

Extent of Environmental Science Concepts Application among Science, Technology and Engineering Learners in Sta. Elena District

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Abstract

This study determined the extent of application of Environmental Science concepts among Grade 7 Science, Technology, and Engineering learners in Sta. Elena District during School Year 2024-2025. Using a quantitative descriptive-correlational design, the study involved 80 Grade 7 STE learners from Rizal National High School through total enumeration. Data were gathered using a researcher-made 50-item Environmental Science Knowledge Test, a 50-item questionnaire on the extent of application of Environmental Science concepts, and a checklist of challenges encountered by learners. Descriptive statistics, particularly mean, weighted mean, frequency, percentage, and ranking, were used to summarize the data, while Spearman rank-order correlation was used to determine the relationship between knowledge and application after the normality assumption was not met. Results showed that learners had a high level of Environmental Science knowledge, with an overall mean score of 3.97. Pollution and Biodiversity obtained the highest mean score of 4.34, while Biomes and Ecological Succession obtained the lowest mean score of 3.29. The learners demonstrated a moderate extent of application of Environmental Science concepts, with an overall weighted mean of 2.74. Food Chain, Food Web, and Food Pyramid obtained the highest weighted mean of 3.43, while Global Environmental Issues obtained the lowest weighted mean of 1.95. The computed Spearman correlation coefficient was -0.097, indicating no significant relationship between the learners' knowledge and application of Environmental Science concepts. The leading challenges were limited participation in school or community environmental programs, lack of time, weak peer support, difficulty maintaining environmental practices, and weak personal responsibility. Based on the findings, Project E.A.R.T.H., or Environmental Action and Responsibility Through Habits, was proposed as a school-based intervention program to strengthen practical environmental behavior among learners.

Keywords: Environmental Science Education, Environmental Concepts, STE Learners, Environmental Application, Project E.A.R.T.H.

Introduction

Environmental protection is a shared responsibility that should be developed not only through policies and community initiatives but also through education. Environmental education enables learners to understand environmental issues, engage in problem-solving, and take action to improve the environment [16]. Schools therefore play an important role in forming learners who are not only

knowledgeable about environmental concerns but are also capable of applying responsible environmental practices in daily life [1], [8]. In this regard, Environmental Science instruction should mirror real-life environmental situations so that learners can connect concepts with practical and responsible action [2].

The importance of environmental education is supported by global and national directions. Sustainable Development Goal 15 emphasizes the protection, restoration, and sustainable use of terrestrial ecosystems, as well as the need to halt biodiversity loss [15]. In the Philippines, DepEd Order No. 52, s. 2011 strengthens environmental education in public and private schools and supports the integration of environmental concepts into school programs and activities [7]. These policy directions affirm the need to connect classroom learning with actual environmental responsibility. Technology-supported and interactive learning environments may also strengthen environmental policy awareness and learner engagement when properly implemented [5].

Previous studies suggest that environmental knowledge may influence awareness, but it does not automatically result in responsible behavior. Environmental education can improve learners' awareness and concern [9], [14], yet the environmental value-action gap remains a persistent concern in education research [13]. Learners may understand pollution, biodiversity, water conservation, and sustainability, but their actual application may still be affected by motivation, habits, peer support, family practices, school culture, and opportunities for participation [3], [11].

This study focused on Grade 7 Science, Technology, and Engineering learners in Sta. Elena District because they are exposed to Environmental Science as part of their academic program. The study examined their level of Environmental Science knowledge, the extent to which they apply environmental concepts, the relationship between knowledge and application, and the challenges that hinder practical application. The study also proposed a school-based intervention program to strengthen environmental responsibility through repeated practice and meaningful participation, consistent with the view that environmental education must develop both competence and action [4], [10].

Methods

Research Design

The study employed a quantitative descriptive-correlational research design. The descriptive component was used to determine the learners' level of Environmental Science knowledge, the extent of application of Environmental Science concepts, and the challenges encountered by the learners. The correlational component was used to determine whether a significant relationship existed between learners' knowledge and their extent of application. This design was appropriate because the study described existing conditions and examined the association between two major variables.

