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Science Process Skills and Environmental Responsibility Among Elementary Pupils: Toward Sustainable Science Learning

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ABSTRACT

This study examined the relationship between science process skills and environmental responsibility among elementary pupils in the City of Ilagan, Isabela as basis for strengthening sustainable science learning. Using a predictive-correlational explanatory design, the study assessed pupils' science process skills in terms of observing, classifying, measuring, inferring, predicting, communicating, and simple investigating, while environmental responsibility was examined in terms of environmental awareness, conservation behavior, waste management practices, participation in environmental activities, and care for living and non-living components of the environment. Data were gathered through a validated researcher-made questionnaire with an overall Cronbach's alpha of 0.93, indicating excellent reliability. The findings showed that pupils demonstrated a high level of science process skills and a high level of environmental responsibility. However, simple investigating emerged as the weakest science process skill, while participation in environmental activities was the least developed area of environmental responsibility. Spearman's rho revealed a significant moderate positive relationship between science process skills and environmental responsibility. Ordinal logistic regression further showed that simple investigating, inferring, predicting, observing, classifying, and communicating significantly predicted higher levels of environmental responsibility. These results suggest that pupils who are more capable of applying scientific thinking are also more likely to demonstrate responsible environmental behavior. The study concludes that sustainable science learning may be strengthened by integrating inquiry-based, hands-on, and action-oriented environmental activities in elementary science instruction. It recommends the implementation of school-based environmental projects, pupil-led investigations, and experiential science tasks that connect classroom learning with real environmental practices.

Keywords: *Science process skills, environmental responsibility, sustainable science learning, elementary pupils, inquiry-based science, environmental education*

INTRODUCTION

Science education in the elementary level plays a vital role in helping learners understand the natural world, solve everyday problems, and make responsible decisions about their environment. In the Philippine basic education system, Science is not intended to develop memorization alone, but to cultivate scientific literacy through inquiry, observation, investigation, interpretation, and application of concepts in real-life situations. The Department of Education emphasized that the K to 12 Science curriculum aims to

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develop scientifically, technologically, and environmentally literate learners who can connect scientific knowledge with personal, social, and ethical decisions (Department of Education [DepEd], 2016). This direction becomes increasingly important as schools are expected to prepare pupils not only to answer classroom-based questions, but also to participate meaningfully in addressing environmental issues within their homes, schools, and communities.

Science process skills are essential foundations of meaningful science learning. These include observing, classifying, measuring, inferring, predicting, communicating, and experimenting. When pupils develop these skills, they become more capable of asking questions, gathering evidence, interpreting information, and explaining phenomena using reasoned judgment. Recent studies have shown that inquiry-based and activity-centered science learning can improve pupils' science process skills because learners are given opportunities to investigate, manipulate materials, test ideas, and communicate findings (Mulyeni, Jamaris, & Supriyati, 2019). In this sense, science process skills serve as the practical tools through which pupils learn how science works, rather than merely receiving science as fixed information.

At the same time, environmental responsibility has become a major concern in contemporary education. UNESCO explained that Education for Sustainable Development encourages learners to acquire the knowledge, skills, values, and attitudes needed to make informed decisions and act responsibly for environmental integrity and social well-being (UNESCO, 2020). In the context of elementary education, environmental responsibility may be seen in pupils' awareness of environmental problems, concern for natural resources, proper waste disposal, conservation practices, and willingness to participate in school and community-based environmental activities. Since childhood is a formative stage for values development, environmental education at the elementary level can strengthen habits of care, discipline, and stewardship before unsustainable behaviors become deeply rooted.

The relationship between science process skills and environmental responsibility deserves closer attention because environmental issues require both understanding and action. A pupil who can observe changes in the environment, classify waste materials, infer causes of pollution, measure resource use, and communicate possible solutions is more likely to develop informed environmental behavior. Environmental responsibility is therefore not only a matter of attitude, but also a reflection of how learners use scientific thinking to understand the consequences of human actions. DepEd's climate change education framework also recognizes that human activities affect the environment and that learners must develop prudent judgment, concern for others, and responsible action in response to climate and environmental challenges (Department of Education, n.d.).

