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Original Article

Assessing the Perceived Eco-Literacy and Learning Engagement of Elementary Learners: Implications for Environmental Education Program Enhancement

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Abstract. Despite the increasing global emphasis on environmental education, elementary learners in Geographically Isolated and Disadvantaged Areas (GIDA) often demonstrate limited opportunities to develop consistent eco-friendly behaviors due to resource constraints, lack of structured programs, and minimal experiential learning. This study investigated the perceived level of eco-literacy and student engagement among elementary learners and examined their relationship. Using a quantitative descriptive-correlational design, data were collected using validated questionnaires that measured knowledge, awareness, and behavioral, emotional, and cognitive engagement in environmental learning. Results indicated that learners exhibit a moderate level of eco-literacy and engagement, with emotional engagement slightly higher than behavioral and cognitive involvement. Correlation analysis revealed a moderate positive relationship between eco-literacy and student engagement, suggesting that greater ecological knowledge and awareness may enhance participation in environmental activities. To address the identified gaps, the study proposes Project GREEN (Guided, Resilient, Engaged Environmental Education Network), a holistic program integrating guided classroom modules, experiential learning activities, and community participation to strengthen both eco-literacy and engagement. Limitations of the study include its focus on a single GIDA district, which may affect the generalizability of the findings. Future research may examine the long-term impact of Project GREEN on eco-literacy, engagement, and pro-environmental behaviors across multiple GIDA schools and diverse contexts.

Keywords: *Eco-literacy; Student engagement; Environmental education; GIDA schools; Experiential learning; SDG 4 (Quality Education); SDG 13 (Climate Action).*

Environmental education plays a vital role in developing learners who are knowledgeable about ecological systems and capable of participating meaningfully in sustainability efforts. At the elementary level, eco-literacy serves as a foundation for understanding environmental issues, interpreting human–environment interactions, and fostering responsible behavior. However, learners' understanding of environmental concepts does not automatically translate into active participation or meaningful engagement in environmental learning activities. When students exhibit limited eco-literacy or low engagement in environmental instruction, the long-term goal of cultivating environmentally responsible citizens may be compromised. This concern highlights the need to examine how learners perceive their environmental knowledge and how actively they engage in environmental learning experiences.

On a global scale, research has demonstrated measurable improvements in students' environmental literacy when structured environmental education programs are implemented. In Taiwan, Pan and Hsu (2020) found that a one-day environmental education program conducted at a nature center significantly improved sixth graders' environmental literacy, particularly in environmental knowledge, attitudes, and responsible environmental behavior. Their findings showed statistically significant gains in post-test scores, emphasizing that targeted environmental programs can enhance eco-literacy among elementary learners. In the same manner, Ricoy and Sánchez-Martínez (2022) in Spain reported that gamified environmental education strategies increased ecological awareness and digital literacy among primary school children, indicating that interactive pedagogical approaches strengthen both understanding and engagement.

Further global evidence underscores the importance of pedagogical strategies in environmental literacy development. Kazazoglu (2025) demonstrated that integrating eco-literacy into English language teaching enhanced students' sustainability awareness and interdisciplinary learning connections, supporting the idea that environmental education can be embedded across subject areas. Additionally, Xiong et al. (2025) emphasized, through a systematic review, that participatory, inquiry-based, and experiential strategies are among the most effective approaches to promoting environmental literacy in school contexts.

In the Philippine context, environmental education is institutionalized through the National Environmental Education Action Plan (NEEAP) 2018–2040, which outlines strategies for strengthening environmental awareness and literacy across educational levels (Chandran et al., 2020). The policy framework emphasizes integrating environmental principles into curricula to develop environmentally responsible citizens. However, translating policy into measurable literacy outcomes remains a continuing challenge. Botoy et al. (2026), in their comprehensive literature review on environmental literacy and knowledge levels among Filipino learners, reported variability in eco-literacy levels across studies and emphasized the need for stronger empirical investigations that focus on student outcomes.

