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Profiling Eco-literacy in Elementary School Students: A Qualitative Case Study Approach

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ABSTRACT

This study aims to describe the eco-literacy profile formulated by the Centre of Eco-literacy. The research design used in this article is qualitative with a case study approach. The research subjects consist of 5 students, two teachers, and the principal. The data collection techniques in this study used three techniques: observation, interviews, and documentation. The data analysis technique examines the data obtained from the beginning of data collection to conclude. The research result shows that: (1) in the cognitive aspect, students understand environmental issues and can connect this knowledge with concrete actions in their daily lives; (2) the emotional aspect shows that students are deeply aware of the interdependence between living beings and the environment, accompanied by empathy and care for nature; (3) the activity aspect is evident from students' involvement in using tools and resources wisely and integrating eco-literacy principles into various practical activities; and (4) the spirit aspect is reflected in the increased awareness of students regarding the relationship between humans and nature, manifested through actual actions born from their knowledge and care. This study concludes that students' eco-literacy profile is good, with skills encompassing cognitive, emotional, activity, and spirit aspects that mutually support understanding and responding to environmental issues effectively. This research is expected to serve as a reference for policymakers and schools in implementing eco-literacy in elementary schools.

INTRODUCTION

The global environmental crisis has highlighted the critical role of education in fostering ecological literacy to shape attitudes, responsibilities, and behaviors toward sustainability (Friman et al., 2024; Liu & Tobias, 2024; Nkaizirwa et al., 2021). Across the globe, ecological literacy is pivotal in building awareness and promoting action on pressing environmental issues. It equips students with the knowledge and skills to navigate and address these challenges responsibly (Debrah et al., 2021; Häggström & Schmidt, 2020; Shutaleva, 2023). However, in Indonesia, the uneven implementation of environmental education remains a significant obstacle. While ecological literacy has the potential to drive meaningful change, disparities in access and execution hinder its widespread adoption, particularly in addressing urgent climate issues (Juliandar et al., 2023; Susilo et al., 2021).

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A comprehensive and inclusive approach to environmental education is essential to ensure that students develop environmental awareness and sensitivity. One effective framework is eco-literacy, which integrates cognitive understanding, emotional connection, and active participation in ecological sustainability (Bhutto & Rūtelionė, 2024; Putri Indah Pratiwi et al., 2024). Through eco-literacy, students are encouraged to critically engage with environmental issues, fostering a generation capable of responding to these challenges effectively (Collins & Donahue, 2019; Kerçİn & Mehmet Şirin Demİr, 2024; Sumarmi et al., 2021). This aligns with global calls for sustainable development and Indonesia's national education goals, which prioritize climate change awareness, financial literacy, and health in the curriculum (Ika Sari et al., 2024; Meisarah et al., 2023).

Despite government initiatives, such as the Adiwiyata program and the introduction of Climate Change Education guidelines, only a small proportion of schools—approximately 6.5%—have adopted these programs. This limited reach underscores the need for targeted efforts to expand environmental education and address barriers such as inadequate teacher training and insufficient curricular focus on ecological issues (Adawiah, 2019; Nurwidodo et al., 2020). Studies have shown that these limitations contribute to students' lack of exposure to ecological knowledge and awareness, hindering their capacity to act sustainably (Sunarto, 2023; Susilo et al., 2021).

This study focuses on describing the eco-literacy profile of students in elementary schools, using the framework proposed by the Center for Eco-literacy: cognitive (head), emotional (heart), spiritual (connection), and behavioral (hands) components. By examining students' understanding, emotional responses, and practical applications of eco-literacy principles, this research seeks to highlight areas of strength and address gaps in current practices.

The findings are expected to offer actionable insights for policymakers, particularly regarding teacher training and support to implement environmental education effectively. Furthermore, this study contributes to the broader objective of fostering a proactive and environmentally conscious generation capable of sustaining ecological balance. Ultimately, the research underscores the importance of integrating eco-literacy into education systems as a cornerstone for achieving long-term environmental sustainability and resilience.