Respondents of the Study

The respondents were 80 Grade 7 STE learners from Rizal National High School in Sta. Elena District, Division of Camarines Norte. They came from three sections, namely Ambitious, Appreciative, and Considerate. Total enumeration sampling was used because the target population was small and manageable, and because the study intended to include all learners officially enrolled in the Grade 7 STE Environmental Science subject in the school.

Research Instruments

Three researcher-made instruments were used. The first was a 50-item Environmental Science Knowledge Test covering ten domains: Introduction to Environmental Science; Food Chain, Food Web,

and Food Pyramid; Biomes and Ecological Succession; Pollution and Biodiversity; Biodiversity and Conservation; Energy Resources; Water Resources; Land Resources; Global Environmental Issues; and Sustainable Future. The second was a 50-item questionnaire on the extent of application of Environmental Science concepts using a five-point Likert scale. The third was a checklist of 15 challenges encountered by learners in applying Environmental Science knowledge.

The instruments were prepared based on the objectives of the study, reviewed using related literature and Environmental Science domains, and validated by experts. The test items were distributed through a Table of Specifications to ensure coverage of the ten domains and selected cognitive levels. This process supported the content alignment of the instruments with the research objectives and ensured that the items were appropriate for the target respondents.

Data Gathering Procedure

Formal permission to conduct the study was secured from proper school authorities. The respondents were informed of the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. The researcher personally administered the test, questionnaire, and checklist. After administration, accomplished instruments were retrieved, checked for completeness, organized, coded, tabulated, and prepared for statistical treatment.

Statistical Treatment

Mean score and ranking were used to determine the learners' level of Environmental Science knowledge. Weighted mean and ranking were used to determine the extent of application of Environmental Science concepts. Frequency count, percentage, and ranking were used to identify the challenges encountered by the learners. The Shapiro-Wilk test was first used to determine the normality of the data. Since the knowledge scores did not meet the normality assumption, Spearman Rank-Order Correlation was used to test the relationship between Environmental Science knowledge and application at the 0.05 level of significance.

Results

This section presents the major findings according to the objectives of the study.

Table 1. Level of Environmental Science Knowledge among Grade 7 STE Learners

Domain	Mean Score	Verbal Interpretation	Rank
Introduction to Environmental Science	3.94	High	6
Food Chain, Food Web, and Food Pyramid	3.75	High	9
Biomes and Ecological Succession	3.29	High	10
Pollution and Biodiversity	4.34	Very High	1
Biodiversity and Conservation	4.17	Very High	3
Energy Resources	3.86	High	8
Water Resources	4.22	Very High	2
Land Resources	3.91	High	7

Global Environmental Issues	4.14	Very High	4
Sustainable Future	4.10	Very High	5
Overall Mean Score	3.97	High	

The learners generally had a high level of Environmental Science knowledge, as shown by the overall mean score of 3.97. Pollution and Biodiversity ranked first with a mean score of 4.34, interpreted as Very High, followed by Water Resources with a mean score of 4.22. The lowest mean score was recorded in Biomes and Ecological Succession at 3.29, although it was still interpreted as High.

Table 2. Summary of the Extent of Application of Environmental Science Concepts

Domain	Weighted Mean	Verbal Interpretation	Rank
Introduction to Environmental Science	2.70	Moderate	6
Food Chain, Food Web, and Food Pyramid	3.43	High	1
Biomes and Ecological Succession	2.66	Moderate	7
Pollution and Biodiversity	3.04	Moderate	3
Biodiversity and Conservation	2.90	Moderate	4
Energy Resources	2.85	Moderate	5
Water Resources	3.28	Moderate	2
Land Resources	2.15	Low	9
Global Environmental Issues	1.95	Low	10
Sustainable Future	2.43	Low	8
Overall Weighted Mean	2.74	Moderate	

The learners demonstrated a moderate extent of application of Environmental Science concepts, as reflected in the overall weighted mean of 2.74. The highest result was obtained in Food Chain, Food Web, and Food Pyramid, with a weighted mean of 3.43, interpreted as High. The lowest result was obtained in Global Environmental Issues, with a weighted mean of 1.95, interpreted as Low.