Moreover, research examining environmental literacy among educators provides insight into instructional influences. In Davao del Sur, Padua and Malinao (2025) found that elementary teachers' ecological literacy levels serve as a basis for strengthening environmental education frameworks, suggesting that teacher competence affects classroom implementation. Further, Agcang et al. (2026) reported a significant positive relationship between environmental education teaching practices and teachers' environmental literacy levels, indicating that effective pedagogical approaches are linked to stronger literacy outcomes.

Despite global and national advancements, a research gap persists in examining the relationship between perceived eco-literacy and learning engagement among elementary learners. Most existing studies focus on policy analysis, teacher literacy, or literature reviews rather than statistically analyzing learner-level relationships between eco-literacy and engagement. Addressing this gap is urgent and aligns with Sustainable Development Goal 4 (Quality Education), which promotes education for sustainable development, and SDG 13 (Climate Action), which underscores the role of education in climate responsiveness.

This study was anchored in Environmental Literacy frameworks that conceptualize eco-literacy as encompassing knowledge, attitudes, skills, and behaviors (Pan & Hsu, 2020; Xiong et al., 2025), and in Student Engagement Theory, which posits that cognitive and behavioral engagement significantly influence learning outcomes. These theoretical foundations suggest that learners who perceive higher environmental understanding may demonstrate stronger engagement in environmental learning activities.

Specifically, this study aimed to: 1.) Determine the level of perceived eco-literacy among elementary learners in terms of ecological awareness, and ecological knowledge; 2.) Assess the level of learning engagement in environmental education in terms of behavioral, emotional, and cognitive engagement; 3.) Examine the relationship between perceived eco-literacy and learning engagement. The findings are expected to provide evidence-based recommendations for enhancing environmental education practices in the Davao Region.

Methodology

Research Design

A descriptive–correlational research design was employed to achieve the study's objectives, specifically to

determine the relationship between perceived eco-literacy and student engagement among elementary learners. This design was appropriate because it enables the researchers to describe the status of the identified variables and examine the strength and direction of their relationship without manipulating any conditions. As noted by Aprecia et al. (2022), descriptive–correlational research systematically describes variables and analyzes the relationships that naturally occur among them.

Participants and Sampling Technique

The respondents of the study were 100 elementary learners enrolled during the Academic Year 2025–2026 at a geographically isolated and disadvantaged area (GIDA) school in Kiblawan, Davao del Sur. The study employed a complete enumeration sampling technique, wherein all learners in the selected school were included as respondents. This approach was considered appropriate because the population was accessible and manageable, allowing the researcher to collect data from all eligible respondents without exclusion. Using complete enumeration minimized sampling bias and strengthened the study's internal validity by ensuring full representation of the target population.

Including all learners enabled the study to capture perspectives across the entire cohort, providing a comprehensive understanding of their perceived eco-literacy and engagement in learning. While the study was limited to a single GIDA school, the sample of 100 respondents was sufficient for descriptive and correlational analyses within the defined population. The findings are considered meaningful for the study context and can serve as a basis for developing or enhancing environmental education programs in similar settings.

Research Instrument

The study employed adapted instruments to ensure that the data collected were both relevant and accurate. The perceived eco-literacy of elementary learners, focusing on their knowledge and awareness, was assessed using an instrument adapted from Ha et al. (2022) in their study *"Assessing Ecological Literacy and Its Application Based on Linguistic Ecology: A Case Study of Guiyang City, China."* Student engagement, on the other hand, was measured using an instrument adapted from the three-dimensional framework of student engagement developed by Fredricks et al. (2004), which conceptualizes engagement as behavioral, emotional, and cognitive involvement in learning. The items were modified to align with the context of environmental education while preserving the framework's original constructs. Both tools were chosen for their suitability in measuring the intended variables, with slight modifications made to fit the local context without altering their theoretical foundations. Responses were interpreted using a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

To ensure content validity and contextual appropriateness, the instruments were reviewed by the school head, a master teacher, and the Chairman of the Barangay Council's Environment Committee. Their feedback was incorporated to improve clarity, relevance, and suitability to the local setting. Recommendations from the panel were incorporated to enhance understanding and contextual fit without changing the fundamental constructs. For reliability, a pilot test was conducted with elementary students outside of the main study sample. Analysis using Cronbach's alpha yielded a coefficient of 0.85, demonstrating strong internal consistency and confirming the instrument's reliability according to Pimentel's (2010) guidelines.