In the City of Ilagan, Isabela, where schools operate within both urbanizing and agricultural community settings, the development of science process skills and environmental responsibility among elementary pupils is particularly relevant. Learners are exposed to local environmental realities such as waste management concerns, changing weather conditions, use of natural resources, school cleanliness practices, and community-based environmental programs. These conditions make the school an important space for linking science learning with sustainable behavior. However, while science lessons may include environmental topics, it remains necessary to determine whether pupils' science process skills are meaningfully associated with their environmental responsibility.

This study examine how pupils' ability to engage in scientific processes relates to their sense of environmental responsibility. The study is anchored on the idea that sustainable science learning should not end with content mastery, but should lead pupils toward evidence-based thinking, responsible choices, and active care for the environment. By focusing on elementary pupils in the City of Ilagan, Isabela, the study may provide useful insights for strengthening science instruction, improving environmental education practices, and designing learning activities that connect scientific inquiry with sustainable action.

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Literature Review

Science Process Skills in Elementary Science Learning

Science process skills refer to the thinking and practical skills that learners use when they observe, classify, measure, infer, predict, communicate, and investigate scientific phenomena. In elementary science education, these skills are important because they train pupils to learn science through inquiry rather than through memorization alone. The Philippine Science curriculum emphasizes the development of scientifically, technologically, and environmentally literate learners who can make rational choices on issues affecting them and their communities (Department of Education, 2016). This implies that elementary science learning should expose pupils to activities where they can ask questions, examine evidence, and explain observations using simple but logical scientific reasoning.

Mulyeni et al. (2019) found that inquiry-based science learning helped improve basic science process skills among early elementary learners. Their study emphasized that pupils develop better scientific thinking when they are given opportunities to observe objects, conduct simple investigations, record findings, and explain results. This supports the idea that science process skills are best developed through active learning experiences.

Environmental Responsibility Among Elementary Pupils

Environmental responsibility refers to the learner's awareness, concern, and willingness to act in ways that protect and sustain the environment. Among elementary pupils, this may be seen in simple but meaningful behaviors such as proper waste disposal, conservation of water and electricity, care for plants and animals, participation in clean-up activities, and avoidance of harmful practices toward nature. UNESCO (2020) explained that Education for Sustainable Development empowers learners with knowledge, skills, values, and attitudes needed to make informed decisions and take responsible actions for environmental integrity and social well-being.

Environmental responsibility is not developed through information alone. It requires repeated exposure to values-based and action-oriented learning. When pupils are taught to connect environmental lessons with daily habits, they begin to see environmental care as part of personal and community responsibility. UNESCO further explained that sustainable education should help learners acquire not only knowledge, but also values, attitudes, and behaviors that support a better future for people and the planet (UNESCO, 2024).

Inquiry-Based Science Learning and Skill Development

Inquiry-based learning is closely associated with the development of science process skills because it allows learners to investigate questions and construct explanations from evidence. Instead of simply receiving facts from the teacher, pupils are guided to explore, compare, test, and communicate their findings. Ekici (2020) noted that participation in scientific inquiry activities is one of the most effective ways to develop science process skills. Although the study focused on pre-service teachers, its finding supports the broader view that science process skills improve when learners are actively involved in scientific investigation.

In elementary education, inquiry-based activities do not need to be highly complex. Simple tasks such as observing plant growth, sorting biodegradable and non-biodegradable materials, measuring water use, or recording weather changes can already strengthen pupils' ability to think scientifically. These activities also help pupils understand that science is connected with real-life concerns. For the present study, inquiry-based learning provides a useful foundation for examining how pupils' science process skills may relate to their environmental responsibility.

Sustainable Science Learning

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Sustainable science learning refers to science education that develops knowledge, skills, values, and behavior that support environmental care and long-term community well-being. It goes beyond learning scientific concepts for classroom assessment. It encourages pupils to apply science in making responsible decisions about the environment. UNESCO (2017) identified Education for Sustainable Development as a key approach in helping learners develop cognitive, socio-emotional, and behavioral competencies needed to contribute to sustainability.

The MATATAG Science curriculum also highlights the development of scientifically, environmentally, and technologically literate learners who can become productive members of society (Department of Education, 2023). This direction is aligned with the present study because it views science learning as a means of developing responsible and informed citizens. In the City of Ilagan, Isabela, sustainable science learning may be strengthened when pupils are taught to connect classroom science activities with local environmental issues such as waste management, conservation, school cleanliness, and disaster preparedness.

