaji. Ilm. Mata Kuliah Umum*, vol. 20, no. 1, pp. 63–82, 2020, doi: 10.21831/hum.v20i1.29039.63-82.

[10] R. Susanti, Y. Anwar, and E. Ermayanti, "Profile of science process skills of Preservice Biology Teacher in General Biology Course," *J. Phys. Conf. Ser.*, vol. 1006, no. 1, 2018, doi: 10.1088/1742-6596/1006/1/012003.

[11] E. Erlistiani, M.; Syachruroji, A.; & Andriana, "Penerapan Model Pembelajaran SSCS (Search, Solve, Create and Share) Terhadap Kemampuan Berpikir Kritis Siswa," *J. Pendidik. Guru Sekol. Dasar*, vol. 13, no. 2, pp. 161–168, 2020, doi: 10.33369/pgsd.13.2.161-168.

[12] L. K. Febriasari and N. Supriatna, "Enhance Environmental Literacy through Problem Based Learning," *J. Phys. Conf. Ser.*, vol. 895, no. 1, 2017, doi: 10.1088/1742-6596/895/1/012163.

[13] Sugiyono, *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta, 2012.

[14] Purwanto, *Prinsip-Prinsip dan Teknik Evaluasi Pengajaran*. Bandung: Remaja Rosdakarya, 2013.

[15] J. Jamilah, I. K. Sadiqin, and F. Fahmi, "Studi Eksplorasi Literasi Aspek Pengetahuan Lingkungan Lahan Basah Siswa Sd Adiwiyata Di Banjarmasin," *J. Banua Sci. Educ.*, vol. 3, no. 2, pp. 135–141, 2023, doi: 10.20527/jbse.v3i2.193.

[16] R. Farwati, A. Permanasari, H. Firman, and T. Suhery, "Pengembangan dan Validasi Instrumen Evaluasi Literasi Lingkungan," *J. Penelit. Pendidik. Kim. Kaji. Has. Penelit. Pendidik. Kim.*, vol. 5, no. 1, pp. 38–44, 2018.

[17] S. D. Ardianti, S. Wanabuliandari, and S. Rahardjo, "Peningkatan perilaku peduli lingkungan dan tanggung jawab siswa melalui model," *J. Ilm. "PENDIDIKAN DASAR,"* vol. IV, no. 1, pp. 1–7, 2017.

[18] N. Anggraini and K. Nazip, "Kemampuan Literasi Lingkungan Mahasiswa Pendidikan Biologi Menggunakan Skor Nela," *J. Educ. Action Res.*, vol. 6, no. 4, pp. 552–557, 2022.

[19] N. Anggraini, K. Nazip, P. K. Wardhani, and D. S. Andrian, "Analysis of Environmental Literacy Skill of Biolfile:///C:/Users/ASUS/Downloads/Syafiradkk (1).pdfogy Teacher Candidates in Human and Environmental Courses Analisis Kemampuan Literasi Lingkungan Calon Guru Biologi Dalam Mata Kuliah," *Sci. Educ. J.*, vol. 5, no. 1, 2021, doi: 10.21070/sej.v5i1.1169.

[20] A. S. Haske and A. R. Wulan, "Pengembangan E-learning berbasis MOODLE dalam Pembelajaran Ekosistem untuk Meningkatkan Literasi Lingkungan Siswa pada Program Pengayaan Developing E-learning Based MOODLE in Learning Ecosystem to Improve Environmental Literacy in Class X Enrichment Progr," in *Seminar Nasional XII Pendidikan Biologi FKIP UNS 2015*, 2015, no. 2009, pp. 402–409.

[21] D. A. Widiyastuti, L. Nurtamara, and A. Ulimaz, "Analisis Kesadaran Dan Literasi Lingkungan Pada Mahasiswa Pendidikan Biologi," *J. Educ.*, vol. 06, no. 04, pp. 18987–18997, 2024.

[22] A. Afandi, "Literasi Lingkungan Dan Kesadaran Lingkungan : Potensi Dan Tantangan Dalam Pendidikan Abad 21," in *Prosiding Seminar Nasional Pendidikan 2020*, 2021, no. March.

[23] S. Indriyani, A. Afandi, and E. S. Wahyuni, "Literasi Lingkungan Dan Kesadaran Lingkungan : Potensi Dan Tantangan Dalam Pendidikan Abad 21," *Pros. Semin. Nas. Pendidik. 2020*, no. March, pp. 239–245, 2020, [Online]. Available: https://www.researchgate.net/publication/353016532_Literasi_Lingkungan_Dan_Kesadaran_Lingkungan_Potensi_Dan_Tantangan_Dalam_Pendidikan_Abad_21

[24] A. J. Ilham, A. T. Kusuma, F. R. Putri, and B. Selsia, "Peran Pendidikan Lingkungan Dalam Meningkatkan Kesadaran Dan Tindakan Berkelanjutan Di Sekolah Dasar," *J. Pendidik. dan Sains*, vol. 3, no. 5, pp. 907–917, 2023.

[25] E. Hariyadi, E. Maryani, W. Kastolani, S. P. Geografi, U. S. November, and K. K. Tenggara, "Analisis literasi lingkungan pada mahasiswa pendidikan geografi," *Gulawentah J. Stud. Sos.*, vol. 6, no. 1, pp. 1–16, 2021, doi: 10.25273/gulawentah.v6i1.6685.

[26] S. Munawar, E. Heryanti, M. Miarsyah, P. Studi, P. Biologi, and U. N. Jakarta, "Hubungan pengetahuan lingkungan hidup dengan kesadaran lingkungan pada siswa sekolah adiwiyata," *LENSA (Lentera Sains) J. Pendidik. IPA*, vol. 9, no. 1, pp. 22–29, 2019.

[27] F. Armanda and W. Saputri, "Analisis Sikap Peduli Lingkungan Dan Minat Berwirausaha," *Bioilmi*, vol. 5, no. June, pp. 54–58, 2019, doi: 10.19109/bioilmi.v5i1.3539.

[28] M. Desfandi, "Mewujudkan masyarakat berkarakter peduli lingkungan melalui program adiwiyata," *SOSIO Didakt. Soc. Sci. Educ. J.*, no. November 2015, 2015, doi: 10.15408/sd.v2i1.1661.

[29] Y. Dasrita, Z. Saam, B. Amin, and Y. I. Siregar, "Kesadaran Lingkungan Siswa Sekolah Adiwiyata," *Din. Lingkung. Indones.*, vol. 2, no. 1, pp. 61–64, 2015.