Table 1. *Interpretation of the Perceived Level of Eco-Literacy*

Likert Scale	Scale Range	Descriptive Interpretation	Descriptive Meaning
5	4.20 – 5.00	Very High	Students demonstrate an excellent understanding and awareness of ecological concepts and practices, actively applying eco-friendly behaviors in their daily lives.
4	3.40 – 4.19	High	Students show a strong understanding and awareness of ecological concepts and practices, with consistent application in daily activities.
3	2.60 – 3.39	Moderate	Students exhibit an average level of eco-literacy, showing partial understanding and awareness, and occasionally applying ecological knowledge in practice.
2	1.80 – 2.59	Low	Students display limited understanding and awareness of ecological concepts, applying eco-friendly practices inconsistently or with guidance.
1	1.00 – 1.79	Very Low	Students show minimal understanding and awareness of ecological concepts, with little or no application of eco-friendly behaviors.

Table 2. *Interpretation of the Perceived Level of Student Engagement*

Likert Scale	Scale Range	Descriptive Interpretation	Descriptive Meaning
5	4.20 – 5.00	Very High	Students are highly engaged in learning activities, showing strong participation, motivation, and focus in both classroom and environmental tasks.
4	3.40 – 4.19	High	Students are actively engaged most of the time, demonstrating motivation, interest, and consistent participation in learning activities.
3	2.60 – 3.39	Moderate	Students show an average level of engagement, participating occasionally and demonstrating moderate focus and interest in learning tasks.
2	1.80 – 2.59	Low	Students exhibit low engagement, participating irregularly and showing minimal interest or motivation in learning activities.
1	1.00 – 1.79	Very Low	Students are disengaged, showing minimal participation, interest, or motivation in learning activities.

Data Gathering Procedure

Before commencing the study, the researchers met with the classroom adviser to discuss the research plan and coordinate data collection logistics. Formal permission was obtained from the learners' parents via a parental consent form, and the students were asked to provide their assent to participate, ensuring that both parties agreed to participate in the study. Approval was also secured from the school principal to conduct the research on the school premises. The purpose, objectives, and significance of the research were clearly explained to the respondents. The learners were informed of their rights, including voluntary participation, the ability to withdraw at any stage, and assurance of confidentiality regarding their responses.

After the orientation, the survey instruments were distributed to the students, who were given around one hour to complete them. Once finished, the researchers gathered the completed questionnaires, organized the responses, and encoded the data into Microsoft Excel. Subsequent statistical analyses were conducted using JASP, an open-source software platform. This methodical procedure ensured that data collection, organization, and analysis were carried out accurately, consistently, and reliably.

Data Analysis

The responses collected were analyzed using a combination of descriptive and inferential statistical methods. Descriptive statistics, including mean and standard deviation, were utilized to determine the levels of perceived eco-literacy, specifically ecological awareness and ecological knowledge, along with the level of learning engagement in environmental education, based on the five-point Likert scale. Before conducting inferential analysis, data normality was checked using the Shapiro–Wilk test and visual inspection of histograms and Q–Q plots. The results indicated normal distribution ($p > 0.05$), allowing Pearson's correlation to assess the relationship between perceived eco-literacy and learning engagement at a 0.05 significance level.

This analytical procedure directly addresses the study's objectives: (1) to identify the level of eco-literacy among elementary learners in terms of awareness and knowledge, (2) to determine the level of student engagement in environmental education, and (3) to investigate the association between eco-literacy and engagement. The results are intended to guide the development of evidence-based strategies for improving environmental education practices in the Davao Region.

