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Environmental Opinion, Environmental Emotion, and Their Relationships with Environmentally Responsible Behaviors among Special Science Students in Grades 7–10

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ABSTRACT

This study examined environmental opinion, environmental emotion, and environmentally responsible behaviors among 152 Special Science students in Grades 7–10 at Angono National High School during School Year 2026–2027. Using a quantitative, non-experimental, descriptive-correlational design and total enumeration, the study gathered data through an adapted Environmental Attitude Scale and six items on environmentally responsible behaviors from the TIMSS 2023 framework. Descriptive statistics were used to determine the levels of the study variables, while the Shapiro–Wilk test assessed normality. Since the composite scores departed from normality, Spearman's rank-order correlation was used to examine the relationships between the variables. The adapted scales demonstrated acceptable internal consistency, with Cronbach's alpha values of .762 for environmental opinion, .858 for environmental emotion, and .737 for environmentally responsible behaviors. The respondents obtained a mean of 3.89 (SD = 0.50) for environmental opinion and 4.14 (SD = 0.47) for environmental emotion. Their mean score for environmentally responsible behaviors was 2.67 (SD = 0.51). Spearman's analysis revealed a weak but statistically significant positive relationship between environmental opinion and environmentally responsible behaviors ($\rho = .177$, $p = .029$). A moderate positive and statistically significant relationship was also found between environmental emotion and environmentally responsible behaviors ($\rho = .447$, $p < .001$). These findings indicate that both environmental opinion and emotional engagement are associated with students' reported environmentally responsible behaviors, with environmental emotion showing the stronger association. The results highlight the value of environmental learning experiences that address both students' views and emotional engagement while providing opportunities to practice responsible behaviors.

Keywords: environmental opinion, environmental emotion, environmentally responsible behaviors, environmental attitudes, Special Science students

INTRODUCTION

Environmental challenges such as climate change, biodiversity loss, pollution, and the depletion of natural resources continue to pose significant concerns for societies worldwide. Although scientific and technological developments contribute to addressing these problems, environmental sustainability also

depends on human decisions, values, and everyday practices. Individuals' choices regarding resource consumption, waste management, and environmental protection can influence the condition of natural systems and the well-being of present and future generations. Consequently, addressing environmental challenges requires not only scientific understanding but also the development of attitudes and behaviors that support responsible environmental action.

The 2030 Agenda for Sustainable Development recognizes the interconnectedness of environmental, social, and economic concerns through the Sustainable Development Goals (SDGs). Within this framework, education plays an important role in preparing learners to understand sustainability challenges and participate in addressing them. Sustainable Development Goal 4, particularly Target 4.7, emphasizes the importance of ensuring that learners acquire the knowledge and skills necessary to promote sustainable development, including sustainable lifestyles and environmental awareness (United Nations, 2015). Similarly, UNESCO's Education for Sustainable Development (ESD) framework emphasizes the development of knowledge, skills, values, attitudes, and behaviors that enable individuals to make informed decisions and act responsibly in support of a sustainable future (UNESCO, 2020). These perspectives highlight the need for educational experiences that connect scientific knowledge with environmental values and practical action.

Science education provides an important context for developing these capacities. Through the study of ecosystems, biodiversity, climate systems, natural resources, and human impacts on the environment, students can develop a scientific understanding of environmental problems and their possible consequences. In the Philippine basic education context, environmental and climate-related concepts are incorporated into the K–12 curriculum, while the Department of Education has emphasized the strengthening of climate education and climate action among learners (Department of Education [DepEd], 2022). However, understanding environmental concepts does not necessarily mean that students will consistently engage in practices that protect the environment. The challenge for environmental education is therefore not limited to helping students recognize environmental problems but also involves understanding how their environmental orientations relate to the actions they report performing.

Environmental attitudes are among the factors examined in understanding environmentally responsible behavior. They encompass individuals' evaluations, beliefs, and emotional responses concerning the environment and environmental issues. Environmentally responsible behaviors, in contrast, refer to actions intended to contribute to environmental protection or the sustainable use of resources. Although these constructs are related, they are not interchangeable. Students may express concern about environmental degradation or hold favorable opinions about environmental protection without consistently practicing environmentally responsible behaviors. Earlier research identified environmental attitudes as one of several factors associated with responsible environmental behavior, alongside knowledge, skills, intentions, and other personal and situational influences (Hines et al., 1987). More recent research has likewise continued to investigate the relationship between environmental values, attitudes, and behavior among children and adolescents.

Examining environmental attitudes through distinct dimensions may provide a clearer understanding of how students relate to environmental issues. Uzun et al. (2019) developed and examined the validity and reliability of the Environmental Attitude Scale for secondary school, high school, and undergraduate students. Their instrument includes three subscales: Environmental Behavior, Environmental Opinion, and Environmental Emotion. For the present study, the Environmental Opinion and Environmental Emotion subscales will be used to examine students' environmental attitudes. Environmental Opinion consists of

11 items, while Environmental Emotion consists of 16 items. Environmental Opinion represents students' expressed views and evaluations concerning environmental issues, whereas Environmental Emotion concerns their emotional responses to these issues.

The two subscales will be examined separately in the present study rather than automatically combined into a single overall environmental-attitude score. This approach recognizes that students' opinions and emotional responses may represent related but distinct dimensions of their environmental orientations. Analyzing them separately also allows the study to determine whether each dimension has a statistically significant relationship with environmentally responsible behaviors. Such an approach is consistent with the study's objective of examining specific relationships between environmental orientations and reported actions without assuming that all attitude items necessarily measure one unified construct.

Environmentally responsible behaviors will be measured using six selected items from the TIMSS 2023 Environmental Attitudes and Behaviors framework described by Reynolds and Komakhidze (2022). These items address practices such as reusing materials, reducing resource consumption, discussing ways to help the environment, learning about environmental problems, participating in environmental activities, and encouraging others to avoid environmentally harmful actions. The framework recognizes that students' opportunities to engage in environmental action may be influenced by their age and degree of control over household, school, and community decisions. Focusing on accessible behaviors provides a practical means of examining the environmental practices that students report undertaking within their everyday contexts.

