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Structural Equation Modelling on the Drivers of Environmental Engagement of Secondary Students in Caraga Region, Philippines: Implications for Policy , Planning and Action

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Abstract. This study aimed to identify the key factors influencing Grade 10 secondary students' awareness ,attitudes and practices towards climate change and biodiversity conservation in Caraga Region, Philippines. Given the region's vulnerability to climatological hazards understanding students environmentalism is essential. By purposive sampling, a cross-sectional survey of 1478 students from 26 flood- prone public national high schools was obtained .Structural equation modelling showed that biodiversity conservation awareness(BCA) positively influenced climate change awareness (CCA).BCA was positively linked to education,personal experiences/observation (PEO) and religious/cultural beliefs (RC), but not media/technology access (MAT). RC, PEO,and MAT.CCA negatively influenced CCA, and not by education. Government policies/regulations had no significant influenced on BCA or CCA. Environmental attitude (EA) was positively correlated with environmental practice (EP), influenced by BCA but negatively influenced by CCA, with sex playing a moderating role. The study found that tangible, local, and culturally embedded factors are more effective in raising awareness of biodiversity issues, while abstract, global and less culturally integrated factors may weaken their influence. This findings underscore the need for comprehensive, contextualized, community-centered environmental literacy programs to increasingly foster awareness and pro-environmental behavior. Future research may use longitudinal approach to analyze causality and conduct objective assessment using actual pro-environmental behavior.

Keywords: Climate change awareness, Biodiversity Conservation Awareness, Structural Equation Modeling, Environmental Practice, Environmental Attitude

1. Introduction

The Philippines, a widely recognized megadiverse country in Southeast Asia, with exceptionally high biodiversity level, has been challenged with the protection, conservation, and sustainable advancement of its resources [1]. In 2023 World Risk Report, Philippines ranked the highest in terms of disaster risk, a risk combination of extreme natural events and vulnerability [2]. Caraga, one of its regions, is recognized as one of the last ecological frontiers, characterized by its diverse biodiversity and unique ecosystems[3].Strengthening resiliency through continued awareness on climate change and disasters has been a government call considering the region's vulnerability to climatological hazards [4].

Climate change (CC) is posing a global threat that has profound ecological [5], socio-economic[6], political [7] and psychological [8] impacts. Anthropogenic climate change is presently influencing worldwide climatic extremes causing losses and damages to nature and people [9] . In comparison to immediate threats, climate change is generally perceived as an abstract issue that operates on a large scale, unfolds gradually, and frequently appears disconnected from our everyday well-being. [10]. The limited knowledge of the climate systems with their complexities and dynamics, effects of external influences, both natural and anthropogenic, and the deficiencies of climate models as standard tools for climate research posed uncertainties [11]. Equivalently, biodiversity loss is a complex educational paradox, as people struggle to recognize species' disappearance over time despite their widespread visibility. Like climate change, this loss is distant,

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progressive, and not immediately apparent, which makes it challenging for individuals to recognize, engage with, and comprehend [12]. Resolving the significant challenges of climate change and biodiversity loss necessitates integrated and coherent conservation methodologies that acknowledge their mutual dependence [13].

While community awareness of climate risks increases with exposure [14], public understanding and support for climate policies is highly variable worldwide. The main driver of declining biodiversity is lack of public awareness on biodiversity conservation [15]. Biodiversity conservation is an integrated framework of coordinated off-site and on- site strategies that safeguard biological variety in its whole [16]. Consequently, the factors that shape individual awareness are not uniform across regions as firstly, environmental awareness is a multi-dimensional construct and a concept that encompasses a broad spectrum of factors or dimensions, classifications, and connotations [17,18,19,20, 21].