Ethical Considerations

The study strictly followed ethical guidelines to safeguard the rights and well-being of all minors. Prior to data collection, written consent was obtained from the parents or legal guardians. The consent process provided a clear explanation of the study's purpose, procedures, potential risks, and anticipated benefits, allowing parents to make an informed choice regarding their child's participation. Once parental consent was secured, the researchers explained the objectives, procedures, and time requirements to the students in clear, age-appropriate terms. Emphasis was placed on voluntary participation, and students were encouraged to ask questions to ensure full understanding. Students then signed an assent form indicating their voluntary agreement to participate in the study.

To prevent undue influence, particularly in the school setting, teachers responsible for academic evaluation were not involved in administering the questionnaires. Respondents were reassured that their decision to participate or withdraw would not affect their grades or standing in school. Throughout data collection, confidentiality and

anonymity were strictly maintained. All responses were securely stored, and personal identifiers were removed. These procedures reflect the principles of respect, protection, and fairness in research involving minors.

Results and Discussion

Perceived Level of Eco-Literacy of Elementary Learners

Table 3 presents the mean analysis of the level of eco-literacy of elementary learners. The results indicate that elementary learners demonstrate a moderate level of eco-literacy (M = 3.07, D = 0.68). This suggests that students have an average understanding of ecological concepts and occasionally practice eco-friendly behaviors, but their consistent practice remains underdeveloped.

Table 3. *Level of eco-literacy of elementary learners*

Indicators	Mean	SD	Qualitative Description
Knowledge			
I understand that forests, oceans, and wetlands are the Earth's three main ecosystems, often called "the Earth's kidneys," "treasures of animals and plants," and "natural storage."	3.12	0.68	Moderate
I know we should not harm animals or insects we do not like (such as bats, mosquitoes, and snakes) because they help keep nature balanced and support the food chain.	3.25	0.71	Moderate
I know about environmental problems like acid rain, pollution, and the ozone layer getting thinner.	2.95	0.74	Moderate
I know that things like fewer species, water pollution, and the greenhouse effect can harm our planet.	3.08	0.69	Moderate
I understand that humans are part of nature and should live in harmony with it.	3.30	0.65	Moderate
I respect, care for, and protect nature while using it wisely.	3.35	0.62	Moderate
I know how to separate my garbage properly and do it every day.	2.88	0.80	Moderate
I try to live in a way that reduces pollution and saves energy.	2.76	0.77	Moderate
Overall	**3.09**	**0.71**	**Moderate**
Awareness			
Environmental protection is not only the responsibility of the country and government; it is also my responsibility.	3.22	0.66	Moderate
Every citizen should help pay for environmental protection through fees or taxes.	2.58	0.82	Low
Protecting the environment is just as important as economic development.	3.05	0.73	Moderate
The Earth cannot provide natural resources forever, so it is important to protect them.	3.18	0.69	Moderate
Some environmental problems in our cities may not seem urgent, but we still need to care for the environment.	3.10	0.72	Moderate
Protecting the environment should be a top priority, along with population control, technology, education, and social security.	2.97	0.75	Moderate
Hunting too many wild animals can harm the balance of nature.	3.28	0.67	Moderate
Overall	**3.05**	**0.72**	**Moderate**
Grand Total	**3.07**	**0.71**	**Moderate**

The results indicate that elementary learners demonstrate a moderate level of eco-literacy. This means that while students generally understand concepts related to ecological balance and environmental protection, the consistent application of eco-friendly behaviors, such as proper waste segregation and energy conservation, remains only moderately evident in their daily practices. These findings are aligned with recent international evidence. The Organisation for Economic Co-operation and Development (2021), through the PISA Global Competence assessment, reported that although 76% of 15-year-old students across OECD member countries expressed concern about climate change, a considerably smaller proportion reported actively engaging in environmental actions. This suggests a noticeable gap between environmental awareness and actual behavior. In the same vein, UNESCO's (2021) global report, Learn for Our Planet, revealed that environmental topics are incorporated into the curricula of more than 80% of surveyed countries. However, only 53% of these curricula explicitly emphasize behavioral change, indicating that integrating environmental content into lessons does not necessarily lead to sustainable practices among learners.

