Students' Knowledge, Attitude, and Climate Action Behavior: A Basis for a Proposed Climate Change Education Program

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ABSTRACT

Climate change presents significant environmental and educational challenges, particularly in climate-vulnerable countries such as the Philippines. This study examined the levels of climate change knowledge, attitudes toward climate action, and climate action behavior among first-year college students and explored the relationships among these variables as a basis for a proposed Climate Change Education Program. A quantitative, explanatory-correlational research design was employed, involving 120 first-year college students selected through purposive sampling. Data were gathered using a researcher-developed climate change knowledge test, an attitude toward climate action scale, and a climate action behavior scale. Descriptive statistics, Spearman rank-order correlation, and bootstrapped mediation analysis were used for data analysis. Results indicated that students generally demonstrated high to very high levels of climate change knowledge, positive attitudes toward climate action, and a high level of engagement in climate action behaviors. Correlation analysis revealed that climate change knowledge was not significantly related to attitudes or behavior, while attitudes toward climate action showed a strong and positive association with climate action behavior. Further, mediation analysis revealed that attitudes toward climate action fully mediated the relationship between climate change knowledge and climate action behavior. These findings highlight the critical role of attitudes in translating climate knowledge into meaningful action and provide empirical support for the Knowledge–Attitude–Behavior model. The study recommends integrating attitudinal and action-oriented strategies into climate change education programs in higher education.

KEYWORDS: *attitudes toward climate action; climate action behavior; climate change education; climate change knowledge; knowledge–attitude–behavior model.*

INTRODUCTION

Climate change is widely recognized as one of the most urgent global challenges of the 21st century, threatening ecological systems, socio-economic stability, and human well-being through rising temperatures, intensified extreme weather events, and environmental degradation (IPCC, 2023). These impacts are particularly severe in climate-vulnerable countries such as the Philippines, which frequently experiences typhoons, flooding, and heatwaves that disrupt communities and education systems (UNICEF, 2025). Such conditions underscore the need for climate-resilient and responsive education that equips learners with the capacity to understand and respond to climate-related risks.

Education is increasingly viewed as a critical driver of climate action, with international frameworks emphasizing its role in building climate literacy, resilience, and environmental responsibility among young people (UNESCO, 2021; World Bank, 2024). Higher education institutions play a strategic role in this effort, as college students are future professionals, leaders, and advocates whose values and behaviors can influence long-term societal responses to climate change. However, growing evidence suggests that climate change knowledge alone is insufficient to promote sustained climate action.

Recent studies across different contexts reveal a persistent knowledge–action gap among students. While learners often demonstrate adequate climate knowledge, this does not consistently translate into pro-environmental behaviors or active participation in climate initiatives (Tang et al., 2022; Feldbacher&Weigelhofer, 2023; Univer et al., 2025). Research indicates that attitudes, values, emotions, and perceived self-efficacy play a crucial mediating role in transforming knowledge into meaningful action (Kollmuss& Agyeman, 2002; Pagliaro et al., 2025).

In the Philippine context, similar patterns have been observed. Studies report that Filipino students generally exhibit awareness of climate issues but show limited engagement in consistent climate-responsive behaviors, particularly in

higher education settings (Castillo &Nozaleda, 2022; Velayo& Jacinto, 2024; Lorenzo-Catabona&Dagamac, 2024). Despite increasing attention to climate change education, empirical research examining how climate change knowledge, attitudes toward climate action, and climate action behavior interrelate—especially among first-year college students—remains limited. This transition stage is critical, as first-year students begin to form independent values, civic responsibility, and long-term behavioral patterns.

Guided by behavior-oriented theories such as the Knowledge–Attitude–Behavior model, the Theory of Planned Behavior, and Social Cognitive Theory, this study examined the levels of climate change knowledge, attitudes toward climate action, and climate action behavior among first-year college students. It further investigated the relationships among these variables, with particular emphasis on the mediating role of attitudes. By generating empirical evidence within the Philippine higher education context, the study aims to inform the development of more effective climate change education strategies that strengthen attitudinal and behavioral engagement among students.