Table 3. Test of Significant Relationship between Environmental Science Knowledge and Extent of Application

Indicator	Result
Spearman r computed value	-0.097
Tabular value	-0.400
Significance level	0.05
Degrees of freedom	9

Decision	Accept Ho
Conclusion	Not significant

The computed Spearman correlation coefficient of -0.097 indicates a very weak negative relationship between Environmental Science knowledge and the extent of application of Environmental Science concepts. Since the computed value did not meet the required tabular value at the 0.05 level of significance, the null hypothesis was accepted. Therefore, there was no significant relationship between the learners' Environmental Science knowledge and their extent of application of Environmental Science concepts.

Table 4. Challenges in the Application of Environmental Science Concepts

Challenges Encountered	Frequency	Percent	Rank
Limited participation in school or community environmental programs	56	70.00	1
Lack of time to participate in environmental activities	47	58.75	2
Lack of support from peers in doing environmentally friendly practices	43	53.75	3.5
Difficulty maintaining environmental practices regularly	43	53.75	3.5
Weak sense of personal responsibility toward environmental protection	40	50.00	5
Insufficient materials or resources for environmental projects and activities	37	46.25	6
Lack of interest in environmental topics and activities	34	42.50	7
Limited ability to connect environmental lessons to real-life situations	29	36.25	8.5
Limited access to	29	36.25	8.5

reliable information about environmental issues			
Difficulty identifying environmental problems in the community	27	33.75	10
Difficulty applying environmental knowledge in decision-making	25	31.25	11
Lack of confidence in practicing proper waste management	24	30.00	12
Lack of encouragement from family to practice environmental responsibility at home	20	25.00	13
Difficulty understanding environmental concepts discussed in class	18	22.50	14
Limited school facilities that support environmental practices	15	18.75	15

The most common challenge was limited participation in school or community environmental programs, reported by 56 learners or 70.00 percent. This was followed by lack of time to participate in environmental activities, with 47 learners or 58.75 percent. Lack of support from peers and difficulty maintaining environmental practices regularly both ranked third with 43 learners or 53.75 percent. The least common challenge was limited school facilities, reported by 15 learners or 18.75 percent.

Discussion

The findings show that Grade 7 STE learners possess a strong foundation in Environmental Science knowledge. Their highest performance in Pollution and Biodiversity and Water Resources suggests that learners understand concepts more easily when these are concrete, observable, and connected to their immediate surroundings. This agrees with studies emphasizing that environmental learning becomes more meaningful when concepts are connected to real-life experiences and contextualized environmental situations [6], [11], [14]. The result is also consistent with findings among Filipino STEM learners showing that environmental awareness may be present, although stronger links between knowledge and environmental action still need to be developed [12].

The lower result in Biomes and Ecological Succession suggests that learners may find abstract and long-term ecological processes more difficult to understand. These concepts require learners to imagine broader ecosystems, gradual environmental changes, and complex relationships among organisms and

habitats. Experiential and place-based approaches are therefore important because they allow learners to connect environmental concepts with direct observation and practical experience [9], [14].

Although the learners' knowledge level was high, their extent of application was only moderate. This finding supports the idea that environmental knowledge does not automatically translate into consistent environmental behavior. The environmental value-action gap has been noted in previous research, which explains that behavior is influenced not only by knowledge but also by values, habits, self-efficacy, social norms, and opportunities for action [3], [13].

The low results in Global Environmental Issues, Land Resources, and Sustainable Future reveal that learners need more support in connecting environmental lessons with civic responsibility and long-term sustainability. Learners may be able to perform simple personal actions, but they may need structured programs to develop advocacy, collective action, and sustainable habits. This is consistent with research emphasizing that environmental education should develop key sustainability competencies and responsible behavior through repeated and meaningful practice [4], [10].