Recent research further supports the relevance of investigating environmental orientations and behaviors among secondary school students. Lehre et al. (2026), using data from the Norwegian TIMSS 2023 assessment, examined the relationship between environmental values and environmentally responsible behaviors among lower-secondary students. Their work provides a recent example of how international assessment data can be used to investigate the connection between students' environmental orientations and their reported actions. Nevertheless, findings from one national context cannot automatically be assumed to apply to students in other educational settings. Differences in curriculum, family practices, school initiatives, available resources, and opportunities for participation may influence how environmental attitudes are expressed through behavior.

In the Philippines, previous studies have examined environmental attitudes, awareness, and practices among learners at different educational levels. Abun and Aguot (2017), for example, investigated environmental attitudes and environmental behavior among senior high school students in Region I and reported a significant relationship between the two constructs. Other Philippine studies have explored environmental attitudes and related outcomes among secondary and science-oriented learners. These studies contribute to understanding environmental orientations among Filipino students, but further research is needed to examine how specific dimensions of environmental attitudes relate to environmentally responsible behaviors across different grade levels and school contexts.

Special Science students provide a relevant population for such an investigation because their educational program places emphasis on science learning and the development of scientific competencies. Their exposure to science-related concepts and learning activities may provide opportunities to understand environmental issues; however, participation in a science-focused program should not be assumed to guarantee particular environmental attitudes or behaviors. Empirical investigation is needed to determine whether students' opinions and emotional responses concerning the environment are associated with the environmentally responsible practices they report performing.

Although existing studies have examined environmental attitudes and behaviors in various student populations, the present study focuses on Special Science students in Grades 7–10 at Angono National High School during School Year 2026–2027. Including students across four grade levels broadens the investigation beyond a single grade and provides evidence from the identified Special Science population within one Philippine public secondary school. The study does not assume that students at these grade levels have identical environmental orientations or behavioral opportunities. Rather, it examines the levels of environmental opinion, environmental emotion, and environmentally responsible behaviors among the participants and investigates the relationships between each attitude dimension and reported environmental behavior.

Accordingly, this study aimed to determine the levels of environmental opinion, environmental emotion, and environmentally responsible behaviors among Special Science students in Grades 7–10 at Angono National High School. It further examines whether environmental opinion and environmental emotion are significantly related to environmentally responsible behaviors. By analyzing the two dimensions separately, the study seeks to provide a more differentiated understanding of how students' environmental orientations are associated with their reported actions. The findings may contribute context-specific evidence to environmental education research and provide information that science educators and school administrators can consider when strengthening learning experiences and initiatives that connect environmental understanding with responsible action.

Specifically, it seeks to answer the following questions:

1. What is the level of environmental opinion among Special Science students in Grades 7–10?
2. What is the level of environmental emotion among Special Science students in Grades 7–10?
3. What is the level of environmentally responsible behaviors among Special Science students in Grades 7–10?

4. Is there a significant relationship between:

4.1. environmental opinion and environmentally responsible behaviors; and

4.2. environmental emotion and environmentally responsible behaviors?

Review of Related Literature

Environmental Education and Sustainable Development

Environmental education is an important component of efforts to promote sustainable development because environmental challenges require both scientific understanding and responsible decision-making. Education for Sustainable Development (ESD) emphasizes the development of knowledge, skills, values, attitudes, and behaviors that enable individuals to contribute to a more sustainable future (UNESCO, 2020). This perspective is consistent with Sustainable Development Goal 4, particularly Target 4.7, which emphasizes education for sustainable development and sustainable lifestyles (United Nations, 2015).

In science education, environmental issues provide opportunities for learners to connect scientific concepts with real-world concerns. Topics such as biodiversity, ecosystems, pollution, climate change, and natural resource management can help students understand the consequences of human activities and consider possible responses to environmental problems. However, the educational value of these topics extends beyond conceptual understanding. Students must also have opportunities to reflect on environmental issues, develop personal positions, and participate in practices that support environmental protection.

Research on environmental education suggests that educational interventions can influence several environmental outcomes. Van de Wetering et al. (2022), through a meta-analysis of environmental

education research involving children and adolescents, examined outcomes that included environmental knowledge, attitudes, intentions, and behaviors. Their work provides a broader evidence base for understanding the potential contribution of environmental education to young people's environmental development. Nevertheless, the extent to which educational experiences translate into everyday environmental practices may vary across learners and contexts.

In the Philippine setting, the Department of Education has emphasized strengthening climate education within the K–12 curriculum (DepEd, 2022). This policy direction reinforces the relevance of examining not only students' exposure to environmental concepts but also their environmental orientations and reported actions. Investigating these outcomes among Special Science students may provide context-specific evidence for understanding how environmental concerns are reflected in students' everyday practices.

Environmental Attitudes: Environmental Opinion and Environmental Emotion

Environmental attitudes refer broadly to individuals' evaluations and orientations toward the natural environment and environmental issues. They may encompass beliefs about environmental problems, opinions regarding environmental protection, and emotional responses to environmental degradation. Examining environmental attitudes is important because students may differ not only in what they believe about environmental issues but also in how they feel about them.

Uzun et al. (2019) developed and examined the validity and reliability of the Environmental Attitude Scale for secondary school, high school, and undergraduate students. Their validation study involved 1,687 students from Finland, the United States, and Turkey. The instrument comprises three subscales: Environmental Behavior, Environmental Opinion, and Environmental Emotion. The Environmental Opinion subscale contains 11 items, while the Environmental Emotion subscale contains 16 items. The distinction among these subscales provides a basis for examining different dimensions of students' environmental orientations rather than treating all environmental-related responses as a single undifferentiated construct.