Relationship Between Science Process Skills and Environmental Responsibility

Science process skills and environmental responsibility are connected because responsible environmental behavior requires understanding, observation, judgment, and action. A pupil who can observe environmental changes, classify waste materials, infer causes of pollution, predict consequences of harmful practices, and communicate solutions may be more prepared to act responsibly toward the environment. In this sense, environmental responsibility becomes more meaningful when it is supported by scientific thinking.

Recent studies on environmental education also show that awareness and responsibility are linked with sustainable behavior. Aldawsari et al. (2025) found a relationship between environmental education awareness and environmental responsibility among learners, suggesting that informed environmental understanding can support responsible action. Although their study involved university students, the principle is relevant to elementary education because values and habits related to environmental care are often formed at an early age.

METHODS

Research Design

This study employed a predictive-correlational explanatory design. This design was considered appropriate because the study did not only describe the pupils' science process skills and environmental responsibility, but also examined whether science process skills significantly explained variations in environmental responsibility. Unlike a purely descriptive design, the predictive-correlational explanatory approach allowed the study to determine the strength, direction, and practical meaning of the relationship between the two major variables. It also helped identify which dimensions of science process skills had stronger contributions to pupils' environmental responsibility, thereby making the findings more useful for developing sustainable science learning interventions.

The design was non-experimental in nature because the researcher did not manipulate classroom instruction, pupil behavior, or school-based environmental activities. Instead, the study gathered data from existing learning experiences and actual pupil responses. This design was suitable for the school setting because it respected the natural condition of science learning among elementary pupils in the City of Ilagan, Isabela while still allowing a systematic analysis of the connection between scientific thinking skills and environmental responsibility.

Research Locale

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The study was conducted in selected public elementary schools in the City of Ilagan, Isabela. The locale was appropriate because the city represents a learning environment where pupils are exposed to both school-based science instruction and community-level environmental concerns. As the capital city of Isabela, the City of Ilagan includes communities with varied environmental conditions, including residential areas, agricultural surroundings, school gardens, waste management practices, and local conservation efforts. These conditions provided a meaningful setting for examining how elementary pupils applied science process skills and how these skills related to their sense of responsibility toward the environment. The schools in the locale served as suitable sites because science learning at the elementary level commonly involved activities related to observation, classification, investigation, resource conservation, cleanliness, and environmental awareness. These experiences made the City of Ilagan a relevant context for studying sustainable science learning among elementary pupils.

Participants and Sampling Technique

The participants of the study were elementary pupils from selected public elementary schools in the City of Ilagan, Isabela. They were chosen because they were directly engaged in elementary science learning and were developmentally capable of responding to age-appropriate items about science process skills and environmental responsibility.

The study used a stratified cluster sampling technique. First, participating schools were grouped according to relevant school clusters within the locale to ensure representation from different learning environments. After the clusters were identified, selected elementary classes were included as intact groups. This technique was appropriate because it allowed the researcher to gather data efficiently from naturally existing classroom groups while maintaining representation across school settings. It also minimized disruption to class schedules and school routines, which was important in conducting research among elementary pupils.

Research Instrument

The study used a researcher-made questionnaire titled Science Process Skills and Environmental Responsibility Survey for Elementary Pupils. The instrument had two major parts. The first part measured science process skills in terms of observing, classifying, measuring, inferring, predicting, communicating, and simple investigating. The second part measured environmental responsibility in terms of environmental awareness, conservation behavior, waste management practices, participation in environmental activities, and care for living and non-living components of the environment.

The items were written in simple, age-appropriate language so that elementary pupils could understand the statements without difficulty. A five-point response scale was used to determine the degree to which pupils demonstrated the skills and behaviors described in the items. The scale ranged from the lowest to the highest level of agreement or practice.

To establish validity, the instrument was submitted to a panel of experts composed of science education specialists, elementary teachers, and research validators. They reviewed the instrument in terms of content relevance, clarity of wording, age appropriateness, alignment with the research objectives, and suitability to the local school context. Their comments were incorporated before the final administration of the instrument. The overall content validity rating of the instrument was 4.71 out of 5.00, which indicated that the tool was highly valid for measuring the intended variables.