METHODS

This study employed a quantitative, cross-sectional, explanatory–correlational design to examine the levels of climate change knowledge, attitudes toward climate action, and climate action behavior among first-year college students, as well as the relationships among these variables. The design was appropriate for identifying both direct associations and the mediating role of attitudes in the relationship between knowledge and behavior without manipulating research conditions.

The study was conducted at a higher education institution in Misamis Occidental, Philippines. Participants consisted of 120 first-year college students selected through purposive sampling. Eligible respondents were officially enrolled first-year students aged 18 years and above who were taking at least one general education course with environmental or civic education components. The sample size exceeded the minimum requirement computed using Raosoft® at a 95% confidence level, ensuring sufficient statistical power for correlation and mediation analyses.

Data were collected using a validated structured questionnaire composed of three parts. Climate change knowledge was measured using a 25-item multiple-choice test assessing students' understanding of climate change causes, consequences, and solutions. The instrument demonstrated high internal consistency (KR-20 = 0.836). Attitudes toward climate action were measured using a 20-item Likert-type scale assessing sense of responsibility, self-efficacy, willingness to participate, and emotional or motivational orientation, with responses rated on a 4-point scale (Cronbach's α = 0.929). Climate action behavior was assessed using a 23-item Likert-type scale measuring the frequency of students' climate-related behaviors across

four domains: personal sustainability practices, advocacy and communication, civic or community engagement, and sustainable consumption. The revised behavior scale exhibited high internal consistency (Cronbach's α = 0.934). All instruments underwent expert validation and pilot testing before data collection.

Ethical clearance was obtained from the Misamis University Research Ethics Committee, and permission was secured from institutional authorities. Participants were informed of the study's purpose and procedures, and written informed consent was obtained before participation. Data were collected during scheduled class hours and, when necessary, through secure online survey forms. Responses were anonymized, coded, and stored in password-protected files to ensure confidentiality and compliance with the Philippine Data Privacy Act of 2012 (RA 10173).

Data were analyzed using statistical software (SPSS/JASP). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were computed to determine the levels of climate change knowledge, attitudes toward climate action, and climate action behavior. Normality was assessed using the Shapiro–Wilk test and skewness and kurtosis values. Depending on data distribution, Pearson's product–moment correlation or Spearman's rank-order correlation was used to examine relationships among climate change knowledge, attitudes toward climate action, and climate action behavior. Internal consistency reliability was assessed using KR-20 for the knowledge test and Cronbach's alpha for the attitude and behavior scales.

To test whether attitudes toward climate action mediated the relationship between climate change knowledge and climate action behavior, a bootstrapped mediation analysis with 5,000 resamples was conducted. Multicollinearity was examined using the variance inflation factor (VIF) values before mediation analysis. Mediation was considered statistically significant when the 95% bias-corrected confidence interval for the indirect effect did not include zero. This analytical approach allowed for the estimation of both direct and indirect effects, consistent with the results reported in the study.

RESULTS AND DISCUSSIONS

The study examined first-year college students' levels of climate change knowledge, attitudes toward climate action, and climate action behavior, as well as the relationships among these variables. Overall, the findings indicate that while students demonstrated high levels of climate change knowledge and generally positive attitudes and behaviors, attitudes toward climate action played a more decisive role than knowledge in shaping climate action behavior.

Results showed that most respondents possessed high to very high levels of climate change knowledge, indicating substantial familiarity with climate change causes, consequences, and solutions upon college entry. This

suggests that prior exposure to climate-related topics during basic education and access to climate information through media and digital platforms have contributed to students' climate literacy. However, the presence of students with moderate to low knowledge levels highlights disparities in understanding, reinforcing the need for structured and sustained climate education in higher education. Consistent with previous studies, knowledge served as an important cognitive foundation but was insufficient on its own to ensure behavioral engagement.