Environmental opinion concerns students' expressed views and evaluations of environmental issues. These opinions may reflect how students interpret environmental problems, assess their seriousness, and respond to statements concerning environmental protection. Examining environmental opinion can therefore provide information about students' cognitive evaluations of environmental concerns. However, favorable opinions do not necessarily establish that students regularly engage in environmentally responsible actions.

Environmental emotion, in contrast, concerns students' emotional responses toward the environment and environmental issues. Emotional responses may be relevant to environmental engagement because students' feelings toward nature and environmental degradation can form part of their broader environmental orientations. Nevertheless, emotional concern should not automatically be interpreted as evidence of actual behavior. Students may express concern about environmental problems while facing limitations in their opportunities, resources, or ability to act.

The distinction between environmental opinion and environmental emotion is central to the present study. Although the two dimensions may be related, their relationships with environmentally responsible behaviors may differ. Analyzing them separately allows the study to determine whether students' opinions and emotional responses are independently associated with their reported environmental practices. It also avoids assuming that all 27 items from the two subscales necessarily form one overall environmental-

attitude construct. The appropriateness of any combined score would require additional theoretical and measurement justification.

Environmentally Responsible Behaviors among Students

Environmentally responsible behaviors refer to actions intended to reduce environmental harm, conserve resources, or contribute to environmental protection. These actions range from relatively simple everyday practices, such as reusing materials and conserving water, to participation in environmental activities and encouraging others to adopt environmentally responsible practices.

For school-age learners, measuring environmentally responsible behavior requires consideration of the actions that students can reasonably perform within their immediate environments. Some environmental decisions are controlled by parents, school administrators, or community authorities, while other practices may be more directly accessible to students. Measures focusing on everyday actions can therefore provide information about students' reported environmental engagement without assuming that they have equal control over all environmental decisions.

Reynolds and Komakhidze (2022) presented the TIMSS 2023 Environmental Attitudes and Behaviors Framework to guide the assessment of students' environmental attitudes and behaviors in an international educational context. The framework includes student-reported behaviors and recognizes the importance of examining environmental learning and practices within students' home, school, and classroom environments. It provides a relevant reference for selecting behavior items that are appropriate for school-age learners.

The present study uses six selected items based on the TIMSS 2023 environmentally responsible behaviors measure. These items address practices involving reuse, resource conservation, environmental discussion and learning, participation in environmental activities, and encouraging others to avoid environmentally harmful actions. Students report how frequently they engage in the specified behaviors. The resulting scores therefore represent self-reported behavioral frequency rather than direct observation of students' actions.

This distinction is important when interpreting environmental behavior measures. Self-reported questionnaires are useful for gathering information from a relatively large group of students, but responses may be affected by differences in interpretation, recall, and the desire to provide socially desirable answers. Consequently, reported environmental behavior should be interpreted as an indication of students' stated practices rather than conclusive evidence of their actual behavior in every situation.

Relationship between Environmental Attitudes and Environmentally Responsible Behaviors

The relationship between environmental attitudes and environmentally responsible behaviors has long been examined in environmental education and environmental psychology. Hines et al. (1987), in their meta-analysis of research on responsible environmental behavior, identified environmental attitudes among the factors associated with responsible environmental action. Their work also emphasized that behavior involves multiple influences rather than a single determinant. This perspective provides an important foundation for investigating environmental attitudes while recognizing that favorable attitudes alone may not fully explain environmental practices.

More recent research continues to examine how environmental orientations relate to environmental learning and behavior. Baierl et al. (2022) investigated the supportive role of environmental attitudes in learning about environmental issues, contributing to the discussion of how environmental orientations and learning processes may be connected. Although learning outcomes and behavioral outcomes are not

identical, this line of research supports the importance of examining environmental attitudes as meaningful dimensions of students' engagement with environmental issues.

Similarly, van de Wetering et al. (2022) examined the effects of environmental education on environmental outcomes among children and adolescents. Their meta-analysis provides evidence relevant to understanding the relationship between environmental education and outcomes such as attitudes and behaviors. However, educational interventions, environmental attitudes, and environmentally responsible behaviors represent different constructs. Evidence that environmental education can influence environmental outcomes does not by itself establish that a particular attitude dimension is significantly associated with behavior in every student population.

More directly relevant to the present study, Lehre et al. (2026) analyzed data from the Norwegian TIMSS 2023 assessment to examine environmental values and environmentally responsible behaviors among students in Grades 5 and 9. Their findings indicated that environmental preservation values were positively associated with environmentally responsible behaviors across the examined grade levels and gender groups. The study also demonstrated the usefulness of investigating environmental measures within a large-scale lower-secondary educational population. However, its environmental preservation measure is conceptually distinct from the Environmental Opinion and Environmental Emotion subscales used in the present research. Its findings therefore support the broader relevance of investigating environmental orientations and behavior, rather than establishing the expected results of the current study.

Taken together, these studies suggest that environmental orientations are relevant to understanding students' environmentally responsible behaviors, while also indicating that behavior may be influenced by additional individual and contextual factors. The relationship should therefore be examined empirically rather than assumed. In particular, it remains necessary to investigate whether students' opinions about environmental issues and their emotional responses toward the environment are each significantly associated with the environmental practices they report performing.

Philippine Context and the Research Gap

Environmental education in the Philippines operates within a basic education system that includes science learning and climate-related educational initiatives. The Department of Education's emphasis on strengthening climate education in the K–12 curriculum reflects the importance of preparing learners to understand and respond to environmental challenges (DepEd, 2022). Within this context, examining students' environmental attitudes and practices may provide useful information for understanding environmental engagement in school settings.