METHODS

This study employed a qualitative case study design to gain an in-depth understanding of eco-literacy among elementary school students. A case study approach was chosen because it allows for a detailed exploration of the contextual and experiential aspects of eco-literacy within a specific educational setting (Lichtman, 2023; Miles et al., 2014). This approach is particularly appropriate for examining the ongoing processes and relationships that shape eco-literacy development in students.

The participants in this study included five students, two teachers, and the principal. The sampling method used was purposive sampling, which ensures participants are selected based on specific criteria aligned with the research objectives (S. Campbell et al., 2020). The criteria for participant selection included a willingness to participate, familiarity with the school environment and culture, active involvement in environmental projects conducted at the school, and a minimum of two years of experience at the school. These criteria were designed to ensure the participants had relevant knowledge and experiences to contribute meaningful data to the research.

Data were collected using three primary methods: observation, interviews, and documentation. Observations were conducted directly and reflexively, focusing on eco-literacy activities within the school environment. These observations included student learning processes and activities related to eco-literacy and were repeated until sufficient data were collected. Semi-structured interviews were also conducted with students, teachers, and the principal to explore their perspectives on eco-literacy activities in the school. The interviews focused on participants' involvement in environmental projects and their understanding of eco-literacy practices. To ensure the credibility and accuracy of the findings, documentation was used to supplement the observation and interview data. This included collecting photos, videos, audio recordings, and other materials that showcased eco-literacy activities in the school.

The data were analyzed using the Miles and Huberman (2014) model, which involves three main stages: data reduction, data display, and conclusion drawing. Data reduction was carried out by summarizing and organizing the data to focus on key themes and patterns related to eco-literacy. This

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process was iterative and continued throughout the research to align the data with the study's objectives. The reduced data were then displayed in concise descriptions, tables, and visual formats, making it easier to interpret and understand. Finally, conclusions were drawn based on the analyzed data, with findings refined as new evidence emerged during the process. This systematic approach ensured a thorough exploration of eco-literacy among elementary school students and provided valuable insights into their understanding, experiences, and behaviors related to environmental sustainability.

RESULTS

Cognitive Aspect

Ecological literacy (eco-literacy) in the cognitive aspect reflects an individual's ability to understand environmental issues and connect that knowledge to real actions. Interview results show that formal education significantly shapes initial knowledge, but direct experience and social interactions are also highly influential. Based on the facts from the interview with the school principal, it was stated:

> *"Students' understanding of maintaining and caring for the environment has developed significantly in this school. Students understand the concept of disposing of waste properly and the positive impact of reducing plastic waste in the school environment. By planting various types of plants in the school environment, students also understand how to properly plant, differentiate between wilting and healthy plants, know various types of plants, their benefits, and how to care for them by making watering schedules that students carry out during class duties. The harvests are processed by students into various types of food and then sold in the Market Day program."*

Figure 1. Students Bring Packed Lunches to Reduce Plastic Waste

The observation results show that students understand the importance of environmental preservation. They can analyze environmental issues around them, such as unhealthy air pollution due to their proximity to industrial areas. The school provides an environmental laboratory where students can directly interact with nature and observe plants and their types firsthand. Additionally, students reduce plastic waste by bringing their food containers and bottles from home (see Figure 1), as teachers require, thus eliminating single-use plastic containers. If students fail to bring their containers, the class teacher lightly reprimands them.

