



Pedagogical practice of integrating environmental education in teaching Science: Benefits and challenges

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ABSTRACT

This study explored how integrating environmental education enhances the teaching and learning of Science in selected elementary schools in the Schools Division of Ilocos Norte. Specifically, it examined teachers' pedagogical practices and the benefits and challenges they encountered when implementing environmental and experiential learning activities. Using a qualitative descriptive design, data were gathered from ten Science teachers through online interviews. Findings revealed that environmental integration promotes learner engagement, critical thinking, and environmental awareness through hands-on and community-based activities such as gardening, waste segregation, and tree planting. Despite challenges such as limited resources and time constraints, teachers became more resourceful and innovative, utilizing locally available materials and community partnerships to sustain environmental projects. One notable program that supports this integration is the SciGaw Kalikasan: Schools Division of Ilocos Norte Eco Initiative. This initiative mobilizes schools to engage in meaningful environmental activities such as clean-ups, gardening, and waste management efforts. Overall, the integration of environmental education transforms Science instruction into a meaningful and sustainable learning experience that fosters both scientific understanding and ecological responsibility.

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Introduction

Improper waste management, pollution, and the destruction of the environment remain some of the most pressing challenges in the Philippines today. While research has contributed to understanding these issues, there is still a lack of community-based action rooted in scientific knowledge.

In response to this, the Department of Education (DepEd) and various schools across the country have integrated environmental activities into their school programs. One such program by the Schools Division of Ilocos Norte, known as SciGaw Kalikasan Eco Initiative, promotes environmental stewardship through science-related activities such as gardening, waste segregation, tree planting, and

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ecological awareness campaigns. The program aims to strengthen the teaching of Science by allowing learners to apply classroom concepts to real-life environmental concerns within their local communities (Department of Education [DepEd] Regional Office I, 2021).

SciGaw Kalikasan: SDOIN Eco initiative calls all schools to take action in protecting the Earth while creating safe and sustainable learning environments. It effectively integrates environmental education, community participation, and practical application, embodying the principle of “learning by doing.” Through this initiative, learners are empowered to protect, restore, and sustain their immediate environment while developing lifelong ecological values (Quebral, 2022).

Several studies have emphasized the role of experiential and environmental learning in enhancing science education. For instance, Djonko-Moore et al. (2018) found that experiential science education programs focusing on eco-justice and cultural relevance significantly increased students’ engagement and knowledge in science. Similarly, Lewis (2019) reported that environmentally based experiential learning activities improved students’ knowledge acquisition and critical thinking skills. These findings highlight how experiential and environmental learning approaches make Science instruction more practical and learner-centered.

However, while these studies affirm the importance of experiential learning, most were conducted outside the Philippine context and focused on general environmental programs rather than localized, school-based initiatives. There remains a lack of research exploring how environmental education programs are integrated into science teaching within the Schools Division of Ilocos Norte, how teachers implement such practices, and what benefits and challenges they encounter. This study addresses this gap by examining the pedagogical practices, benefits, and challenges of integrating environmental education into Science instruction, particularly through the SciGaw Kalikasan: Schools Division of Ilocos Norte (SDOIN) Eco Initiative.

This study aimed to explore how the integration of SciGaw Kalikasan: Schools Division of Ilocos Norte (SDOIN) Eco Initiative, which is a school-based environmental program that enhances the teaching and learning of Science. It sought to determine how experiential and environmentally centered activities—such as gardening, waste segregation, tree planting, and ecological awareness campaigns—help students apply scientific concepts to real-life environmental situations. Furthermore, it assesses the program’s effectiveness in fostering environmental stewardship, critical thinking, problem-solving skills, and active learner participation in Science education.

Literature review

The purpose of this related literature is to contextualize the study within existing research and underscore the significance of integrating environmental and experiential learning in Science education. It establishes the theoretical and methodological foundations that guide the present study and ensures the avoidance of duplication of previous works. Furthermore, it deepens the researcher’s understanding of the topic, enhances the study’s credibility, and provides a framework for analyzing how environmental

initiatives such as SciGaw Kalikasan contribute to improving Science instruction, learner engagement, and environmental responsibility in schools.