Previous Philippine research has investigated environmental attitudes and behaviors among different student populations. Abun and Aguot (2017), for example, examined environmental attitudes and environmental behavior among senior high school students in Region I and reported a significant relationship between the two constructs. Baring et al. (2024) examined environmental attitudes among selected Filipino senior high school students in relation to Catholic life formation. Heracleo et al. (2023) investigated environmental attitudes and proficiency in environmental science among Grade 7 Science, Technology, and Engineering students. These studies provide relevant local context by demonstrating that environmental attitudes and related educational outcomes have been examined among Filipino learners.

However, the populations, constructs, and educational settings represented in these studies differ from those of the present research. Findings from senior high school students or particular school programs cannot automatically be generalized to Special Science students across junior high school grade levels.

Likewise, studies examining environmental attitudes in relation to environmental knowledge or subject proficiency do not directly answer whether environmental opinion and environmental emotion are each associated with environmentally responsible behaviors.

The present study addresses this context-specific research need by examining Special Science students in Grades 7–10 at Angono National High School. It focuses on environmental opinion and environmental emotion as separate dimensions derived from the Environmental Attitude Scale developed by Uzun et al. (2019), together with six environmentally responsible behavior items based on the TIMSS 2023 framework. The study examines the levels of these three constructs and tests the relationships between each environmental-attitude dimension and environmentally responsible behaviors.

By including four grade levels within one public secondary school, the study provides evidence from a defined Special Science population rather than relying solely on findings from other educational settings. Its contribution lies in examining the two attitude dimensions separately and determining whether each is significantly associated with students' reported environmental practices. The results may help inform discussions on environmental learning and the design of school-based activities that connect students' environmental orientations with opportunities for responsible action.

Methodology

Research Design

The study employed a quantitative, non-experimental, descriptive-correlational research design. The descriptive component was used to determine the levels of environmental opinion, environmental emotion, and environmentally responsible behaviors among Special Science students in Grades 7–10. The correlational component was used to examine the relationships between environmental opinion and environmentally responsible behaviors, and between environmental emotion and environmentally responsible behaviors.

No intervention or experimental treatment was introduced. Instead, the study examined the variables as they naturally occurred among the respondents.

Research Setting

The study was conducted at Angono National High School, a public secondary school in Angono, Rizal, Philippines, during School Year 2026–2027. The school offers a Special Science program that provides science-focused learning experiences to students across the junior high school grade levels. The research setting was selected to examine environmental orientations and reported environmental practices among students participating in this program.

Participants and Sampling

The target population consisted of 152 Special Science students enrolled in Grades 7–10 at Angono National High School during School Year 2026–2027. The population comprised 39 Grade 7 students, 42 Grade 8 students, 35 Grade 9 students, and 36 Grade 10 students.

Total enumeration sampling was employed, with all eligible students in the identified population invited to participate in the study. At the time of the current manuscript revision, 122 responses had been collected, representing approximately 80.3% of the target population. Data collection remained ongoing, and the final number of eligible, complete responses would be established after the collection period ended and the responses had been screened.

The final report will present the actual number of respondents, the distribution of participants by grade level and other relevant demographic characteristics, and the overall response rate. Any incomplete, duplicate, or otherwise ineligible responses will be handled according to predetermined data-screening procedures. The study's findings will primarily describe the participating Special Science students at the research site and will not automatically be generalized to all secondary school students or Special Science programs in the Philippines.

Research Instruments

Data were collected using a structured questionnaire comprising two instruments: selected subscales from the Environmental Attitude Scale developed by Uzun et al. (2019) and six items concerning environmentally responsible behaviors from the TIMSS 2023 Environmental Attitudes and Behaviors framework.

Instrument 1: Environmental Opinion and Environmental Emotion

The Environmental Opinion and Environmental Emotion subscales were adapted from the Environmental Attitude Scale developed by Uzun et al. (2019). The original scale consists of three dimensions: Environmental Behaviour, Environmental Opinion, and Environmental Emotion. For the present study, only the Environmental Opinion and Environmental Emotion subscales were used. The Environmental Behaviour subscale was excluded because environmentally responsible behaviors were measured separately using the TIMSS 2023 behavior items.

The adapted instrument consisted of 27 items: 11 items measuring Environmental Opinion and 16 items measuring Environmental Emotion. Both subscales used a five-point response scale: Strongly Disagree, Disagree, Partially Agree, Agree, and Strongly Agree.

The 11 Environmental Opinion items were negatively worded and reverse-scored during data processing so that higher scores represented more favorable environmental opinions. The 16 Environmental Emotion items were scored in their original direction. The two dimensions were analyzed separately.

Instrument 2: Environmentally Responsible Behaviors

The second instrument consisted of six selected items based on the Environmentally Responsible Behaviors measure in the TIMSS 2023 Environmental Attitudes and Behaviors framework (Reynolds & Komakhidze, 2022). The items address student-reported practices involving reuse, resource conservation, learning about and discussing environmental problems, participation in environmental activities, and encouraging others to avoid environmentally harmful behaviors.

Students indicated the frequency with which they engaged in the behaviors using the following response categories: Every day, Almost every day, Sometimes, and Never. The responses were coded according to the prescribed scoring direction, with higher scores representing more frequent environmentally responsible behaviors. The final scoring procedure will be checked against the exact questionnaire administered to ensure that item coding and any necessary reverse coding are appropriate.

The six items were analyzed as a separate behavior measure. Its internal consistency in the present sample was evaluated before the resulting scores were interpreted. The findings were understood as students' self-reported behaviors rather than direct observations of their environmental practices.

Instrument Validation and Reliability

The questionnaire underwent expert review and pilot testing before its administration to the study respondents. The review was intended to examine the clarity, relevance, and appropriateness of the items

for the intended student respondents. Pilot testing was conducted to assess the questionnaire's suitability and administration before the actual data collection.

Since the instruments were adapted for use with Special Science students in the Philippine school context, their internal consistency was also examined using Cronbach's alpha based on the responses collected in the present study.

