

Modeling the Path from Ecological Knowledge to Environmental Action: Attitude Towards Environmental Sustainability as Intermediary Factor among College Students

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ABSTRACT

Environmental action among college students remains poor. This study examined the mediating role of attitudes towards environmental sustainability between ecological knowledge and environmental action. Using a predictive research design, the data surveyed from 744 respondents, selected through a simple random sampling technique, were analyzed using mediation analysis. It reveals that attitude towards environmental sustainability partially but significantly mediates the predictor-criterion correlation, supporting the Knowledge–Attitude–Practice (KAP) theory. Future research may examine additional mediating variables through qualitative approaches. Educational leaders, policymakers, and curriculum developers may strengthen experiential environmental education by fostering positive environmental attitudes through policy and programs and by integrating cognitive and affective components into sustainability initiatives.

Keywords: Ecological Knowledge, Environmental Action, Attitudes Towards Environmental Sustainability, College Students

INTRODUCTION

The Problem and its Scope

Environmental action among students in Catholic higher education remains poor. (Baring et al., 2024), raising concerns about how they integrate ecological responsibility into their daily lives and future professional roles. In Italy, a study shows that, despite increasing global awareness and concern about climate change, actual environmental actions remain insufficient (Colombo et al., 2023). In Denmark, environmental action remains inconsistent and relatively weak across society, with interventions to encourage sustainable action (Helferich et al., 2023). A systematic review by Pong and Tam (2023) also revealed that although global environmental concern is widespread, actual participation in environmental protection activities remains limited among many populations worldwide. Similarly, in Poland, younger individuals tend to be skeptical of ecological campaigns, resulting in low participation in sustainable activities (Boermans et al., 2024).

At the national level, studies among Filipino students reveal a persistent gap between environmental awareness and the actual practice of sustainable behaviors. Juanita et al. (2023) conducted a study among university students in Metro Manila and found that although respondents demonstrated positive environmental attitudes, these attitudes did not consistently translate into environmental behavior. Similarly, Yadav & Singh (2024) examined university students' environmental awareness and actions across several higher education institutions in the Visayas region, finding that although participants were knowledgeable about sustainability concepts, their engagement in eco-friendly practices such as waste segregation, energy conservation, and plastic reduction was relatively low. Moreover, a study conducted by Saro et al. (2025) in Agusan Del Norte revealed that participants generally demonstrated neutral ecological behaviors, indicating a divided stance and limited concrete environmental actions among the students.

At the local level, several studies have examined students' environmental awareness and behavior, consistently revealing that while awareness levels are generally high, actual engagement in environmental actions remains

limited. This concern mirrors the situation in Davao City, where Pandoy et al. (2025) examined students' environmental attitudes and behaviors at the University of Mindanao–Davao Main Campus. Results showed that while respondents generally exhibited positive environmental attitudes, their actual participation in environmentally friendly practices was limited. Most environmental behaviors were externally driven, such as compliance with school activities or community programs, rather than intrinsic, voluntary actions. Similarly, Sánchez et al. (2024) reported that undergraduate students in Davao City exhibited high levels of climate change awareness yet showed varying degrees of behavioral engagement; many experienced "eco-anxiety," which, while heightening concern, did not necessarily result in concrete pro-environmental actions.

Research underscores a critical need to investigate how attitude mediates the relationship between environmental knowledge and action among undergraduate students, particularly within Catholic higher education institutions where moral formation is central. Despite the increasing adoption of "integral ecology" into institutional missions (Sánchez-Camacho & Moreno, 2024), there remains a significant scarcity of local research regarding tertiary-level curriculum constraints and collective-action strategies (Portus et al., 2024; Baring et al., 2024). This persistent knowledge–action gap (Yang, 2025) and the failure to translate accessible environmental resources into sustainable behaviors (Saro et al., 2025) exacerbate feelings of powerlessness and eco-anxiety among young people (Hickman et al., 2021, as cited by Baldwin et al., 2023). Consequently, there is an urgent demand for practice-centered strategies and institution-specific interventions to transform ecological literacy into concrete, responsible environmental action. Hence, this study was conducted.