Experiential/nature-based environmental Science learning

The integration of a garden-based education program in the curriculum supported the development of the cognitive domain of learning. According to Paño, Jumao-as, and Picardal (2022), school administrators and teachers should provide learning opportunities through a school garden to support the learner by exposing them to different mechanisms and aspects of garden-based instruction, not only for enhanced academic outcomes but also for other areas of development. To maximize the successful and sustainable implementation of GBE in promoting holistic development of learners, this study recommends that the integration have to be mandated in the discipline where the teacher can formally integrate school garden learning in their lessons to bridge the concepts and real-life application.

Djonko-Moore et al. (2018) found that experiential science programs incorporating eco-justice and cultural relevance boost student engagement and knowledge retention. This approach enhances learning by connecting science to students' lives, using hands-on activities, and providing rich social interactions, particularly benefiting students from underrepresented groups. The study highlights how making science personally relevant to students' own lives and communities improves their motivation and interest in STEM.

Calixto and Santiago (2022) further noted that contextualizing science instruction around local environmental issues promotes relevance and sustainability awareness among rural learners. This is particularly important in the Philippine context, where environmental issues such as pollution and deforestation are experienced firsthand by students. As Alvarez (2020) and Lucido and Bautista (2023) observed, contextualized environmental education allows teachers to connect scientific theories to local realities, thereby improving student engagement and retention.

Moreover, Conel and Avilla (2018) concluded in their study that experiential-reflective instruction has a significant difference in increasing students' environmental knowledge based on the gain of scores in the summative tests. In addition, it had an effect on students' environmental knowledge within the group. The student's perception of experiential learning enables them to gain cooperative learning, increase their enjoyment, and foster both lesson retention and active participation. The main theme of environmental education is aligned across grade levels with an emphasis on sustainable living and the involvement of students in solving local environmental concerns. The school, together with the teachers, needs to focus on holistic collaboration to encourage and support the students who are willing to share their knowledge in community-based environmental projects. This may be done through forming strategic partnerships with government agencies such as the Department of Environment and Natural Resources (DENR) and Local Government Units (LGUs) in the conduct of community-based projects to increase awareness and address environmental issues.

Overall, these studies underscore that experiential and garden-based approaches in science education not only improve academic outcomes but also cultivate environmental responsibility, critical thinking, and

community engagement among learners. The integration of such programs ensures that science learning becomes both meaningful and transformative, bridging the gap between theory and practical application.

Integration of environmental education into Science curriculum

Environmental literacy among grade school learners in the Philippines gives impetus to the strategies and approaches in the curriculum on environmental education. As concluded by Mendoza (2023) in his research *Assessing Environmental Literacy and Exploring Citizen Science Capability Among Grade Six Learners in the Philippines*, the grade six learners' average to high performance in the assessment implies a strong delivery of content on the topics of environment. The delivery modality of environmental education in grade schools points to the potent efficacy of science teachers to teach the subject matter that directly contributes to the learner's modest performance in the assessment tools. There is a direct link between environmental literacy and citizen science capability, so that learners can conduct environmental projects and research with the supervision of experts. This implies that learners' knowledge must be translated into environmental actions to be authentic and practical. The projects open the way for learners as constructivists that scaffold the competencies of expert teachers. Orchestrating literacy with capability helped the Department of Education to form an environmentally literate citizenry as mandated by DepEd. The constructivist theory is that learners learn efficaciously if the teachers have a firm grounding and command of environmental education content. Thus, the national government and other stakeholders support the call for localization and contextualization in teaching environmental science in elementary grades. Making learners aware of our local ecosystem teaches them to become warriors to preserve and protect our environment.

However, according to Zamora (2023), the implementation of DepEd orders related to environmental education curriculum integration remains inconsistent and faces various challenges. The review highlighted the benefits of environmental education, such as fostering environmental awareness, promoting positive attitudes and behaviors towards the environment, and providing students with the knowledge and skills necessary to become responsible and engaged environmental citizens. The review also identified the benefits of community service learning, including promoting academic learning, personal and social development, and civic engagement.