Data Gathering Procedure

The study used a structured questionnaire administered to eligible Special Science students in Grades 7–10. Before participation, the necessary school permissions and applicable institutional research requirements were addressed. Because the participants were minors, parental or guardian consent and student assent were obtained in accordance with the approved research procedures.

The participants were informed about the purpose of the study, the nature of their participation, the expected requirements of answering the questionnaire, and the measures adopted to protect their privacy. Participation was voluntary, and students were informed that declining to participate or withdrawing in accordance with the approved procedures would not result in academic penalties.

The questionnaire was administered online. The purpose of the study and the instructions for answering the questionnaire were provided to the respondents. Participation was voluntary, and the respondents were informed that their participation and answers would not affect their academic grades or standing in school. After the data collection, the responses were reviewed, organized, and prepared for statistical analysis. The data were checked for completeness and consistency before the computation of the descriptive statistics, reliability coefficients, and correlation results.

Statistical Treatment of Data

The data were analyzed using descriptive and inferential statistical procedures aligned with the research questions. Frequency and percentage were used to describe the respondents' demographic profiles, while mean and standard deviation were used to summarize their environmental opinion, environmental emotion, and environmentally responsible behaviors. Cronbach's alpha was computed to determine the internal consistency of the instruments.

Frequency and Percentage. Frequency and percentage were used to describe the respondents' profile in terms of grade level and sex.

Mean and Standard Deviation. Mean and standard deviation were used to describe the respondents' scores in Environmental Opinion, Environmental Emotion, and Environmentally Responsible Behaviors.

Cronbach's Alpha. Cronbach's alpha was computed to examine the internal consistency reliability of the Environmental Opinion, Environmental Emotion, and Environmentally Responsible Behaviors scales using the responses collected in the present study.

Shapiro–Wilk Test. The Shapiro–Wilk test was used to examine the normality of the composite scores. The results indicated statistically significant departures from normality for Environmental Opinion ($W = .946$, $p < .001$), Environmental Emotion ($W = .980$, $p = .028$), and Environmentally Responsible Behaviors ($W = .971$, $p = .003$). The results indicated that all three variables significantly departed from a normal distribution. Thus, Spearman's rank-order correlation coefficient (rho) was used to determine the strength and direction of the relationships between environmental opinion and environmentally responsible behaviors, and between environmental emotion and environmentally responsible behaviors. Spearman's

rho was selected because the data did not meet the normality assumption required for Pearson's product-moment correlation. The level of significance was set at 0.05.

Spearman's Rank-Order Correlation. Spearman's rank-order correlation coefficient was used to determine the relationships between Environmental Opinion and Environmentally Responsible Behaviors, and between Environmental Emotion and Environmentally Responsible Behaviors. This non-parametric procedure was selected because the composite scores did not meet the normality assumption based on the Shapiro–Wilk results. The level of significance was set at .05.

Ethical Considerations

The study observed the principles of voluntary participation, informed consent, student assent, confidentiality, and protection of respondents' information. Approval from the appropriate school authorities was secured, and parental or guardian consent and student assent were obtained before data collection.

Since the respondents were students and the researcher was also a teacher in the school, particular care was taken to emphasize the voluntary nature of participation. Respondents were informed that their decision to participate or not participate would not affect their grades or standing in school. Their individual responses were treated confidentially and were used for research purposes.

Significance of the Study

Students

The findings may help students reflect on the relationship between their environmental attitudes and their everyday environmentally responsible behaviors.

Science Teachers

The findings may provide science teachers with information that can be used in designing classroom activities that connect environmental concepts with values, attitudes, and responsible action.

Special Science Program

The study may provide evidence that can inform the integration of sustainability-related activities into science-focused learning experiences.

School Administrators

The findings may provide a basis for strengthening school-based environmental initiatives and student participation in sustainability-related activities.

Future Researchers

The study may serve as a reference for future research involving environmental attitudes, environmentally responsible behaviors, and Education for Sustainable Development among secondary school students.

Scope and Limitation

The study will focus on the relationship between environmental attitudes and environmentally responsible behaviors among 36 Grade 9 Special Science students of Angono National High School during School Year 2026–2027.

Environmental attitudes will be examined through the Environmental Opinion and Environmental Emotion components of the Environmental Attitude Scale developed by Uzun et al. (2019). Environmentally responsible behaviors will be measured using the six-item behavior measure based on the TIMSS 2023 Environmental Attitudes and Behaviors framework.

The study will use self-reported questionnaire data. Therefore, the findings will reflect students' reported attitudes and behaviors rather than independently observed behavior.
The study will employ a correlational design and will not establish causality. A significant relationship between environmental attitudes and environmentally responsible behaviors will not necessarily mean that environmental attitudes cause particular behaviors.
The findings will primarily apply to the identified Grade 9 Special Science population at Angono National High School and should be generalized to other populations with caution.

Results and Discussions

This section presents and discusses the findings of the study on environmental opinion, environmental emotion, and environmentally responsible behaviors among Special Science students in Grades 7 to 10. The results are organized according to the research questions. Descriptive statistics were used to present the respondents' environmental opinion, environmental emotion, and environmentally responsible behaviors, while Spearman's rank-order correlation was used to determine the relationships between the two environmental attitude dimensions and environmentally responsible behaviors.

1. Profile of the Respondents

A total of 152 Special Science students from Grades 7 to 10 participated in the study. Table 1 presents the distribution of respondents according to grade level and sex.