Significance of the Study

This study aims to examine how ecological knowledge translates into actual environmental action by exploring the mediating role of attitudes towards environmental sustainability among college students in Catholic schools in Davao City. Furthermore, it contributes to the growing body of research on how education fosters ecological responsibility and encourages sustainable lifestyles.

The findings of this study can guide students, teachers, school administrators, and curriculum developers to design educational programs that not only increase students' environmental awareness but also encourage them to act on it in their daily lives. Moreover, this study can serve as a reference for policymakers and environmental organizations in developing youth-focused initiatives that strengthen environmental responsibility within schools and communities. This study also supports the United Nations Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, SDG 12: Responsible Consumption and Production, and SDG 13: Climate Action. SDG 14: Life Below Water, SDG 15: Life on Land. Additionally, it advances SDG 17: Partnerships for the Goals by emphasizing the importance of collaboration between schools, church institutions, environmental agencies, and local communities to strengthen sustainability initiatives. Lastly, this study is aligned with the principles of *Laudato Si'* (Pope Francis, 2015), which emphasize environmental stewardship and responsible living. Collectively, these alignments underscore education's power to shape ecological responsibility and advance global efforts toward a more sustainable, climate-resilient future.

Statement of the Problem

This study aimed to determine the mediating effect of attitudes towards environmental sustainability on the relationship between ecological civilization knowledge and environmental action. Specifically, this study seeks to achieve the following research objectives:

1. To determine the levels of ecological knowledge in terms of animal knowledge, pollution knowledge, knowledge on general issues, water knowledge, energy knowledge, and recycling knowledge; environmental action in terms of participatory and leadership action; and attitudes towards environmental sustainability in terms of attitude;
2. To determine the significance of the correlation between ecological knowledge, environmental action, and attitudes towards environmental sustainability;
3. To determine the significance of the direct effect of ecological knowledge on the environmental action, controlling for attitude towards environmental sustainability;
4. To determine the significance of the indirect effect of ecological knowledge on environmental action, through the attitude towards environmental sustainability; and

5. To determine the significance of the total effect of ecological knowledge on environmental action.

Hypotheses

H01. Ecological knowledge and attitudes towards environmental sustainability do not significantly correlate with environmental action.

H02. The direct effect of ecological knowledge on the environmental action, controlling for attitude towards environmental sustainability, is not significant.

H03. The indirect effect of ecological knowledge on environmental action, through the attitude towards environmental sustainability, is not significant.

H04. The total effect of ecological knowledge on environmental action is not significant.

Theoretical Framework and Conceptual Framework

This study is grounded in the Knowledge-Attitude-Practice (KAP) theory, originally articulated by Everett M. Rogers in 1962. The KAP model posits that human behavior follows a sequential pathway: individuals first acquire knowledge, which then shapes their attitudes, and ultimately leads to the development of practices or behavior. Knowledge provides the foundation for informed judgment, attitude serves as the motivational force influencing perceptions and predispositions, and practice represents the behavioral outcome (Launiala, 2009).

In this study, ecological knowledge represents the knowledge component, encompassing students' understanding of sustainability principles, ecological balance, and human–nature interdependence, which serve as the cognitive foundation for informed environmental decision-making. This knowledge then influences the attitude component, represented by students' attitudes toward environmental sustainability, which reflects their affective and evaluative responses toward ecological issues and their sense of responsibility toward the environment. Positive environmental attitudes, in turn, are expected to manifest in the practice component—students' environmental action—which involves concrete behaviors such as reducing waste, conserving resources, and participating in environmental initiatives. Guided by the KAP theory, this study posits that ecological knowledge fosters positive attitudes towards environmental sustainability, which subsequently translates into environmental action, highlighting the vital role of education in transforming awareness into responsible ecological behavior. Hence, this study is fully anchored on the Knowledge–Attitude–Practice (KAP) theory.