Globally, Cutter-Mackenzie-Knowles et al. (2019) emphasized that experiential, place-based education strengthens environmental stewardship and empowers learners as agents of change. In the Philippine context, Lucido and Bautista (2023) and Ferrer and Martinez (2020) found that sustainability-focused science lessons improve both environmental literacy and students' motivation to engage in ecological projects. Hence, the integration of SciGaw Kalikasan Eco Initiative into science instruction aligns with international goals for sustainable education while addressing local environmental challenges.

The study emphasized the need for further empirical research to explore the actual implementation and effectiveness of DepEd orders related to environmental education curriculum integration, investigate the role of community partnerships, and explore the impact of environmental education on student outcomes beyond just environmental knowledge and attitudes. Overall, the study suggests that environmental education and community service learning have the potential to enhance the curriculum and promote responsible and engaged environmental citizenship in the Philippines.

Waste management and school-based environmental practices

The study of Carale et al. (2025) highlighted the vital role of effective classroom waste management in creating a clean, healthy, and sustainable school environment. Designated, clearly labeled bins and their strategic placement improve waste segregation, recycling, and composting, reducing landfill waste. Success requires a comprehensive approach combining education, community involvement, and infrastructure like composting facilities and Material Recovery Facilities (MRF). Student monitoring and leadership roles, such as “Waste Management Ambassadors,” enhance accountability and responsible disposal habits. Barriers like knowledge gaps, weak supervision, enforcement issues, and behavioral challenges must be addressed through clear policies, education, and consistent enforcement involving the whole school community. Ultimately, a multi-faceted strategy integrating policy, hands-on practice, awareness, infrastructure, and participation is essential for sustainable school waste management.

Statement of the problem/research questions

This study aimed to examine how the SciGaw Kalikasan: Schools Division of Ilocos Norte (SDOIN) Eco initiative, a school-based environmental program implemented in the division, serves as a pedagogical practice that enhances the teaching and learning of science.

Specifically, it sought to explore how the integration of experiential and environmentally focused activities within the SciGaw Kalikasan Eco Initiative framework contributes to improving science instruction, learner engagement, and environmental awareness.

To achieve this purpose, the study sought to address the following research questions:

1. What are the pedagogical practices of integrating environmental education in teaching science?
2. What are the benefits and challenges of integrating environmental education into teaching science?

Research methodology

This chapter presented the research design, the locale of the study, population, and sampling, data presentation instrument, data gathering procedure, research methodology, ethical consideration, and data presentation and analysis.

Research design

This study employed a phenomenological research design. Specifically, this study adopted a descriptive phenomenology that focuses on understanding lived experiences and contextual nuances. This approach allows an in-depth exploration of the impact of school heads’ instructional leadership on teaching quality and student learning outcomes. It used an open-ended question embedded in an online interview questionnaire for school heads. This approach allows the researcher to collect rich narrative data that can provide deeper insights into leadership practices and challenges.

Locale of the study

The study was conducted in selected elementary schools within the Schools Division of Ilocos Norte, where the SciGaw Kalikasan Eco initiative is actively implemented. These schools are purposefully chosen to represent varied contexts such as urban and rural settings, allowing for a broader understanding of how the SciGaw Kalikasan Eco initiative is integrated into science instruction across different school environments. The diversity in geographical location, available resources, and levels of community participation provides a rich basis for analyzing how environmental and experiential learning activities—such as gardening, waste segregation, and tree planting—enhance Science teaching and learning. Through these selected schools, the study seeks to capture the distinct practices, challenges, and successes experienced by teachers and learners in implementing SciGaw Kalikasan Eco Initiative as a pedagogical approach.

Population and sampling

The population of this study consisted of science teachers from selected elementary schools within the Schools Division of Ilocos Norte, where the SciGaw Kalikasan initiative is implemented. The respondents will be chosen through purposive sampling to ensure that participants have direct experience and active involvement in carrying out SciGaw Kalikasan Eco Initiative activities such as gardening, waste segregation, tree planting, and ecological awareness campaigns. The sample will include ten (10) Science teachers representing various school types and locations to capture diverse instructional contexts and teaching experiences. This composition aims to provide comprehensive insights into how SciGaw Kalikasan Eco Initiative enhances science teaching practices, promotes learner engagement, and fosters environmental awareness in different educational settings.