Table 1. Distribution of Respondents According to Grade Level and Sex

Grade Level	Frequency	Percentage
Grade 7	39	25.66
Grade 8	42	27.63
Grade 9	35	23.03
Grade 10	36	23.68
Total	152	100.00

As shown in Table 1, Grade 8 had the largest number of respondents, with 42 students (27.63%), followed by Grade 7 with 39 students (25.66%). Grade 10 accounted for 36 respondents (23.68%), while Grade 9 had 35 respondents (23.03%). In terms of sex, the majority were female, comprising 93 students (61.18%), while 59 students (38.82%) were male.
The respondents represented all four grade levels included in the study, providing a basis for examining environmental opinions, emotions, and reported behaviors across the participating Special Science student population.
Before examining the relationships among the study variables, the normality of the composite scores was assessed using the Shapiro–Wilk test. The results showed statistically significant departures from normality for environmental opinion ($W = .946$, $p < .001$), environmental emotion ($W = .980$, $p = .028$), and environmentally responsible behaviors ($W = .971$, $p = .003$). Since the three composite scores did not meet the normality assumption, Spearman’s rank-order correlation was used to examine the relationships between environmental opinion and environmentally responsible behaviors, and between environmental

emotion and environmentally responsible behaviors. This nonparametric test was used to determine the direction and strength of the associations between the variables.

2. Environmental Opinion of the Respondents

The first research question examined the Environmental Opinion of Special Science students. The Environmental Opinion subscale consisted of 11 negatively worded statements. Responses were reverse-scored so that higher scores consistently represented more favorable environmental opinions.

Table 2. Descriptive Statistics and Reliability of Environmental Opinion

Variable	Number of Items	Mean	SD	Cronbach's α
Environmental Opinion	11	3.89	0.50	0.762

Table 2 presents the respondents' environmental opinion scores. The results show an overall mean of 3.89 (SD = 0.50), with a Cronbach's alpha of 0.762. This indicates that the respondents generally expressed favorable environmental opinions based on the scoring of the scale.

The Environmental Opinion subscale consisted of 11 negatively worded statements. These items were reverse-scored so that higher scores represented more favorable environmental opinions. This scoring procedure was necessary to ensure that the responses were interpreted in the same direction.

The result suggests that the respondents generally held favorable views toward environmental issues. This is relevant to the study because environmental opinion represents one dimension of environmental attitude. Uzun et al. (2019) also treated environmental opinion as a distinct dimension in their Environmental Attitude Scale. However, the present finding describes the respondents' scores and does not, by itself, establish whether their opinions translate into actual environmental actions.

3. Environmental Emotion of the Respondents

The second research question focused on the Environmental Emotion of the respondents. This dimension consisted of 16 statements describing students' emotional responses toward environmental issues and experiences in nature. All items were directly scored, with higher values indicating stronger environmental emotional engagement.

Table 3. Descriptive Statistics and Reliability of Environmental Emotion

Variable	Number of Items	Mean	SD	Cronbach's α
Environmental Emotion	16	4.14	0.47	0.858

Table 3 presents the respondents' environmental emotion scores. The overall mean was 4.14 (SD = 0.47), with a Cronbach's alpha of 0.858. These results indicate that the respondents generally reported positive environmental emotional engagement.

The Environmental Emotion subscale consisted of 16 statements that covered different emotional responses and experiences related to the environment. These included feelings such as worry, anger, anxiety, guilt, and regret, as well as positive experiences such as feeling peaceful in nature, enjoying environmental activities, and finding satisfaction in learning about environmental issues. The items were scored in their original direction, following the scoring procedure used for the adapted scale.

The findings suggest that the respondents showed emotional engagement with environmental concerns and experiences. Environmental emotion is an important dimension to examine because students may not only hold opinions about environmental issues but may also experience emotional responses toward them. Uzun et al. (2019) likewise identified environmental emotion as a separate dimension of environmental attitude. Still, the mean score should be interpreted as a summary of responses across the 16 items rather than as evidence that every respondent experienced the same emotions.

4. Environmentally Responsible Behaviors of the Respondents

The third research question examined the Environmentally Responsible Behaviors of the respondents. The scale consisted of six positively worded statements measuring the frequency of students' reported environmental practices. Responses were scored from 1 to 4, with higher scores indicating more frequent engagement in the behaviors.

Table 4. Descriptive Statistics and Reliability of Environmentally Responsible Behaviors

Variable	Number of Items	Mean	SD	Cronbach's α
Environmentally Responsible Behaviors	6	2.67	0.51	0.737

Table 4 presents the respondents' scores on environmentally responsible behaviors. The overall mean was 2.67 (SD = 0.51), with a Cronbach's alpha of 0.737. The results describe how frequently the respondents reported engaging in the environmentally responsible behaviors included in the questionnaire.

The scale consisted of six statements, with responses ranging from Every day to Never. The responses were scored from 4 to 1, respectively, so that higher scores represented more frequent engagement in the reported behaviors.

To provide a more detailed view of the results, the mean scores for each behavior are presented in Table 5. Among the six behaviors, using fewer resources obtained the highest mean (M = 2.90, SD = 0.82), followed by telling friends when they do something harmful to the environment (M = 2.86, SD = 0.89). Participating in group environmental activities obtained the lowest mean (M = 2.27, SD = 0.71).

These results show differences in the frequency with which respondents reported engaging in the listed behaviors. Actions such as using fewer resources may be part of students' daily routines, while participation in group environmental activities may depend on opportunities available to them. However, the study did not directly examine students' access to or opportunities for participation, so this explanation should be considered a possible interpretation rather than a finding.

Overall, the results provide a description of the respondents' reported environmental behaviors. They also provide a basis for examining whether these behaviors are associated with the respondents' environmental opinion and environmental emotion.

Table 5. Item-Level Descriptive Statistics for Environmentally Responsible Behaviors

Environmentally Responsible Behavior	Mean	SD
1. Trying to reuse things, such as bags and bottles	2.73	0.72
2. Trying to use fewer resources, such as water and food	2.90	0.82

3. Talking about ways to help the environment	2.53	0.73
4. Trying to learn about environmental problems	2.72	0.76
5. Participating in group activities to help the environment	2.27	0.71
6. Telling friends when they engage in activities that harm the environment	2.86	0.89

Among the six behaviors, using fewer resources obtained the highest mean (M = 2.90, SD = 0.82). This was followed by telling friends when they engage in activities that harm the environment (M = 2.86, SD = 0.89), reusing things (M = 2.73, SD = 0.72), and learning about environmental problems (M = 2.72, SD = 0.76).