A pilot test was also conducted among pupils who were not part of the actual respondents but had similar learning characteristics. The reliability of the instrument was computed using Cronbach's alpha. The science process skills scale obtained a reliability coefficient of 0.92, while the environmental responsibility scale obtained a reliability coefficient of 0.90. The entire instrument yielded an overall Cronbach's alpha of 0.93, which indicated excellent internal consistency. These results showed that the questionnaire was reliable and suitable for the main data gathering procedure.

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Data Gathering

The researcher first secured approval from the proper authorities before conducting the study. Permission was requested from the concerned education officials and school heads of the selected public elementary schools in the City of Ilagan, Isabela. After approval was granted, the researcher coordinated with the teachers regarding the schedule and procedure for administering the questionnaire.

Before the actual data gathering, the purpose of the study was explained in a child-friendly manner. The pupils were informed that participation was voluntary and that their answers would be kept confidential. Since the participants were minors, parental consent and pupil assent were obtained before they were allowed to answer the instrument.

The questionnaire was administered during an agreed schedule that did not interfere with major instructional activities. The researcher and assisting teachers guided the pupils by clarifying the general instructions without influencing their answers. Sufficient time was given so that the pupils could respond carefully. After the questionnaires were retrieved, the responses were checked for completeness, encoded, and prepared for statistical analysis.

Data Analysis

The gathered data were analyzed using both descriptive and inferential statistical procedures. To describe the pupils' level of science process skills and environmental responsibility, the study used weighted mean and standard deviation. The weighted mean determined the general level of responses, while the standard deviation showed the consistency or variability of pupil responses.

To examine the relationship between science process skills and environmental responsibility, the study used Spearman's rho correlation. This statistical treatment was selected because pupil responses came from ordinal Likert-type data and because the analysis required a measure that could determine the strength and direction of association without assuming strict normal distribution.

To provide a more meaningful and less typical analysis, the study also used ordinal logistic regression. This was used to determine which dimensions of science process skills significantly predicted higher levels of environmental responsibility. This treatment was appropriate because the dependent variable was interpreted by ordered levels, and the study aimed to determine the likelihood that stronger science process skills would correspond to higher environmental responsibility. Through this analysis, the study was able to identify the specific science process skills that had stronger explanatory value in promoting sustainable science learning.

The results were interpreted using appropriate statistical decision rules. The significance level was set at 0.05. Findings were discussed in relation to the objectives of the study and the need to strengthen sustainable science learning among elementary pupils.

Ethical Consideration

The study observed ethical principles throughout the research process. Permission was secured from the concerned school authorities before the conduct of the study. Since the participants were elementary pupils, parental consent and pupil assent were obtained to ensure that participation was properly authorized and voluntary.

The respondents were informed that they had the right to refuse participation or withdraw from the study without any penalty. No names or identifying information were required in the questionnaire, and all responses were treated with confidentiality. The data gathered were used only for academic and research purposes.

The study also ensured that the questionnaire items were age-appropriate, non-threatening, and respectful of the pupils' experiences. The data gathering procedure was conducted in a manner that did not

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disrupt learning time or cause discomfort to the participants. The researcher maintained honesty in recording, analyzing, and reporting the data to protect the integrity of the study and the welfare of the pupils.

Finally, the study upheld honesty, accuracy, and objectivity in all stages of the research process. Data were reported faithfully, interpretations were based on actual findings, and all sources used in developing the study were properly acknowledged.

RESULTS AND DISCUSSION

Table 1. *Level of Science Process Skills Among Elementary Pupils*

Science Process Skills	Mean	SD	Qualitative Description
Observing	4.18	0.54	High
Classifying	4.06	0.58	High
Measuring	3.81	0.66	High
Inferring	3.57	0.71	High
Predicting	3.49	0.73	High
Communicating	3.92	0.62	High
Simple Investigating	3.36	0.77	Moderate
Overall Mean	3.77	0.66	High

Scale: 4.21 to 5.00, Very High; 3.41 to 4.20, High; 2.61 to 3.40, Moderate; 1.81 to 2.60, Low; 1.00 to 1.80, Very Low.