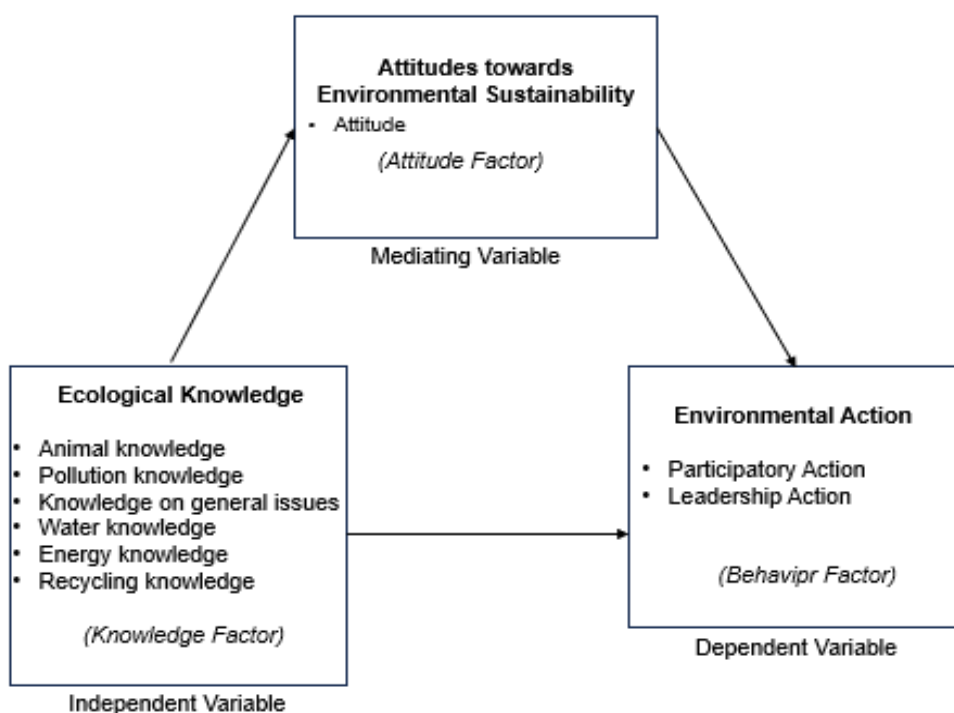


Figure 1: Conceptual Framework

METHOD

Included in this chapter are the research design, locale of the study, sample and sampling technique, data gathering technique, data analysis, and ethical consideration.

Research Design

This study employed a predictive research design with a mediation analysis. A predictive research design is a type of quantitative, non-experimental research design that examines the relationship between two or more variables and uses the strength and direction of these relationships to predict the value of one variable based on another (Creswell & Creswell, 2018). It is a predictive research design, examining the relationship between ecological knowledge and environmental action and whether attitudes towards environmental sustainability mediate that relationship.

Locale of the Study

The study was conducted within two selected member colleges of the Davao Association of Catholic Schools (DACS) in Davao City, Philippines, a non-profit organization dedicated to academic excellence and Catholic values. These institutions were chosen as the research locale because their educational philosophy, which emphasizes ethical reflection and ecological awareness, provides an ideal setting for examining students' sustainability values. By focusing on a diverse student body of future leaders, the study supports SDG 4 (Quality Education) and aligns with the DACS mission to enhance values-based environmental instruction and curriculum development with principles of *Laudato Si'* (Pope Francis, 2015), which emphasize environmental stewardship and responsible living.

Sample and Sampling Technique

A total of 746 college students from the chosen Davao Association of Catholic Schools (DACS) institutions in Davao City. To ensure all participants have a baseline understanding of sustainability concepts, the criteria for selecting the respondents include the following: (a) a bona fide first-year college; (b) currently enrolled in science, technology, and society (STS) subject for academic year 2025-2026; (c) either male or female, and 18 years old or above. The exclusion criteria are the following: (a) students who were absent during the collection of data, and (b) students who were not able to answer the questionnaire completely.

This study employed a simple random sampling technique. Simple random sampling is a probability sampling technique in which every member of the population has an equal and independent chance of being selected for the study. This method relies on random selection procedures, such as lottery methods or random number generators, to ensure fairness and reduce selection bias. According to Thomas (2023), simple random sampling is "a randomly selected subset of a population" where "each member of the population has an exactly equal chance of being selected."

Data Gathering Technique

The survey technique was used in gathering data. This technique is a systematic method for collecting information from a sample using structured questionnaires to describe the characteristics, opinions, or behaviors of a larger population, and it is applied in research to efficiently assess, test, or generalize findings across a defined group (Sheikh et al., 2024).