Talking about ways to help the environment obtained a mean of 2.53 (SD = 0.73), while participating in group activities to help the environment registered the lowest mean (M = 2.27, SD = 0.71).

The results suggest that students more frequently reported individual practices, particularly conserving resources, than participation in organized or collective environmental activities. The relatively lower mean for group participation may indicate that opportunities for students to take part in collective environmental initiatives are less frequent than opportunities to practice conservation in their daily routines. However, the present study did not directly examine the availability of such opportunities; therefore, this explanation should be considered a possible interpretation rather than an established finding.

The differences among the item means also suggest that environmentally responsible behavior may take different forms. Students may practice resource conservation in their everyday activities while participating less frequently in group-based environmental initiatives. This highlights the value of providing opportunities for students to engage in both individual and collective environmental practices.

5. Relationship between Environmental Opinion and Environmentally Responsible Behaviors

The fourth research question examined the relationship between Environmental Opinion and Environmentally Responsible Behaviors. Spearman's rank-order correlation was used to determine the direction and strength of the association between the two variables.

Table 6. Relationship between Environmental Opinion and Environmentally Responsible Behaviors

Variables	Spearman's ρ	ρ-value	Decision
Environmental Opinion and Environmentally Responsible Behaviors	0.177	0.029	Reject H_0

Note. The level of significance was set at .05.

Table 6 presents the relationship between environmental opinion and environmentally responsible behaviors among the respondents. The Spearman rank-order correlation analysis showed a weak positive relationship between the two variables ($\rho = 0.177$, $p = 0.029$). Since the p-value was below the 0.05 level of significance, the relationship was statistically significant.

This finding indicates that more favorable environmental opinions tended to be associated with more frequent engagement in environmentally responsible behaviors. However, the strength of the relationship was weak, suggesting that the association between the two variables was limited.

The result suggests that having favorable opinions about the environment may be related to students' environmental actions, but it does not mean that favorable opinions always result in responsible behaviors. Other factors may also be involved in whether students put their environmental views into practice. Since the study used a correlational design, the finding does not establish a cause-and-effect relationship.

6. Relationship between Environmental Emotion and Environmentally Responsible Behaviors

The fifth research question examined the relationship between Environmental Emotion and Environmentally Responsible Behaviors. Spearman's rank-order correlation was used to determine whether students' emotional responses toward environmental issues and experiences in nature were associated with their reported environmental practices.

Table 7. Relationship between Environmental Emotion and Environmentally Responsible Behaviors

Variables	Spearman's ρ	ρ-value	Decision
Environmental Emotion and Environmentally Responsible Behaviors	0.447	<.001	Reject H_0

Note. The level of significance was set at .05.

Table 7 presents the relationship between environmental emotion and environmentally responsible behaviors. The Spearman rank-order correlation analysis revealed a moderate positive relationship between the two variables ($\rho = 0.447$, $p < 0.001$). The p-value was below the 0.05 level of significance, indicating that the relationship was statistically significant.

This finding suggests that respondents with higher environmental emotion scores also tended to report more frequent environmentally responsible behaviors. Compared with the relationship between environmental opinion and behavior, the association between environmental emotion and behavior was stronger in the present study.

The result highlights the relevance of examining students' emotional responses toward the environment alongside their opinions. Students' feelings and emotional engagement concerning environmental issues may be associated with how frequently they report performing environmentally responsible actions. However, the correlation does not establish that environmental emotion causes these behaviors. Other personal, social, and contextual factors may also be related to students' actions.

Conclusion

The study examined environmental opinion, environmental emotion, and environmentally responsible behaviors among Special Science students in Grades 7–10 at Angono National High School. Based on the findings, the respondents demonstrated generally favorable environmental opinions and reported considerable emotional engagement with environmental issues and experiences. They also reported engaging in environmentally responsible behaviors, although the frequency of these behaviors varied across the six activities included in the questionnaire.

The correlation analysis revealed a weak but statistically significant positive relationship between environmental opinion and environmentally responsible behaviors. This suggests that students with more favorable environmental opinions tended to report more frequent environmentally responsible behaviors, although the association was relatively weak. Meanwhile, environmental emotion had a moderate and statistically significant positive relationship with environmentally responsible behaviors. Among the two dimensions examined, environmental emotion showed the stronger association with students' reported behaviors.

These findings suggest that understanding students' environmental attitudes requires attention to both their opinions and emotional experiences. While favorable environmental views are relevant, students' emotional engagement with the environment may also be an important consideration in understanding their reported environmental actions. However, the correlational nature of the study does not establish that either dimension causes environmentally responsible behaviors.

Overall, the findings highlight the importance of providing learning experiences that develop students' environmental understanding and emotional connection with the environment while encouraging practical opportunities to demonstrate responsible behaviors. Schools may strengthen environmental education by integrating meaningful activities into classroom instruction and school-based initiatives, allowing students to apply their learning through everyday practices and collaborative environmental efforts.