Data gathering instrument

The main instrument for data collection was an open-ended online questionnaire divided into two main sections: an open-ended question on the pedagogical practices of science teachers and their learners' learning outcomes, and the challenges, benefits, and strategies of science teachers in the implementation of the SciGaw Kalikasan Eco Initiative. The instrument was developed using Google Forms to ensure accessibility and ease of response.

Data gathering procedure

The data was collected through online interview questionnaires in Google Forms. Each form will include a section for informed consent, requiring participants to acknowledge their voluntary participation before proceeding to answer the questions.

The links to the school teacher's questionnaire were distributed through official communication channels, such as school email groups or Messenger group chats. Participants were given a specific time frame, typically two weeks, to complete their responses. After the submission period, the researcher downloaded the collected data from Google Forms, with quantitative responses compiled in spreadsheet format for analysis, and qualitative responses organized for thematic interpretation.

Ethical considerations

The study upheld strict ethical standards to protect the rights and privacy of all participants. Participation will be entirely voluntary, and respondents will have the right to withdraw at any stage without consequence. Informed consent will be obtained electronically through the first section of the online form, which will explain the purpose, scope, and procedures of the study. All responses will remain confidential and anonymous; personal identifiers will not be included in the reporting of results. Data will be stored securely in password-protected files and will be used solely for academic purposes. The researcher will respect the time, perspectives, and professional responsibilities of all participants throughout the research process.

Results and discussion

This part presented findings from the online interview with elementary school teachers of the Schools Division of Ilocos Norte. The data is organized according to key themes identified.

Problem 1: What are the pedagogical practices of integrating environmental education in teaching science?

Theme 1: Pedagogical practices of science teachers and their learners’ learning outcomes

The implementation of the SciGaw Kalikasan Eco Initiative has influenced the pedagogical practices of science teachers by promoting approaches that integrate environmental awareness, experiential learning, and community participation. Through this initiative, teachers have adopted more dynamic, learner-centered strategies that connect classroom instruction to real-life environmental issues. These practices not only enrich science teaching but also foster students’ engagement, critical thinking, and sense of environmental responsibility.

Table 1: Pedagogical practices of science teachers and their learners’ learning outcomes

Theme 1: Pedagogical Practices of integrating environmental education in teaching science	Participant
Integration of environmental and experiential learning in science instruction	P1, P7
Enhancement of learner engagement and environmental awareness	P2
Development of inquiry-based and critical thinking skills	P3, P5
Strengthening collaboration and community involvement	P1, P6
Integration of cross-subject and environmental learning	P4, P8, P9, P10

Source of data: Selected Elementary Teachers of Piddig-Carasi District, Schools Division of Ilocos Norte.

The implementation of the SciGaw Kalikasan Eco Initiative has influenced the pedagogical practices of science teachers by promoting approaches that integrate environmental awareness, experiential learning, and community participation. Through this initiative, teachers have adopted more dynamic, learner-centered strategies that connect classroom instruction to real-life environmental issues. These

practices not only enrich science teaching but also foster students' engagement, critical thinking, and sense of environmental responsibility.

Integration of environmental and experiential learning in Science instruction

Science teachers highlighted that the implementation of SciGaw Kalikasan Eco Initiative has allowed them to integrate environmental and experiential learning into their science instruction. Through hands-on, inquiry-based, and community-driven activities such as gardening, waste segregation, and recycling, lessons became more contextualized and engaging. Teachers emphasized that these approaches enabled learners to apply scientific concepts in real-world situations, making science instruction more meaningful and relevant to their daily lives. This integration also helped strengthen environmental values and scientific curiosity among students.