This study used a modified survey questionnaire to collect data. The Ecological Knowledge scale will be adapted from Ogunjinmi et al. (2015) in their study "Determining Ecological Knowledge and Attitudes of Students: The Role of Personal Factors and School Exposure," which consists of 30 items that measure students' understanding of ecological knowledge concepts. The Environmental Attitude scale will be adapted from Akash, M. (2024) in his study "Students' Attitude towards Environmental Sustainability," which consists of 5 items, designed to evaluate students' affective and evaluative orientations toward environmental protection and sustainability. Lastly, the Environmental Action scale will be adapted from Carmona, Loureiro, and Aguilar-Luzón (2021), who developed the scale in their study, "Environmental Action Scale," which consists of 18 items that assess

individuals' pro-environmental behaviors, including waste reduction, resource conservation, and participation in environmental initiatives. The questionnaire will consist of 53 items in total. The respondents used this 4-point Likert scale to answer the questionnaire: 1 as Strongly Disagree, 2 as Disagree, 3 as Agree, and 4 as Strongly Agree.

The three questionnaires were adapted and refined to align with the respondents' context and the study's objectives. Each employed a Likert scale with defined indicators, and reliability testing showed strong internal consistency, with all items achieving a Cronbach's alpha of 0.95.

Data Analysis Technique

In this study, the data analysis techniques used were descriptive, correlation, and mediation analyses. Descriptive analysis helps organize and summarize large amounts of data, making it easier for researchers to understand real-world patterns while saving time, no matter the situation or field of study (Costa, 2024). In this study, the mean and standard deviation were used as statistical tools. Moreover, the correlation analysis examines the strength and direction of the relationship between two continuous variables (Rizk, 2023). The Pearson Product-moment correlation statistical tool was used. Lastly, mediation analysis separates the overall effect of the treatment into two parts: the indirect effect, which operates through one or more middle factors (mediators), and the direct effect, which explains the remaining part of the outcome that is not caused by those mediators (Celli, 2022). The beta-estimate statistical tool was used to estimate the direct, indirect, and total effects of the determinant.

The matrix below outlines the scale, descriptive level, and corresponding interpretation for each variable in this study. This measure is particularly used to describe levels of ecological knowledge, attitudes towards environmental sustainability, and environmental action.

<i>Scale</i>	<i>Level</i>	<i>Ecological Knowledge</i>	<i>Attitude Towards Environmental Sustainability</i>	<i>Environmental Action</i>
3.25 – 4.00	Very high	Very Good	Very Strong	Very Strong
2.50 – 3.24	High	Good	Strong	Strong
1.75 – 2.49	Low	Poor	Weak	Weak
1.00 – 1.74	very low	Very Poor	Very Weak	Very Weak

Standard Deviation Value Ranges and Interpretation

<i>Range</i>	<i>Description</i>	<i>Interpretation</i>
SD ≤ 0.50	High Consistent Responses	Strong and uniform perception
SD = 0.51 – 1.00	Moderate Consistent Responses	Acceptable consistency
SD = 1.01 – 1.50	Low Consistent Responses	Differing views or experiences
SD > 1.50	Very Low Consistent Responses	High variability and lack of consensus

In this study, the significance of the correlation was tested at 0.05 confidence level. The following is the standard measure for the interpretation scale of *r*-value, the following scheme was used:

<i>Computed r</i>	<i>Descriptive Interpretation</i>
+/- 1.00	Perfect correlation
Between +/- 0.75 – +/- 0.99	High correlation
Between +/- 0.51 – +/- 0.74	Moderately high correlation
Between +/- 0.31 – +/- 0.50	Moderately low correlation
Between +/- 0.01 – +/- 0.30	Low correlation
0.00	No correlation

The standard measure for the interpretation of the strength of the mediation is as follows:

<i>Proportion Mediated</i>	<i>Interpretation</i>
< 0.20	Weak Mediation
0.20 – 0.50	Moderate Mediation
> 0.50	Strong Mediation