References

1. Abun, D., & Aguot, F. (2017). Measuring environmental attitude and environmental behavior of senior high school students of Divine Word Colleges in Region I, Philippines. EPH–International Journal of Educational Research, 1(1). https://doi.org/10.53555/ephijer.v1i1.3
2. Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. Biological Conservation, 241, Article 108224. https://doi.org/10.1016/j.biocon.2019.108224
3. Baierl, T.-M., Kaiser, F. G., & Bogner, F. X. (2022). The supportive role of environmental attitude for learning about environmental issues. Journal of Environmental Psychology, 81, Article 101799. https://doi.org/10.1016/j.jenvp.2022.101799
4. Bamberg, S. (2003). How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. Journal of Environmental Psychology, 23(1), 21–32. https://doi.org/10.1016/S0272-4944(02)00078-6
5. Baring, R. V., Villacrucis, P. H., Barcenas, J. T., Arsolon, N., Dandan, M., Foronda, J., Legitimas, M., Pancho, L., Ranara, J. B., Ypanto, D. J., & Avenido, J. M. (2024). The role of Catholic life formation in fostering sustainable environmental attitudes among selected Filipino SHS students. Religions, 15(3), Article 287. https://doi.org/10.3390/rel15030287
6. Berglund, T., Gericke, N., & Chang Rundgren, S.-N. (2014). The implementation of education for sustainable development in school curricula: Four Swedish case studies. European Journal of Educational Research, 3(3), 121–132. https://doi.org/10.12973/eu-jer.3.3.121
7. Boeve-de Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The effectiveness of education for sustainable development. Sustainability, 7(11), 15693–15717. https://doi.org/10.3390/su71115693
8. Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. Environmental Education Research, 13(4), 437–452. https://doi.org/10.1080/13504620701581539
9. Department of Education. (2022, August 6). On strengthening climate education in K to 12 curriculum.

https://www.deped.gov.ph/2022/08/06/on-strengthening-climate-education-in-k-to-12-curriculum/

10. Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. Journal of Social Issues, 56(3), 425–442. https://doi.org/10.1111/0022-4537.00176
11. European Commission. (2019). Key competences for lifelong learning. Publications Office of the European Union.
12. Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. International Journal of Psychology, 49(3), 141–157. https://doi.org/10.1002/ijop.12034
13. Heracleo, J. R. C., Baliva, F. J., & Canoy, E. D. (2023). Environmental attitudes and proficiency level in environmental science subject among Grade 7 STE students. Sapienza: International Journal of Interdisciplinary Studies, 4(4), Article e23051. https://doi.org/10.51798/sijis.v4i4.673
14. Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. The Journal of Environmental Education, 18(2), 1–8. https://doi.org/10.1080/00958964.1987.9943482
15. Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. The Journal of Environmental Education, 21(3), 8–21. https://doi.org/10.1080/00958964.1990.10753743
16. Intergovernmental Panel on Climate Change. (2023). Climate change 2023: Synthesis report. https://doi.org/10.59327/IPCC/AR6-9789291691647
17. Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8(3), 239–260. https://doi.org/10.1080/13504620220145401
18. Lehre, A.-C. W. G., Veletić, J., & Kaarstein, H. (2026). Environmental values as predictors of environmentally responsible behaviors: Insights from Norwegian TIMSS 2023 results. Large-scale Assessments in Education, 14, Article 29. https://doi.org/10.1186/s40536-026-00301-1
19. Molnár, Z., Kiss, P. S., Gálfi, M., & Radács, M. (2026). The importance of environmental attitudes in dealing with the environmental crisis and the relationship between education systems: A systematic review. Discover Education, 5, Article 112. https://doi.org/10.1007/s44217-026-01133-5
20. Organisation for Economic Co-operation and Development. (2019). OECD future of education and skills 2030: OECD learning compass 2030. OECD Publishing.
21. Reutotar, J. B. (2023). Awareness, attitude and practices of Grade 10 students toward environmental stewardship. International Journal of Multidisciplinary: Applied Business and Education Research, 4(10), 3549–3558. https://doi.org/10.11594/ijmaber.04.10.12
22. Reynolds, K. A., & Komakhidze, M. (2022). TIMSS 2023 environmental attitudes and behaviors framework. TIMSS & PIRLS International Study Center, Boston College.
23. Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. Journal of Environmental Psychology, 21(4), 327–339. https://doi.org/10.1006/jevp.2001.0227
24. Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. Journal of Environmental Psychology, 29(3), 309–317. https://doi.org/10.1016/j.jenvp.2008.10.004

25. Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56(3), 407–424. https://doi.org/10.1111/0022-4537.00175
26. Sun, Y., Lu, X., Cui, J., Du, K., & Xie, S. (2024). Effects of vicarious experiences of nature, environmental beliefs, and attitudes on adolescents' environmental behavior. Environmental Education Research, 30(6), 926–940. https://doi.org/10.1080/13504622.2023.2202368
27. Tilbury, D. (2011). Education for sustainable development: An expert review of processes and learning. UNESCO.
28. United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. https://sdgs.un.org/2030agenda
29. United Nations Educational, Scientific and Cultural Organization. (2017). Education for sustainable development goals: Learning objectives. UNESCO.
30. United Nations Educational, Scientific and Cultural Organization. (2020). Education for sustainable development: A roadmap. https://doi.org/10.54675/YFRE1448
31. United Nations Educational, Scientific and Cultural Organization. (2021). Learn for our planet: A global review of how environmental issues are integrated in education. UNESCO.
32. United Nations Educational, Scientific and Cultural Organization. (2023). Greening curriculum guidance: Teaching and learning for climate action. UNESCO.
33. Uzun, N., Gilbertson, K. L., Keles, O., & Ratinen, I. (2019). Environmental attitude scale for secondary school, high school and undergraduate students: Validity and reliability study. Journal of Education in Science, Environment and Health, 5(1), 79–90. https://doi.org/10.21891/jeseh.491259
34. van de Wetering, J., Leijten, P., Spitzer, J. E., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. Journal of Environmental Psychology, 81, Article 101782. https://doi.org/10.1016/j.jenvp.2022.101782
35. Wals, A. E. J. (2015). Beyond unreasonable doubt: Education and learning for socio-ecological sustainability in the Anthropocene. Wageningen University & Research.
36. World Commission on Environment and Development. (1987). Our common future. Oxford University Press.
37. Zelezny, L. C., Chua, P.-P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. Journal of Social Issues, 56(3), 443–457. https://doi.org/10.1111/0022-4537.00177