“The implementation of SciGaw Kalikasan Eco Initiative has significantly enhanced my teaching practices as a science teacher. It provided opportunities to integrate environmental education into my lessons through hands-on, inquiry-based, and community-oriented activities.” (P1)

“Implementing SciGaw Kalikasan Eco Initiative enhanced my teaching practices by promoting hands-on and inquiry-based learning, encouraging students to explore environmental issues through scientific investigation.” (P7)

This finding aligns with Paño, Jumao-as, and Picardal (2022), who found that garden-based and sustainability-centered education enhances learners' cognitive and affective domains by connecting scientific knowledge with practical experiences. Similarly, Guerrero (2017) emphasized that experiential-reflective instruction increases environmental sensitivity and decision-making skills among learners. These studies support the idea that integrating environmental and experiential learning into science instruction enriches both teaching practice and student understanding, as seen in the implementation of *SciGaw Kalikasan Eco Initiative*.

Enhancement of learner engagement and environmental awareness

Teachers observed that the *SciGaw Kalikasan Eco Initiative* significantly enhanced learners' engagement and awareness of environmental issues. By involving students in hands-on activities such as tree planting, waste segregation, and clean-up drives, science lessons became more interactive, meaningful, and enjoyable. These real-life applications of scientific concepts sparked students' curiosity and encouraged them to take active roles in addressing environmental challenges. As a result, learners not only deepened their understanding of science but also developed positive attitudes toward nature and sustainability.

“Participating in SciGaw Kalikasan Eco Initiative helps learners become more engaged and interested in Science by allowing them to explore real-life environmental issues through hands-on activities. It improves their understanding of scientific concepts as they apply what they learn in meaningful ways. Moreover, it develops positive attitudes toward protecting nature and promotes responsibility and awareness about caring for the environment.” (P2)

This finding supports the results of Djonko-Moore et al. (2018), who found that experiential science programs emphasizing eco-justice and cultural relevance increase students' engagement and knowledge retention. Similarly, Espinola (2023) reported that sustainability-focused science learning materials enhance student motivation and ecological awareness. These studies affirm that experiential and environmental-based instruction, as embodied by *SciGaw Kalikasan Eco Initiative*, not only strengthens academic engagement but also nurtures learners' environmental consciousness and sense of social responsibility.

Development of inquiry-based and critical thinking skills

Teachers emphasized that the *SciGaw Kalikasan Eco Initiative* promotes inquiry-based learning and fosters students' critical thinking and problem-solving skills. Through activities such as scientific investigations, environmental observations, and project-based tasks, learners are encouraged to ask questions, explore causes of environmental problems, and propose solutions grounded in scientific principles. These experiences cultivate analytical thinking and enable students to apply the scientific method beyond the classroom, strengthening their ability to connect theory with practice. Teachers also noted that such activities make lessons more interactive and develop learners' confidence in exploring real-world environmental issues.

“It promotes inquiry-based teaching and learning approach as well as critical thinking, and lessons are more contextualized, making learning enjoyable and easy to grasp.” (P5)

“Implementing SciGaw Kalikasan Eco Initiative enhanced my teaching practices by promoting hands-on and inquiry-based learning, encouraging students to explore environmental issues through scientific investigation.” (P3)

This finding is consistent with Lewis (2019), who found that environmentally based experiential learning models significantly enhance students' knowledge acquisition and critical thinking abilities. Similarly, Guerrero (2017) emphasized that reflective and inquiry-driven learning environments develop greater analytical skills and encourage independent thought. These studies reinforce that *SciGaw Kalikasan Eco Initiative* provides a powerful pedagogical platform for nurturing inquiry, reflection, and scientific reasoning among learners, thereby improving both their cognitive and problem-solving capacities.

Strengthening collaboration and community involvement

Teachers shared that the *SciGaw Kalikasan Eco Initiative* has strengthened collaboration among educators, students, and the wider community. Through collective environmental initiatives such as school gardening, tree planting, and waste management projects, teachers were able to foster partnerships that extended learning beyond the classroom. This collaboration not only enhanced student participation but also encouraged shared responsibility for environmental stewardship. The involvement of parents, local officials, and community members provided authentic learning experiences and helped create a supportive and environmentally conscious school culture.