Students also exhibited positive attitudes toward climate action across all dimensions, with a sense of responsibility emerging as the strongest component, followed by self-efficacy, emotional or motivational orientation, and willingness to participate. These findings indicate that students recognize their personal and collective responsibility in addressing climate change and generally believe in their capacity to contribute to climate action. The relatively lower, yet still positive, willingness to participate suggests that engagement may depend on the availability of institutional support and meaningful opportunities. These results align with behavioral theories emphasizing the role of responsibility and efficacy in fostering positive environmental attitudes.

In terms of behavior, students demonstrated a high level of climate action behavior, particularly in personal sustainability practices such as resource conservation and responsible consumption. Engagement in advocacy and communication, while still high, was comparatively lower, suggesting that students are more inclined toward individual actions than public or collective forms of climate engagement. This pattern supports existing literature indicating that young people often prioritize private, low-barrier actions over advocacy-based behaviors, which may require greater confidence, social support, or institutional platforms.

Correlation analysis revealed that climate change knowledge was not significantly related to either attitudes toward climate action or climate action behavior, whereas attitudes toward climate action showed a strong and significant positive relationship with climate action behavior ($\rho = 0.59$, $p < .001$). These findings indicate that possessing climate knowledge alone does not automatically translate into favorable attitudes or sustained action. Instead, students with more positive attitudes were substantially more likely to engage in climate-friendly behaviors. This result reinforces previous research demonstrating that attitudinal and motivational factors are stronger predictors of climate action than factual knowledge alone.

Further analysis using bootstrapped mediation confirmed that attitudes toward climate action fully mediated the relationship between climate change knowledge and climate action behavior. While climate change knowledge significantly predicted attitudes, its direct effect on behavior became non-significant once attitudes were included in the model. This finding indicates that knowledge influences

behavior only indirectly, through its effect on students' attitudes. The significant indirect effect provides strong empirical support for the Knowledge–Attitude–Behavior model and is consistent with Social Cognitive Theory, which emphasizes the roles of self-efficacy and motivation in sustaining behavior.

Taken together, these findings highlight the central role of attitudes in translating climate change knowledge into meaningful action among first-year college students. Although students enter college with relatively high climate knowledge, this knowledge leads to sustained climate action only when accompanied by positive attitudes, responsibility, efficacy, and motivation. These results underscore the importance of climate change education programs that move beyond information dissemination and prioritize experiential learning, reflection, and opportunities for active engagement. Strengthening attitudinal and motivational components within higher education may therefore be critical in fostering sustained climate action behavior among students.

CONCLUSIONS

Based on the findings of the study, it is concluded that first-year college students possess substantial knowledge of climate change; however, knowledge alone does not directly influence their attitudes toward climate action nor their engagement in climate action behaviors. While students generally demonstrate positive attitudes, particularly in terms of sense of responsibility and self-efficacy, these attitudinal factors play a more decisive role in motivating climate-related actions than cognitive understanding alone. The strong relationship between attitudes toward climate action and climate action behavior, together with the mediation results, confirms that attitudes serve as the critical mechanism through which climate change knowledge is translated into meaningful and sustained behavior. These findings provide empirical support for the Knowledge–Attitude–Behavior (KAB) model and highlight the importance of emphasizing attitude formation, motivation, and values development in climate change education. Consequently, climate change initiatives in higher education should move beyond information dissemination and adopt integrated, action-oriented approaches that foster positive attitudes and empower students to engage actively in climate action.

Recommendations

Based on the findings and conclusions of the study, the recommendations emphasize the need for attitude-centered, experiential, and action-oriented climate change education in higher education. Given that attitudes toward climate action were found to be the key mechanism through which climate change knowledge translates into climate action behavior, educational interventions should move beyond information delivery and focus on strengthening responsibility, self-efficacy, motivation, and opportunities for meaningful engagement among first-year college students.

Higher education institutions are encouraged to institutionalize comprehensive climate change education initiatives that integrate cognitive, attitudinal, and behavioral components. Instruction should not be limited to knowledge-based approaches but should deliberately incorporate reflective learning, service learning, and community-based environmental projects to ensure that climate knowledge leads to sustained climate action behavior.