Ethical Considerations

Respondents were fully informed about the study's purpose, procedures, and their right to withdraw at any time, with informed consent obtained prior to data collection. Participants' identities remained confidential using anonymized data and secure storage systems, with access limited solely to the research team. The study was designed to prevent harm, ensuring that participants are fully aware of their rights and are free to withdraw at any point without penalty. The research was conducted with honesty, integrity, and respect, safeguarding participants' privacy and recognizing the value of their contributions. Ethical approval was secured from the SMILE Ethics Board, and permission to conduct the study was respectfully sought and obtained from the Vice President for Academic Affairs (VPAA). Efforts have been made to maximize benefits, minimize potential risks, and ensure fairness throughout the research process, with findings reported transparently and any potential conflicts of interest properly disclosed to uphold the integrity of the research.

RESULTS

Included in this chapter are the statistical results of descriptive, correlation, and mediation tabular presentation, and the corresponding analysis and interpretation of the statistical results. This chapter ends with a summary of findings.

Descriptive Results

Table 1 presents the levels of environmental knowledge, attitudes toward environmental sustainability, and environmental action among respondents.

Table 1. Descriptive Results (N = 744)

Variable	Standard Deviation	Mean	Descriptive Level
1. Environmental Knowledge	0.484	3.51	Very High
1.1. Animal Knowledge	0.542	3.48	Very High
1.2. Pollution Knowledge	0.538	3.49	Very High
1.3. Knowledge on General Issues	0.512	3.57	Very High
1.4. Water Knowledge	0.532	3.49	Very High
1.5. Energy Knowledge	0.525	3.48	Very High
1.6. Recycling Knowledge	0.536	3.53	Very High
2. Attitude Towards Environmental Sustainability	0.784	2.97	High
3. Environmental Action	0.677	3.07	High
3.1. Participatory Action	0.618	3.18	High
3.2. Leadership Action	0.786	2.97	High

Specifically, the table shows that the ecological knowledge variable had a mean of 3.51, indicating very high levels. This indicates that the respondent's ecological knowledge is very good. All indicators obtained a very high level. The standard deviation of 0.488 is described as highly consistent, indicating strong and uniform perception. Furthermore, the attitude towards environmental sustainability variable obtained a mean of 2.97, described as high. This indicates that respondents' attitudes towards environmental sustainability are strong. The standard deviation of 0.78 is described as highly consistent, denoting strong and uniform perception. Finally, the environmental action variable obtained a mean of 30.7, described as high. This signifies that the respondent's environmental action is strong. Consistently, all indicators are described as high—the standard deviation of 0.67, described as moderate consistent, signifying an acceptable consistency of the responses.

Environmental knowledge is interpreted at a very high level, indicating a strong cognitive foundation in environmental concepts. Furthermore, attitudes towards environmental sustainability and environmental action, interpreted at a high level, imply that respondents possess strong knowledge and positive attitudes; however, their translation into action is present but not exceptionally high.

Correlation Results

Table 2 shows the relationships among ecological knowledge, attitude toward environmental sustainability, and environmental action.

Table 2: Correlation Table (N=744)

Variables	Environmental Action			
	r-value	p-value	Decision on H_0	Interpretation
Ecological Knowledge	0.369	0.000	Reject H_{01}	Moderately low, significant correlation
Attitudes towards Environmental Sustainability	0.964	0.000	Reject H_{01}	High, significant correlation

Level of Significance: 0.05, Decision Rule: Reject H_0 if $p < 0.05$

Specifically, the table shows that the correlation between ecological knowledge and environmental action variables obtained a p-value of 0.000, which is lower than the 0.05 level of significance. Hence, the null hypothesis is rejected, indicating that the correlation is statistically significant. The r-value of 0.369 reflects a moderately low correlation between ecological knowledge and environmental action variables. It implies that for every unit change in ecological knowledge, there is a corresponding unit change in the environmental action. Similarly, attitudes towards environmental sustainability variable yielded a p-value of 0.000, which is also lower than the 0.05 level of significance. Hence, the null hypothesis was rejected, indicating that the correlation is statistically significant. The r-value of 0.964 shows a high correlation between attitudes towards environmental sustainability and environmental action. It implies that attitudes toward environmental sustainability are a very strong predictor of environmental-related outcomes, indicating that the more positive attitudes students develop, the more likely they are to engage in sustainable practices.