“The implementation of SciGaw Kalikasan Eco Initiative strengthened collaboration among teachers, learners, and community partners in promoting sustainability projects.” (P1)

“Integration of environmental awareness; hands-on and inquiry-based learning; collaboration with the community.” (P6)

This finding aligns with Quebral (2022), who noted that *SciGaw Kalikasan Eco Initiative* effectively integrates environmental education, community participation, and practical action to promote sustainable practices in schools. Similarly, Pasaol and Baguio (2021) highlighted that community-based environmental programs enhance student engagement and reinforce a collective sense of responsibility toward environmental conservation. These studies support the view that *SciGaw Kalikasan Eco Initiative* fosters a collaborative learning environment where science education becomes both a shared community effort and a means of cultivating environmental advocacy.

Integration of cross-subject and environmental learning

Teachers reported that *SciGaw Kalikasan Eco Initiative* encouraged them to integrate Science lessons with other subject areas and real-life environmental issues. By linking Science to Math, English, and Araling Panlipunan, teachers provided learners with opportunities to apply competencies from multiple disciplines while promoting environmental awareness and responsibility. These cross-subject activities strengthened students’ understanding of scientific concepts, critical thinking, and collaborative skills.

“I usually use examples that are available in our community.” (P8)

“Using competencies from other subjects to teach Science, like using fractions in experiments.” (P9)

“By integrating and applying it in school and community.” (P10)

“As a Science teacher, I integrate cross-subject and environmental activities by connecting Science lessons with real-life themes and other learning areas. For example, I include environmental experiments that involve Math skills for measuring and recording data, English for writing reflections or reports, and Araling Panlipunan for discussing local environmental issues.” (P4)

This finding aligns with Carale et al. (2025), who emphasized that integrating environmental education across subjects reinforces holistic learning and helps students apply knowledge in practical contexts. *SciGaw Kalikasan Eco Initiative* facilitates authentic, interdisciplinary experiences that make Science lessons meaningful and relevant to real-life challenges.

Problem 2: What are the benefits and challenges of integrating environmental education into teaching science?

Theme 2: Challenges, benefits, and strategies of Science teachers in the implementation of *SciGaw Kalikasan*

The implementation of *SciGaw Kalikasan Eco Initiative* in classrooms presents both opportunities and challenges for teachers, particularly in multigrade and resource-limited settings. While the program actively engages learners in hands-on science and environmental activities, it also requires careful

planning, creativity, and adaptability from educators. Despite these challenges, the experience of implementing *SciGaw Kalikasan Eco Initiative* fosters significant professional growth. Teachers develop innovative teaching strategies, improve classroom management, and enhance their ability to integrate sustainability and environmental responsibility into lessons.

Theme 2: Challenges, benefits, and strategies of Science teachers in the implementation of SciGaw Kalikasan eco initiative	Respondents
Increased student engagement	P2
Improved learning outcomes and understanding	P3, P4
Development of positive attitudes toward science and nature	P2, P6
Promotion of environmental awareness and responsibility	P7, P8
Empowerment through real-life application and action	P1, P5
Increased teacher resourcefulness and creativity	P9, P10
Insufficient learning materials and resources	P1

Source of data: Selected Elementary Teachers of Piddig-Carasi District, Schools Division of Ilocos Norte.

Increased student engagement

Teachers consistently highlighted that participation in *SciGaw Kalikasan Eco Initiative* significantly enhanced learners’ engagement in Science classes. The program’s experiential and hands-on nature made lessons more meaningful and enjoyable for students. Through activities such as gardening, waste segregation, tree planting, and environmental campaigns, learners became active participants rather than passive recipients of knowledge. This approach allowed them to directly observe and apply scientific principles in real-life contexts.

“Participating in SciGaw Kalikasan Eco Initiative greatly influences learners by making Science more engaging and meaningful. It encourages active participation through hands-on experiments, environmental projects, and creative presentations.” (P2)

“Students become more actively involved in the learning process. They don’t just memorize scientific concepts—they apply them in real-life situations, such as waste segregation, recycling, and biodiversity awareness projects.” (P5)

This finding supports the view of Djonko-Moore et al. (2018) and Lewis (2019) that experiential, environmentally focused programs enhance learners’ engagement by connecting scientific content to their lived experiences. Similarly, Paño, Jumao-as, and Picardal (2022) emphasized that school-based garden and environmental programs enrich the cognitive and affective domains by linking learning to authentic environmental interactions.