Empirical studies further reinforce the moderate level observed in this study. Olsson et al. (2022) reported that students demonstrated moderate sustainability consciousness (M = 3.21), with cognitive understanding scoring higher than behavioral implementation. Similarly, Otto and Pensini (2017) found that environmental knowledge significantly predicted pro-environmental behavior ($\beta = 0.34$, $p < .01$), but the relationship was moderate, underscoring that knowledge alone is insufficient to ensure consistent ecological action.

Moreover, the United Nations Environment Programme (2023) emphasized the importance of early

environmental education. Despite this, global youth survey data indicate that while more than 70% of young learners express concern about environmental issues, less than half consistently practice every day eco-friendly behaviors such as proper waste management and energy conservation.

The comparatively lower mean score for the statement "Every citizen should help pay for environmental protection" (M = 2.58) may reflect a limited understanding of civic and economic accountability in environmental governance. This observation is consistent with the conclusions of Ardoin et al. (2019), who noted that environmental literacy frameworks tend to prioritize ecological knowledge while giving comparatively less emphasis to the socio-economic and civic dimensions of sustainability.

Perceived Level of Student Engagement

Table 4 shows the levels of student engagement in behavioral, emotional, and cognitive domains. The findings show that students demonstrate a moderate level of engagement (M = 3.0, SD = 0.72). Emotional engagement scored slightly higher than behavioral and cognitive engagement, suggesting that while students feel concerned and interested in environmental issues, active participation and deeper cognitive involvement remain moderate.

Table 4. *Level of student engagement*

Indicators	Mean	SD	Qualitative Description
Behavioral Engagement			
I actively participate in environmental education activities in class.	3.02	0.70	Moderate
I complete environmental projects on time.	3.15	0.68	Moderate
I join clean-up drives, tree planting, or similar activities.	2.55	0.84	Low
I follow environmental rules in school.	3.28	0.63	Moderate
I share ideas during discussions about environmental topics.	2.90	0.76	Moderate
Overall	**2.98**	**0.72**	**Moderate**
Emotional Engagement			
I enjoy learning about environmental topics.	3.20	0.65	Moderate
I feel interested during environmental lessons.	3.10	0.69	Moderate
I feel concerned about environmental problems.	3.32	0.61	Moderate
I feel motivated to help protect the environment.	3.05	0.73	Moderate
I feel proud when I practice eco-friendly behaviors.	3.25	0.66	Moderate
Overall	**3.18**	**0.67**	**Moderate**
Cognitive Engagement			
I think about solutions to environmental problems.	3.00	0.72	Moderate
I try to understand how environmental issues affect my community.	3.08	0.70	Moderate
I connect what I learn to real-life environmental situations.	2.95	0.74	Moderate
I ask questions when I do not understand environmental lessons.	2.70	0.81	Moderate
I try to learn more about the environment beyond classroom lessons.	2.60	0.83	Moderate
Overall	**2.87**	**0.76**	**Moderate**
Grand Total	**3.01**	**0.72**	**Moderate**

The results indicate that students demonstrate a moderate level of engagement in environmental learning, with emotional engagement being slightly stronger than behavioral and cognitive engagement. This suggests that while students are interested and concerned about environmental issues, consistent participation in activities and deeper cognitive involvement remain developing. This pattern aligns with findings from Van De Wetering et al. (2022), who conducted a meta-analysis of environmental education studies involving children and adolescents, which found that programs significantly improve environmental knowledge, attitudes, intentions, and behavior. Bergman (2015) also supports this interpretation. In her study of locally designed environmental education projects, she found that students' environmental attitudes, awareness, and intention to act improved significantly.