Furthermore, a classroom teacher stated,

> *"Environmental knowledge is not only obtained through lessons but also by providing direct experiences with nature. For instance, in the IPAS (Natural and Social Science) subject, students can conduct direct observations using the plants they have grown* (see Figure 2)*. This way, students can learn about various types of plants and their benefits."*

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Figure 2. Students' Project on Ecosystem

Emotional Aspect

Eco-literacy in the emotional aspect refers to the awareness and understanding of the interactions between living beings and their environment, encompassing significant emotional components. The emotional aspect of eco-literacy includes three indicators: empathy and care, collaboration and appreciation, and commitment to equality, inclusivity, and respect for all people. The first indicator of empathy and care for others, the environment, and living beings is shown by students through sharing meals and lending stationery (see Figure 3). Their empathy and care for the environment are demonstrated by bringing their food containers and properly disposing of waste. Students also remind each other to water plants and avoid stepping on or damaging them.

Figure 3. Sharing Lunch

Besides empathy and care, eco-literacy should involve cooperation and tolerance with others. Based on interview facts, the school principal stated,

> *"For the new academic year, first-grade students are asked to bring plants they grow at home and not to buy from outside to learn how to plant and care for them. There will be a Market Day at the end of the academic year. During Market Day, students are grouped and must cooperate to process their crops to be sold at the event, with the proceeds allocated for buying new seeds and fertilizers."*

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Figure 4. Market Day

This demonstrates that students are accustomed to collaborating to solve learning or project-related problems. Collaboration and respect for others are not limited to peers but also extend to parents. Critical thinking skills and analysis tasks are assigned at the beginning and end of each academic year. During Market Day, at the end of the school year, communication and collaboration occur between the school community—teachers, students, and parents—to foster character development in students during their formative years (see Figure 4).

The third indicator is a commitment to equality, justice, inclusivity, and respect for all. This aligns with an interview with a teacher, who stated,

> *"There are 21 students with special needs (ABK) at this school. They have various types of learning difficulties, autism, hyperactivity, and mild intellectual disabilities. The school implements an inclusive approach to support them, ensuring that all students are treated equally. Teachers usually provide special assistance through additional tutoring outside of class hours. Moreover, ABK students are involved in joint activities, such as sports and arts, to build social interactions with their classmates. Peer tutoring programs are also implemented, where non-ABK students help ABK students learn. However, we face challenges due to the many students and limited teachers."*

Activity Aspect

There are three indicators of activity. The first is creating and using tools and objects needed for eco-literacy activities. Based on observations and interviews, students can use tools and objects for eco-literacy activities and understand how to plant various types of crops in each of their classes. Some medicinal plants students planted include chili, purple corn, galangal, lemongrass, and noni. Students also know about different types of fertilizers, how to use them, and their effects on plants. They understand how to care for plants by watering them regularly, placing them in sunlight, pruning dry/dead leaves, and weeding the surrounding area.

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Figure 5. Students Planted and Weeded the Garden

Figure 6. Students Watered Plants

The next indicator is the application of eco-literacy in daily life. The observation results also provide deeper insights into how students interact with their environment. The school organizes various activities to ensure that eco-literacy is implemented in students' daily lives. Students are encouraged to actively participate in preserving nature and developing environmentally conscious habits through direct interaction with their surroundings (see Figures 5 and 6). Some flagship programs that serve as platforms for implementing eco-literacy include SEHATI (Biodiversity School), KURASAKI (Reduce Our School's Waste), and Market Day (see Figures 7 and 8). In interviews, several teachers mentioned,

> *"The SEHATI program aims to raise students' awareness about biodiversity and the importance of maintaining ecosystem balance. This program includes tree planting, mini-garden creation, and the introduction of various local flora and fauna. Students are actively involved in gardening activities, from selecting plant species to caring for them. This program is expected to foster a love for nature and a sense of responsibility towards the environment. The KURASAKI program is designed to teach students how to manage waste properly and reduce plastic use in the school environment. Teachers emphasize the importance of sorting and repurposing waste into new products, such as making eco-bricks. Students are encouraged to bring reusable containers and avoid single-use packaging. These habits instill early awareness of the importance of keeping the environment free from excessive waste. Then, we also have the Market Day activity, where students can practice entrepreneurship with an eco-friendly concept. Students sell various products like crafts from recycled materials and*

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healthy food without plastic packaging. During the event, students sell products and educate visitors about the benefits of eco-friendly living."