The results suggest that *SciGaw Kalikasan Eco Initiative* serves as an effective pedagogical approach that promotes active participation through experiential learning. Learners are motivated to explore,

inquire, and collaborate with peers while addressing environmental challenges within their community. This aligns with Quebral (2022), who described SciGaw Kalikasan Eco Initiative as a framework integrating community action and practical environmental education that empowers learners to “protect, restore, and sustain” their environment.

Improved learning outcomes and understanding

Participants reported that SciGaw Kalikasan Eco Initiative not only made lessons engaging but also enhanced learners’ understanding and mastery of scientific concepts. Through experimentation, observation, and community-based projects, students were able to connect scientific theories to practical environmental problems.

“Participating in SciGaw Kalikasan Eco Initiative transforms multigrade learners’ engagement through hands-on experiences, improves learning outcomes by connecting theory to practice.” (P3)

“It enhances critical thinking and understanding. These, without any doubt, have a great positive impact on pupils’ love for learning, making them more engaged, competent, and invested in finding science-based solutions.” (P4)

This outcome reflects Lewis (2019), who emphasized that experiential learning models enhance knowledge acquisition and critical thinking. Similarly, Conel and Avilla (2018) found that experiential-reflective instruction significantly improves students’ environmental knowledge and retention. By engaging learners in contextualized scientific tasks, SciGaw Kalikasan Eco Initiative supports the constructivist learning theory—students learn more effectively when they actively construct knowledge through real-world experience.

Teachers also observed that multigrade learners particularly benefited from this approach, as the shared activities unified diverse grade levels under a common purpose. These results indicate that SciGaw Kalikasan Eco Initiative enhances Science learning outcomes by integrating practical experiences with formal instruction, fostering deeper comprehension and long-term understanding.

Development of positive attitudes toward science and nature

Teachers noted that participation in *SciGaw Kalikasan Eco Initiative* cultivated positive attitudes toward science and the environment among learners. Students expressed enthusiasm, curiosity, and a sense of pride in their environmental projects. They began to view Science not as a difficult subject but as a meaningful way to contribute to their community and the planet.

“SciGaw Kalikasan Eco Initiative makes students more active and interested in learning Science because it connects lessons to real-life environmental issues.” (P2)

“It builds positive attitudes toward caring for nature and being responsible members of the community.” (P6)

This finding supports Mendoza (2023), who established a direct link between environmental literacy and civic responsibility among Filipino learners. By integrating environmental education into science lessons, *SciGaw Kalikasan Eco Initiative* helps learners develop empathy for nature and appreciation for scientific inquiry.

Furthermore, Zamora (2023) found that environmental education fosters positive behavior and engagement in environmental protection activities. *SciGaw Kalikasan Eco Initiative*, therefore, not only enhances academic outcomes but also promotes affective and moral development. It transforms Science into a platform for values education, nurturing lifelong appreciation for both learning and nature.

Promotion of environmental awareness and responsibility

Teachers observed that *SciGaw Kalikasan Eco Initiative* effectively raised students' environmental awareness and inspired them to take active roles in environmental protection. Learners developed habits such as recycling, waste segregation, and proper disposal, and they began influencing others in their community to do the same.

“Learners’ awareness of recycling materials encouraged them to protect the environment.” (P7)

“Helping learners understand the importance of being an environmentalist.” (P8)

These findings are consistent with Carale et al. (2025), who highlighted that classroom waste management programs nurture accountability and sustainable habits when supported by education and community involvement. The integration of *SciGaw Kalikasan Eco Initiative* provides authentic environmental learning experiences that go beyond textbooks, reinforcing Quebral's (2022) view that the program embodies “learning by doing” and environmental stewardship.

By engaging in these activities, learners become more conscious of their ecological footprint and more committed to environmental sustainability. The program also aligns with DepEd's broader goal of cultivating environmentally literate and responsible citizens who can translate their scientific knowledge into meaningful ecological actions.

Empowerment through real-life application and action

Finally, respondents highlighted that *SciGaw Kalikasan Eco Initiative* empowered learners by providing opportunities to apply scientific knowledge to real-life environmental challenges. Through community projects such as tree planting, composting, and biodiversity awareness campaigns, students gained confidence and a sense of purpose.