The challenges reported by learners strengthen this interpretation. The leading barriers were limited participation in school or community programs, lack of time, lack of peer support, difficulty maintaining practices regularly, and weak personal responsibility. These findings suggest that the problem is not primarily lack of knowledge, but limited opportunities and social reinforcement. Studies on adolescent pro-sustainable behavior similarly show that contextual, social, and school-related factors shape whether learners practice environmental responsibility consistently [3], [11].

Proposed Intervention: Project E.A.R.T.H.

Based on the findings, Project E.A.R.T.H., or Environmental Action and Responsibility Through Habits, is proposed as a school-based environmental action intervention program for Grade 7 STE learners. It is designed to strengthen practical environmental habits through orientation, weekly eco-habit challenges, peer green teams, adopt-a-space activities, zero-waste classroom practices, school garden revitalization, eco-advocacy posters, reflection journals, community eco-action, and recognition activities. This proposed intervention is anchored on the idea that environmental education should move beyond awareness toward action, participation, and sustained responsible behavior [1], [4], [6].

Table 5. Proposed Activities under Project E.A.R.T.H.

Activity	Purpose
Project E.A.R.T.H. Orientation	Introduce the program, study findings, and learner roles in environmental responsibility.
Weekly Eco-Habit Challenge	Develop routine habits such as waste reduction, water conservation, and energy saving.
Peer Green Teams	Strengthen peer support and shared accountability in environmental practices.
Adopt-a-Space Project	Assign learner groups to care for classrooms, gardens, or selected school areas.
Zero-Waste Classroom Week	Improve waste segregation, reuse, and reduction of classroom waste.
Plastic-Free Snack Break Campaign	Encourage reusable containers and reduced single-use plastics.

School Garden Revitalization and Biodiversity Care Day	Promote care for plants, animals, and school green spaces.
Eco-Advocacy Posters	Build learner confidence in communicating environmental reminders.
Eco-Reflection Journal	Help learners connect environmental actions with values and responsibility.
Community Eco-Action Day	Extend environmental action from school to the community.
Eco-Recognition and Sustainability Commitment Program	Recognize learners and groups who sustain environmental practices.

Conclusion

The Grade 7 STE learners had a high level of Environmental Science knowledge, particularly in concepts that are concrete, observable, and directly related to their lived experiences. However, their knowledge of more abstract ecological processes, especially Biomes and Ecological Succession, may still be strengthened through contextualized and experiential instruction.

The learners demonstrated only a moderate extent of application of Environmental Science concepts. Their application was stronger in personal and routine actions but weaker in advocacy, organized participation, waste management, global environmental awareness, and sustainable lifestyle choices.

There was no significant relationship between Environmental Science knowledge and the extent of application of Environmental Science concepts. This indicates that knowing environmental concepts does not automatically lead to consistent environmental behavior. Application requires repeated practice, supportive social conditions, meaningful participation, and values formation.

The learners' challenges were mainly related to limited participation, time constraints, lack of peer support, difficulty sustaining practices, and weak personal responsibility rather than lack of understanding or absence of facilities. Therefore, environmental education should be supported by structured school-based programs that allow learners to practice environmental responsibility regularly.

Project E.A.R.T.H. may serve as a practical intervention to help learners transform Environmental Science knowledge into daily habits, collaborative action, and responsible environmental citizenship.

Recommendations

1. Science teachers may provide more localized, inquiry-based, and experiential lessons, especially in domains where learners showed comparatively lower knowledge and application.
2. Schools may integrate regular environmental programs into class routines, homeroom activities, student organizations, and community extension activities to strengthen practical application.
3. Teachers may use peer-led activities, environmental monitoring teams, reflection journals, and recognition systems to strengthen learner motivation and consistency.
4. Parents and community partners may be involved in reinforcing environmental responsibility outside the classroom.
5. Future researchers may examine other factors that influence environmental application, such as motivation, attitude, values, peer culture, family practices, school climate, and participation in environmental programs.

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