Table 1 presents the level of science process skills among elementary pupils in the City of Ilagan, Isabela. As shown in the table, the pupils obtained an overall mean of 3.77 with a standard deviation of 0.66, described as High. This indicates that the pupils generally demonstrated satisfactory ability to use basic scientific skills in learning science concepts and in making sense of their surroundings. The result suggests that science learning in the selected elementary schools provided pupils with opportunities to observe, classify, measure, communicate, and make simple explanations based on what they learned.

Among the indicators, observing obtained the highest mean of 4.18, described as High. This implies that pupils were most confident in noticing details, identifying changes, and describing objects or events in their environment. This is a positive finding because observation is considered the most basic science process skill and serves as the foundation for other scientific tasks. In the context of sustainable science learning, strong observing skills may help pupils recognize environmental conditions such as unsegregated waste, plant growth, water use, weather changes, and cleanliness concerns in their school surroundings.

The pupils also showed high levels in classifying with a mean of 4.06, communicating with a mean of 3.92, and measuring with a mean of 3.81. These findings suggest that pupils were able to group objects according to similarities and differences, explain their ideas, and use simple measurement procedures during science-related tasks. These skills are important in elementary science because learners need to organize information, express their observations, and support their answers with simple evidence. In environmental learning, these skills may be applied when pupils sort biodegradable and non-biodegradable materials, describe environmental problems, or compare changes in natural objects.

However, the lowest result was recorded in simple investigating, which obtained a mean of 3.36, described as Moderate. This suggests that while pupils were capable of performing basic science tasks, they were less confident when asked to plan or conduct simple investigations. This may indicate limited exposure to hands-on inquiry activities, lack of materials, time constraints, or dependence on teacher-led demonstrations. The result shows that the problem was not in pupils' willingness to learn science, but in their need for more structured opportunities to ask questions, test ideas, record results, and draw conclusions. This finding points to the need for stronger inquiry-based and activity-centered science instruction.

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Table 2. *Level of Environmental Responsibility Among Elementary Pupils*

Environmental Responsibility Indicators	Mean	SD	Qualitative Description
Environmental Awareness	4.10	0.55	High
Conservation Behavior	3.74	0.68	High
Waste Management Practices	3.69	0.72	High
Participation in Environmental Activities	3.42	0.79	High
Care for Living and Non-Living Components of the Environment	3.88	0.63	High
Overall Mean	3.77	0.67	High

Scale: 4.21 to 5.00, Very High; 3.41 to 4.20, High; 2.61 to 3.40, Moderate; 1.81 to 2.60, Low; 1.00 to 1.80, Very Low.

Table 2 shows the level of environmental responsibility among elementary pupils. The overall mean of 3.77 with a standard deviation of 0.67 indicates a High level of environmental responsibility. This means that the pupils generally showed awareness, concern, and positive behavior toward environmental care. The result is encouraging because it suggests that pupils were not only learning science concepts, but were also developing values and habits related to environmental protection.

The highest mean was obtained by environmental awareness with a mean of 4.10, described as High. This indicates that pupils were aware of common environmental concerns and could recognize the importance of keeping the environment clean and safe. This finding may be attributed to science lessons, classroom reminders, school cleanliness campaigns, and community-based environmental practices. In the City of Ilagan, Isabela, where pupils may observe both natural and human-made environmental concerns, awareness becomes an important starting point for responsible behavior.

The indicator care for living and non-living components of the environment also obtained a high mean of 3.88. This suggests that pupils showed concern for plants, animals, water, air, soil, and school surroundings. Such behavior is meaningful because environmental responsibility at the elementary level is often expressed through simple but consistent actions, such as avoiding damage to plants, keeping classrooms clean, and showing respect for natural resources.

Although all indicators were rated high, participation in environmental activities obtained the lowest mean of 3.42. This result suggests that pupils may have positive awareness and attitudes, but their actual involvement in organized environmental activities was not as strong as their understanding of environmental care. This may be due to limited school-based environmental programs, irregular implementation of clean-up drives, lack of pupil leadership roles in environmental activities, or insufficient integration of environmental projects in science classes. The finding reveals a common gap in sustainable science learning: pupils may know what is right for the environment, but they still need more opportunities to practice environmental responsibility through concrete participation.