“Students apply what they learned in real-life situations, such as waste segregation and biodiversity projects.” (P5)

“Through SciGaw Kalikasan Eco Initiative, learners develop curiosity, responsibility, and a deeper appreciation for both Science and the environment.” (P1)

This finding mirrors Quebral (2022) and Pasaol and Baguio (2021), who both asserted that community-based environmental programs empower students to act as agents of change and foster collaborative action between schools and communities. Participation in *SciGaw Kalikasan Eco Initiative* thus transforms learners from passive observers into active environmental advocates.

In essence, this empowerment contributes to ecological citizenship—students gain not only scientific competence but also leadership and social responsibility. They begin to see Science as a powerful tool for improving their communities and safeguarding the environment for future generations.

Increased teacher resourcefulness and creativity

Many teachers shared that the limited materials and resources available during *SciGaw Kalikasan Eco Initiative* implementation pushed them to become more innovative and creative in delivering lessons. They learned to use recyclable, indigenous, or locally available materials for experiments and projects.

“Since materials were sometimes limited, I learned to use recycled or locally available resources to conduct experiments and activities.” (P9)

“The challenges made me more resourceful and flexible as a teacher.” (P10)

This finding aligns with Paño, Jumao-as, and Picardal (2022), who recommended maximizing available materials in environmental education to promote sustainability and contextualized learning. *SciGaw Kalikasan Eco Initiative* encourages teachers to think critically and creatively, transforming constraints into opportunities for innovation.

Insufficient learning materials and resources

Many teachers reported that the lack of materials and resources was one of the main challenges in implementing the *SciGaw Kalikasan Eco Initiative*. Limited funds, inadequate laboratory tools, and scarcity of environmental project supplies restricted the range of activities that could be conducted. Teachers faced difficulty sustaining projects like gardening, waste segregation, or experiments due to resource limitations.

“One of the main challenges I experienced was the lack of materials and resources needed for some environmental and scientific activities.” (P1)

This finding highlights the need for strategic planning and support from school administration and local stakeholders to ensure that experiential environmental programs like *SciGaw Kalikasan Eco Initiative* can be effectively carried out. Despite these constraints, teachers demonstrated flexibility and determination to maintain student engagement and uphold the objectives of environmental education.

Conclusion

The findings of this study revealed that the integration of *SciGaw Kalikasan Eco Initiative* as a pedagogical practice significantly enhanced the teaching and learning of Science. By embedding

environmental and experiential learning in classroom instruction, teachers successfully linked scientific theories to real-life environmental contexts. The program fostered active student participation through hands-on projects such as gardening, waste segregation, and biodiversity awareness, which in turn strengthened learners' understanding of scientific concepts and cultivated environmental responsibility. Science instruction became more meaningful, dynamic, and relevant to students' lives.

Despite its success, the study also identified several challenges, including the lack of instructional materials, limited time for project-based learning, and difficulties in managing multigrade classes. However, these obstacles led to teachers' professional growth, encouraging them to become more resourceful, creative, and adaptive in utilizing locally available materials and community partnerships. Learners likewise demonstrated greater engagement, collaboration, and appreciation for both Science and nature. Overall, *SciGaw Kalikasan Eco Initiative* emerged as an effective pedagogical model that combines environmental advocacy with academic learning, promoting cognitive, affective, and social development among learners.

This study was limited to ten (10) elementary Science teachers from selected schools in the Schools Division of Ilocos Norte. The data were collected through online interviews, which may not fully capture the depth of participants' experiences compared to in-person observations or focus group discussions. Furthermore, the study focused only on teachers' perspectives and did not include learners, school heads, or parents who could provide additional insights into the program's broader impact.

It is recommended that the Department of Education and school administrators continue to support and strengthen environmental initiatives like *SciGaw Kalikasan Eco Initiative* by providing sustained training, resources, and policy support for teachers. Future studies may expand the scope by including more schools across different divisions or regions, as well as involving multiple stakeholders such as learners and community members. Researchers may also employ mixed-method or longitudinal designs to measure the long-term effects of environmental integration on students' scientific literacy, behavior, and sustainability values.

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