The last indicator is the utilization of energy and resources. From the observations conducted, many students are saving energy at school. Students know the importance of conserving energy, as shown by their actions, such as turning off lights and fans when not in use. This fact is reinforced by some students who quickly turn off electricity before leaving the classroom. In addition to saving electricity, students understand the importance of not bringing plastic waste or non-biodegradable materials to school.

Figure 7. Poster of KURASAKI

Figure 8. SEHATI Program

Spiritual Aspect

The spiritual aspect of eco-literacy is a way to enhance student's awareness of the relationship between humans and nature, manifested through real actions driven by knowledge and care. Some indicators of the spiritual aspect of eco-literacy include understanding the environment, appreciating the environment, and having a good relationship with the environment. Based on interviews with students, one stated,

"The environment must be preserved so that the living creatures on Earth can live well. Sometimes I feel sad and guilty when a plant wilts or dies because it indirectly means I have failed to preserve the environment."

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Figure 9. A Student Admiring a Plant

Observation results show that students understand their environment well, as evidenced by their awareness of creating a green and beautiful environment at school. Students actively care for the school's garden, clean the yard, and regularly manage waste by sorting organic and inorganic trash. Keeping the classroom clean is routine without being asked, demonstrating responsibility and care for the surrounding environment. These activities prove that students can understand their environment because they have good knowledge. This understanding of the environment is gained through classroom learning and advice during flag ceremonies and morning assemblies.

Figure 10. Students Feel More Comfortable Interacting and Reading Books Under a Tree

Moreover, the third indicator, concerning a good relationship with the environment, shows that students have a positive relationship with nature at school. During breaks and free periods, many students choose open areas such as the garden, yard, or under shady trees for their activities. Some students can be seen sitting under trees, enjoying the fresh air while reading books or chatting with friends (see Figures 9 and 10). This area has become a favorite spot because of its relaxed atmosphere. This condition illustrates a positive connection between students and the environment and a love for the surrounding nature.

DISCUSSION

The research findings provide an in-depth analysis of the development of ecological literacy (eco-literacy) among students across cognitive, emotional, activity, and spiritual aspects. The findings emphasize the significant role of formal education, experiential learning, and structured school programs in fostering students' environmental awareness and actions. The cognitive aspect of eco-

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literacy demonstrates students' understanding of environmental issues and their ability to connect this knowledge to practical applications (Kerçİn & Mehmet Şirin Demİr, 2024; Sigit et al., 2021). The integration of formal education with experiential learning activities, such as gardening and waste management, highlights a holistic approach to building students' ecological knowledge (Chien et al., 2019; Evans, 2019; Juliandar et al., 2023).

Students exhibit a solid understanding of environmental preservation through various initiatives. For example, they engage in activities like proper waste disposal, reducing plastic use by bringing reusable containers (Figure 1) and applying their knowledge to care for plants. These practices align with experiential learning theories, where real-world application reinforces theoretical knowledge (Gemmell & Kolb, 2020). Furthermore, the use of environmental laboratories and ecosystem projects enhances critical thinking and analytical skills. These experiences allow students to explore and address local environmental challenges, such as air pollution from industrial areas (Concina, 2019; Huertas et al., 2021). This approach not only builds students' knowledge but also fosters problem-solving skills, a critical component of eco-literacy (Collins & Donahue, 2019; Erfariyah & Jaenudin, 2024; Ninsiana et al., 2024; Putri Indah Pratiwi et al., 2024).