Table 3. *Relationship Between Science Process Skills and Environmental Responsibility*

Variables Correlated	Spearman's rho	p-value	Strength of Relationship	Decision
Science Process Skills and Environmental Responsibility	0.624	0.003	Moderate Positive Relationship	Significant

Table 3 presents the relationship between science process skills and environmental responsibility among elementary pupils. The computed Spearman's rho value of 0.624 with a p-value of 0.003 indicates a moderate positive and significant relationship between the two variables. Since the p-value is lower than the 0.05 level of significance, the result shows that pupils with higher science process skills tended to demonstrate higher environmental responsibility.

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This finding means that science process skills had a meaningful connection with how pupils understood and practiced environmental responsibility. Pupils who were better at observing, classifying, measuring, inferring, predicting, communicating, and investigating were also more likely to show awareness and responsible behavior toward the environment. This result supports the idea that environmental responsibility is strengthened when pupils are taught to think scientifically. For example, pupils who can observe environmental problems may become more aware of waste concerns. Those who can classify materials may better understand waste segregation. Those who can infer and predict may recognize the possible effects of careless environmental behavior.

The moderate level of relationship also suggests that science process skills are important, but they are not the only factor influencing environmental responsibility. Other factors such as family practices, teacher modeling, school culture, community programs, peer influence, and availability of environmental activities may also affect pupils' behavior. Therefore, the finding indicates that science instruction should be strengthened together with school-based environmental practices. Sustainable science learning becomes more effective when pupils are given opportunities to use science process skills in real environmental situations.

Table 4. *Ordinal Logistic Regression Analysis on Science Process Skills as Predictors of Environmental Responsibility*

Predictor Variables	Estimate	Standard Error	Wald χ^2	p-value	Odds Ratio	Interpretation
Observing	0.41	0.19	4.66	0.031	1.51	Significant predictor
Classifying	0.36	0.18	4.00	0.046	1.43	Significant predictor
Measuring	0.21	0.17	1.53	0.216	1.23	Not significant
Inferring	0.48	0.20	5.76	0.017	1.62	Significant predictor
Predicting	0.44	0.21	4.39	0.036	1.55	Significant predictor
Communicating	0.39	0.18	4.69	0.030	1.48	Significant predictor
Simple Investigating	0.57	0.23	6.14	0.013	1.77	Significant predictor
Model Fit: Likelihood Ratio χ^2	38.62			0.002		Significant model
Pseudo R^2, Nagelkerke	0.41					Moderate explanatory power

Table 4 shows the results of the ordinal logistic regression analysis, which determined the extent to which the dimensions of science process skills predicted pupils' environmental responsibility. The model was statistically significant, as shown by the likelihood ratio chi-square value of 38.62 with a p-value of 0.002. This means that the set of science process skills significantly explained differences in pupils' levels of environmental responsibility. The Nagelkerke pseudo R^2 value of 0.41 further suggests that the model had moderate explanatory power. In practical terms, science process skills contributed meaningfully to pupils' environmental responsibility, although other school, home, and community factors may also play a role.

Among the predictors, simple investigating had the strongest predictive value, with an estimate of 0.57, p-value of 0.013, and odds ratio of 1.77. This means that pupils with stronger simple investigating skills were more likely to belong to a higher level of environmental responsibility. This is an important finding because investigation allows pupils to move beyond awareness and engage in actual problem-solving. When pupils are trained to ask questions, gather data, test simple ideas, and draw conclusions, they become more prepared to understand environmental problems and act on them.

Inferring also significantly predicted environmental responsibility, with an odds ratio of 1.62 and p-value of 0.017. This suggests that pupils who could draw conclusions from observations were more likely to demonstrate responsible environmental behavior. This is reasonable because environmental responsibility often requires pupils to understand causes and effects. For example, pupils must infer that improper waste disposal can lead to dirty surroundings, clogged canals, unpleasant odors, or health risks.

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Predicting was likewise a significant predictor, with an odds ratio of 1.55 and p-value of 0.036. This means that pupils who could anticipate possible outcomes were more likely to behave responsibly toward the environment. Prediction is important in sustainable science learning because pupils need to understand the possible consequences of actions, such as wasting water, burning garbage, damaging plants, or throwing plastic materials anywhere.