Ecological knowledge shows only a limited influence on environmental action, indicating that knowledge alone does not strongly drive sustainable behavior. In contrast, attitudes toward environmental sustainability demonstrate a much stronger influence, suggesting that positive attitudes play a more critical role in promoting environmental action.

Mediation Results

This table examines whether attitude toward environmental sustainability mediates the relationship between environmental knowledge and environmental action.

Table 3. Mediation Table (N = 744)

Label	Path/Effect	Estimate (B)	SE	z-value	p-value	Decision on H_0	Interpretation
A	Environmental Knowledge → Attitude Towards Environmental Sustainability	0.564	0.073	7.736	0.000	Reject H_{03}	Significant
B	Attitude Towards Environmental Sustainability → Environmental Action	0.932	0.009	100.396	0.000	Reject H_{03}	Significant

C	Environmental Knowledge → Environmental Action	0.237	0.019	100.396	0.000	Reject H02	Significant
c'	Direct	0.237	0.019	12.328	0.000	Reject H02	Significant
a x b	Indirect	0.526	0.068	7.713	0.000	Reject H03	Significant
c	Total	0.762	0.070	10.825	0.000	Reject H04	Significant

Note. Bootstrap Replications: 5000; R^2 Environmental Action = 0.941; R^2 Attitude Towards Environmental Sustainability = 0.074

Level of Decision Rule: Reject H_0 if $p < 0.05$ Significance: 0.05

Proportion Mediated: indirect effect/ total effect = 0.690

The table specifically shows that the direct effect of ecological knowledge on environmental action, controlling for the attitude towards environmental sustainability variable, yielded an estimated Beta of 0.237. The corresponding p-value of 0.000 is less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This indicates that the direct effect of ecological knowledge on environmental action, controlling for attitude towards environmental sustainability, is significant. Furthermore, the indirect effect of ecological knowledge on environmental action through attitude towards environmental sustainability obtained an estimated beta of 0.526, with a p-value of 0.000, which is less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This indicates that the indirect effect of ecological knowledge on environmental action, via attitude towards environmental sustainability, is significant. Lastly, the total effect of ecological knowledge on environmental action resulted in an estimated Beta of 0.762. The corresponding p-value of 0.000 is less than the 0.05 level of significance; therefore, the null hypothesis was rejected. This indicates that the total effect of ecological knowledge on environmental action is significant.

The table likewise specifies the mediated proportion, which is 0.690, indicating that the strength of attitude towards environmental sustainability in mediating the correlation between ecological knowledge and environmental action is strong. Since the direct effect of ecological knowledge is significant on environmental action, the indirect effect of ecological knowledge on environmental action is significant through attitude towards environmental sustainability, thus the attitude towards environmental sustainability mediation is significant.

Summary of Findings

Based on the statistical results, it was found that:

1. Ecological knowledge and attitude towards environmental sustainability significantly correlate with environmental action.
2. The direct effect of ecological knowledge on the environmental action, controlling for attitude towards environmental sustainability, is significant.
3. The indirect effect of ecological knowledge on environmental action, via attitudes towards environmental sustainability, is significant.
4. The total effect of ecological knowledge on environmental action is significant.

CONCLUSION

Based on the study's findings, attitude towards environmental sustainability partially and significantly mediates the relationship between ecological knowledge and environmental action. Hence, the Knowledge-Attitude-Practice (KAP) Theory, which posits that knowledge influences attitudes that subsequently shape behavioral responses, was fully supported.

RECOMMENDATIONS

Based on the conclusion, the following are proposed:

1. Educational leaders may enhance experiential and action-based environmental programs to translate knowledge into stronger behavioral engagement.
2. Policymakers may develop initiatives that not only inform but also strengthen positive environmental attitudes.
3. Environmental educators may integrate both cognitive knowledge and affective attitude components to effectively promote sustainable action.
4. Future researchers may explore additional mediating variables such as environmental values, norms, and perceived behavioral control to account the remaining 31% of the variance in the strength of mediation.

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