The emotional aspect of eco-literacy highlights students' empathy, collaboration, and inclusivity. Activities such as sharing meals (Figure 3) and reminding peers to care for plants demonstrate their growing empathy for the environment and others. This development reflects the importance of fostering emotional connections as a foundation for sustainable environmental practices (Fteiha & Awwad, 2020). Students' collaborative efforts, such as group activities during Market Day (Figure 4), promote teamwork and mutual respect. The requirement for first-grade students to bring home-grown plants exemplifies how the school instills a sense of responsibility and cooperation. This collaboration extends beyond peers to involve parents and teachers, fostering a community-oriented approach to eco-literacy (Ika Sari et al., 2024; Juliandar et al., 2023; Shutaleva, 2023). Inclusivity is another crucial component. The school's support for students with special needs (ABK) through peer tutoring and joint activities illustrates an equitable approach to education. Despite challenges, such as limited resources, the school ensures all students are actively involved in environmental initiatives, reflecting a commitment to inclusivity and social justice (Juvonen et al., 2019; Nishina et al., 2019; Page et al., 2023).

Students demonstrate their eco-literacy through hands-on activities that emphasize the practical application of environmental knowledge. Planting and caring for various crops (Figures 5 and 6) teaches students about sustainability and biodiversity. Programs like SEHATI and KURASAKI provide structured platforms for eco-literacy, integrating environmental preservation with entrepreneurial skills, as seen in Market Day activities (Figures 7 and 8). Additionally, students apply their eco-literacy knowledge in daily life, such as conserving energy and managing waste responsibly. The promotion of sustainable habits, including the use of eco-bricks and reusable containers, reflects the effectiveness of school programs in embedding environmentally friendly behaviors into students' routines (Salimi et al., 2021). These practices align with UNESCO's framework for sustainability education, which emphasizes active participation and practical application (C. Campbell et al., 2021; Oe et al., 2022).

The spiritual aspect of eco-literacy reflects students' awareness of their connection with nature, underpinned by a sense of responsibility and care. Students express emotional connections with the environment, as seen in their feelings of guilt when plants die. These sentiments indicate a deeper understanding of humanity's role in environmental stewardship (Ninsiana et al., 2024; Putri Indah Pratiwi et al., 2024; Salimi et al., 2021). Activities like cleaning the schoolyard, managing waste, and caring for gardens demonstrate how students' spiritual awareness translates into tangible actions (Gitmiwati & Indrayuda, 2024; Ilham et al., 2024). Furthermore, their preference for spending time in green spaces, such as reading under trees (Figures 9 and 10), illustrates a positive relationship with the

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environment. This aligns with the concept of biophilia, which emphasizes the innate human connection to nature (Sachs, 2022; Wilson, 2017).

CONCLUSION

This study highlights the comprehensive development of ecological literacy (eco-literacy) among students through cognitive, emotional, activity, and spiritual dimensions. In the cognitive aspect, students gain a solid understanding of environmental issues through formal education and experiential learning, with practical activities like gardening and waste management reinforcing critical thinking and sustainability skills. Programs like Market Day further connect ecological knowledge with entrepreneurial practices. Emotionally, students demonstrate empathy, collaboration, and inclusivity through acts of care for the environment and teamwork on projects like Market Day. Inclusivity is reflected in the active involvement of students with special needs, fostering equality and mutual respect. In the activity dimension, hands-on practices such as planting and environmental programs like SEHATI and KURASAKI instill sustainable habits and practical skills. Spiritually, students develop a deep connection with nature, evident in their appreciation and care for their surroundings, and find comfort in natural spaces.

The study underscores the importance of a holistic approach to eco-literacy education, combining cognitive, emotional, practical, and spiritual learning. By integrating environmental knowledge into formal education, providing hands-on experiences, and fostering empathy and inclusivity, schools can develop students who are not only environmentally aware but also proactive in implementing sustainable practices. Such educational models can serve as frameworks for broader adoption in other schools, emphasizing the significance of building eco-literacy as a lifelong competence for future generations. Through sustained efforts, students can emerge as environmental stewards equipped to address global challenges and contribute to sustainable development.

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