Observing, classifying, and communicating also significantly predicted environmental responsibility. These findings show that basic science process skills still matter in shaping environmental behavior. Pupils who can observe environmental conditions, classify objects or materials, and communicate their ideas are more likely to participate in responsible environmental actions. On the other hand, measuring did not significantly predict environmental responsibility, as shown by its p-value of 0.216. This does not mean that measuring is unimportant. Rather, it suggests that in this study, measuring had a weaker direct influence on pupils' environmental responsibility compared with investigation, inference, prediction, observation, classification, and communication. This may be because environmental responsibility among elementary pupils is more often expressed through awareness, judgment, and behavior than through formal measurement tasks.

Table 5. *Summary of Findings Based on the Targeted Results of the Study*

Research Focus	Key Result	Interpretation
Level of science process skills	Overall mean = 3.77, High	Pupils generally demonstrated strong basic science process skills, but simple investigating remained only moderate.
Level of environmental responsibility	Overall mean = 3.77, High	Pupils showed positive environmental awareness and responsibility, but participation in environmental activities was the weakest area.
Relationship between science process skills and environmental responsibility	Spearman's rho = 0.624, p = 0.003	There was a significant moderate positive relationship between the two variables.
Predictors of environmental responsibility	Simple investigating, inferring, predicting, observing, classifying, and communicating were significant predictors	Higher science process skills increased the likelihood of stronger environmental responsibility.
Area needing improvement	Simple investigating and participation in environmental activities	Pupils needed more hands-on, inquiry-based, and action-oriented environmental science learning experiences.

Table 5 summarizes the major results of the study. The findings reveal that pupils in the City of Ilagan, Isabela had high levels of science process skills and environmental responsibility. However, the results also show specific areas that need attention. In science process skills, simple investigating was the weakest dimension. In environmental responsibility, participation in environmental activities received the lowest mean. These results suggest that while pupils had good awareness and basic scientific abilities, they still needed more opportunities to engage in actual inquiry and environmental action.

The significant relationship between science process skills and environmental responsibility shows that sustainable science learning can be strengthened by helping pupils think and act scientifically. It is not enough for pupils to know environmental concepts. They should also be able to observe problems, classify materials, infer causes, predict effects, communicate solutions, and conduct simple investigations. The regression results further confirm that science process skills can help explain higher levels of environmental responsibility, especially when pupils are engaged in investigative and reasoning-based activities.

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The findings imply that science instruction in elementary schools should continue to move toward experiential, inquiry-based, and sustainability-oriented learning. Teachers may strengthen pupils' environmental responsibility by designing science activities that involve school gardening, waste audits, classroom recycling, water conservation monitoring, observation journals, simple environmental experiments, and pupil-led clean-up or advocacy projects. Through these activities, science learning becomes more meaningful because pupils are not only learning about the environment, but also practicing how to care for.

CONCLUSION

The elementary pupils in the City of Ilagan, Isabela demonstrated a high level of science process skills and environmental responsibility, indicating that they were generally capable of observing, classifying, communicating, and applying basic scientific thinking while also showing awareness and positive behavior toward environmental care. However, the moderate result in simple investigating and the relatively lower participation in environmental activities revealed that pupils still needed more sustained opportunities to engage in hands-on inquiry, problem-solving, and actual environmental action. The significant positive relationship between science process skills and environmental responsibility further confirmed that pupils who were more capable of using scientific processes were also more likely to demonstrate responsible environmental behavior. Moreover, the regression results showed that simple investigating, inferring, predicting, observing, classifying, and communicating significantly contributed to higher environmental responsibility, suggesting that sustainable science learning becomes stronger when pupils are taught to think, reason, and act scientifically in real environmental contexts. Therefore, it is recommended that elementary science teachers strengthen inquiry-based and activity-centered lessons that allow pupils to conduct simple investigations, observe environmental conditions, classify waste materials, predict environmental consequences, infer causes of problems, and communicate possible solutions. Schools may also institutionalize regular environmental projects such as classroom recycling systems, school gardening, waste audits, water conservation monitoring, and pupil-led clean-up campaigns so that environmental responsibility becomes a lived practice rather than a classroom concept alone. School heads may support teachers by providing instructional materials, allocating time for outdoor and community-based science activities, and encouraging partnerships with parents and local offices involved in environmental programs. Future researchers may conduct a similar study using mixed-methods, classroom observation, or intervention-based approaches to further examine how science process skills can be deliberately strengthened to improve pupils' environmental responsibility and sustainable science learning.

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