Furthermore, Vasilaki et al. (2025) conducted a systematic review of nature-based learning, emphasizing that outdoor and experiential activities positively influence students' emotional engagement and environmental awareness. However, the study noted that behavioral and cognitive engagement outcomes depend strongly on the design of activities and the inclusion of active, problem-solving, or inquiry-based learning approaches.

Relationship Between Level of Eco-Literacy and Student Engagement

Table 5 highlights the relationship between eco-literacy level and student engagement. The results show a moderate positive correlation (r = 0.46) between eco-literacy and student engagement, which is statistically significant (p = 0.001). This indicates that as students' eco-literacy increases, their engagement in environmental

learning activities tends to increase as well. Therefore, the null hypothesis stating that there is no significant relationship between eco-literacy and student engagement is rejected.

Table 5. *Relationship between level of eco-literacy and student engagement*

Variables	r-value	p-value	Remark	Decision
Level of Eco-Literacy and Student Engagement	0.46	0.001	Moderate Positive Correlation	Reject Ho

This finding is supported by Frensley et al. (2020), who investigated the link between student engagement and environmental literacy in residential education settings. They found that higher levels of engagement were significantly associated with greater environmental literacy outcomes, highlighting that students who are more involved and attentive tend to acquire a deeper understanding of ecological concepts and demonstrate stronger pro-environmental attitudes.

Similarly, Napitupulu et al. (2025) examined environmental literacy among middle school students and reported that environmental knowledge, cognitive skills, and affective connection to the environment significantly influenced pro-environmental behavior. Their results suggest that students who are more literate in ecological concepts are also more likely to engage in environmentally responsible behaviors, reinforcing the observed positive relationship between eco-literacy and engagement in this study.

Conclusion

The study found that elementary learners demonstrate a moderate level of eco-literacy and student engagement. Learners generally understand ecological concepts, the importance of environmental protection, and sustainable practices. However, the consistent application of eco-friendly behaviors, such as proper waste segregation, energy conservation, and participation in environmental activities, remains underdeveloped. Emotional engagement appears slightly stronger than behavioral and cognitive engagement, suggesting that students are interested in and concerned about environmental issues. However, active participation and deeper cognitive involvement may still need strengthening. Correlation analysis revealed a moderate positive relationship between eco-literacy and student engagement, indicating that students with higher levels of environmental knowledge and awareness may also participate more in environmental learning activities. This finding suggests that improving eco-literacy may contribute to stronger behavioral, emotional, and cognitive engagement among learners.

These results underscore the need to enhance environmental education programs, particularly in GIDA schools where resource constraints, limited teaching materials, and geographical challenges may restrict students' opportunities for experiential learning. To address these challenges, a structured intervention, Project GREEN (Guided, Resilient, Engaged Environmental Education Network), may be implemented specifically for GIDA contexts. Project GREEN may serve as a holistic enhancement program that strengthens both eco-literacy and student engagement by integrating classroom instruction, experiential activities, and community participation. The program may include guided learning modules focusing on ecosystems, biodiversity, pollution, climate change, and sustainable living practices. Experiential activities, such as school-based clean-up drives, tree planting, recycling campaigns, and energy-saving projects, may help students translate knowledge into consistent eco-friendly behaviors despite resource limitations. Reflection strategies, including eco-logs, student journals, group discussions, and action planning sessions, may also be embedded to strengthen cognitive processing and personal accountability. By combining structured knowledge delivery, emotional connection, and practical application, Project GREEN may help bridge the gap between environmental awareness and sustained pro-environmental behavior, even in resource-constrained GIDA schools. School administrators may support the program by allocating instructional time, providing basic teaching resources, facilitating teacher training, and establishing partnerships with local environmental organizations. Continuous monitoring and evaluation may further determine the program's effectiveness, provide insights for improvement, and guide potential replication across other GIDA schools to promote environmentally literate and actively engaged learners.

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