Curriculum planners and academic administrators are advised to vertically and horizontally integrate climate change concepts across general education and discipline-specific courses, with particular emphasis on attitude-building strategies such as problem-based learning, experiential activities, and student-led climate initiatives. These approaches can enhance students' sense of responsibility, self-efficacy, and motivation to engage in climate action.

Faculty members are encouraged to adopt learner-centered pedagogical approaches that promote active engagement, including project-based learning, simulations, and collaborative environmental campaigns. Participation in professional development activities focused on climate-responsive and sustainability-oriented teaching strategies is also recommended to strengthen instructional effectiveness.

Student development, extension, and NSTP–CWTS offices should expand platforms for student participation in advocacy, communication, and civic engagement related to climate action. Strengthening partnerships with local communities and supporting student organizations can address the relatively lower engagement in advocacy-related behaviors observed in the study and foster collective and community-based climate action.

In line with these recommendations, it is proposed that higher education institutions adopt a semester-long Climate Change Education Program for first-year college students. Anchored on the Knowledge–Attitude–Behavior model, the program should integrate knowledge-building activities, attitude-strengthening interventions, and behavior-oriented climate action initiatives within academic and co-curricular contexts. Emphasis should be placed on reflective activities, action-planning workshops, campus- and community-based sustainability projects, and student-led advocacy and communication efforts to facilitate the translation of climate change knowledge into sustained climate action behavior. Regular monitoring and evaluation, including pretest–posttest assessments and reflection-based documentation, are recommended to guide program improvement and potential institutionalization.

The findings of this study may also serve as empirical evidence for policymakers and educational leaders in formulating policies that promote climate literacy and action-oriented education in higher education institutions, particularly in climate-vulnerable regions such as the Philippines.

Finally, future researchers are encouraged to examine additional mediating or moderating variables—such as social norms, institutional support, or emotional responses to climate change—and to employ longitudinal or experimental research designs to assess changes in knowledge, attitudes, and behaviors over time and to evaluate the long-term effectiveness of climate change education programs.

REFERENCES

1. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.

2. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall.

3. Castillo, J. S., &Nozaleda, B. M. (2022). Environmental education of students pursuing higher education: Probing on climate change awareness. Journal of Climate Change, 8(3), 41–49.

4. Feldbacher, E., &Weigelhofer, G. (2023). Identifying gaps in climate change education: A case study in Austrian schools. International Research in Geographical and Environmental Education, 33(2), 109–124.

5. Intergovernmental Panel on Climate Change. (2023). Climate change 2023: Synthesis report. IPCC. https://www.ipcc.ch/report/ar6/syr/

6. 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.

7. Lorenzo-Catabona, A. R., &Dagamac, N. H. A. (2024). Knowledge, level of awareness, and perception of high school and undergraduate students in rural and urban communities on climate change. Age, 11(15), 63.

8. Pagliaro, S., Barbaranelli, C., & Caprara, G. V. (2025). The integrated pro-environmental behaviors scale (I-PEBS): Development and validation in the Italian context. Sustainability, 17(9), 3825.

9. Schwartz, S. H. (1977). Normative influences on altruism. Advances in Experimental Social Psychology, 10, 221–279.

10. Tang, K. H. D., Hadibarata, T., &Yuniarto, A. (2022). Investigating students' climate change awareness and pro-environmental behavior: Evidence from higher education. Environmental Science and Pollution Research, 29(9), 12846–12858.

11. UNESCO. (2020). Education for sustainable development: A roadmap.

12. UNICEF. (2025). Ethical standards for research involving children.

13. Univer, X. X., Santos, R. M., & Lee, J. Y. (2025). Climate literacy and student engagement: Examining the

knowledge–action gap in higher education. Journal of Environmental Education Research, 31(1), 45–61.

14. Velayo, R. S., & Jacinto, E. C. (2024). Climate change awareness and environmental responsibility among Filipino college students. Asia Pacific Journal of Multidisciplinary Research, 12(1), 15–25.

15. World Bank. (2024). Education and climate change: Building resilient education systems.