Identifying relevant determinants that influence awareness leading to positive attitudes and pro-environmental behavior is essential for effective environmental education policy, planning and action. A multivariate analysis utilizing Structural Equation Modeling (SEM) may provide a more nuanced understanding of the complex relationships between these variables and allow for identifying potential intervention points to enhance strategies and policies and thus promote sustainable behavior fostering a more environmentally conscious generation. While SEM is valuable for understanding complex relationships, might be a lack of studies that use a comprehensive model and might be underutilized in environmental awareness research in the Philippines, particularly in the Caraga Region.

This study specifically examined the factors influencing climate change and biodiversity conservation awareness. To get more robust findings, it subsequently tested its influence on environmental attitude and environmental practice. In particular, this research investigated the influence of education, religion and cultural beliefs, personal experiences and observations, government policies and regulations and media and access technology on climate change and biodiversity conservation awareness . It also sought to determine if biodiversity conservation awareness significantly influenced climate change awareness. It further determined the influence of environmental attitude on environmental practice. Sex and type of residence were also examined as moderating variables affecting the relationships of climate change awareness and biodiversity conservation awareness to environmental attitude.

2. Literature Review and Hypothesis Development

2.1 Theoretical Framework

No singular theory can adequately elucidate the comprehensive interactions and linkages among variables that influence human behavior in environmental conservation [26].This study is primarily anchored on Theory of Planned Behavior (TPB) (Alzen, 1981) and Value-Belief Norm Theory of pro environmental behavior of Stern (2000) [27, 28]. The (TPB) has evolved as a reliable and accurate paradigm for predicting and analyzing individual environmental behavior [29,30,31,32]. TPB specifically examines the relationship between attitudes and behaviors (practices). It asserts that the intention to engage in a behavior is the closest predictor of actual behavior, with this intention shaped by one’s attitude toward the behavior, subjective norms (the sense of social pressure felt), and perceived behavioral control (the confidence in one's capability to execute the behavior).This research aims to understand what influences environmental action (practice). The TPB provides a framework for examining how students' attitudes towards environmental behaviors (e.g., recycling, conserving energy), their perceptions of what important others think they should do (subjective norms related to environmental action within their families, schools, and communities), and their belief in their ability to engage in these actions (perceived behavioral control, considering factors like access to resources or knowledge) collectively shape their intentions to act, and consequently, their actual environmental practices. Extensively, a robust literature has established

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positive relationship between environmental awareness and attitude towards environmental behavior [31,33,34]. There are studies that integrate supplementary constructs to improve the prediction capacity of the TPB [35, 36]. TPB framework may be enhanced and expanded by incorporating additional constructs or modifying the relationships among its variables [27,38]. This study investigates how awareness of climate change and biodiversity conservation might influence these TPB components, ultimately affecting environmental behavior.

The VBN theory offers a more thorough framework that clarifies pro-environmental behavior as a result of a series of individual values, an ecological worldview (beliefs regarding the environment), awareness of consequences, attribution of responsibility, and personal norms (feelings of moral duty). This theory explains pro-environmental actions and their associated indicators through a causal chain involving various factors, including values (altruistic, biospheric and egoistic), beliefs (ecological worldview, awareness of adverse consequences, and self-attribution of responsibility), and personal norms (the obligation to participate in pro-environmental activities) [38].It delves deeper into the foundational beliefs and values that drive environmental concern and action. This study seeks to understand the determinants of environmental action, and the VBN theory offers a pathway from awareness (of climate change and biodiversity conservation) to practice through a chain of psychological constructs. The study likely explores how students' underlying values, their beliefs about the state of the environment and humanity's impact, their awareness of the negative consequences of environmental problems , their sense of personal responsibility to address these issues, and the resulting personal norms (moral obligation to act) influence their engagement in environmental practices. Awareness of climate change and biodiversity conservation are key elements in this causal chain, influencing the awareness of consequences and potentially the ascription of responsibility.

2.2 Research Variables

Education is essential in tacking the pressing global concerns on climate change and biodiversity loss [39]. The UN's 2030 Agenda recognized quality education (SDG4) as essential for achieving all other Sustainable Development Goals , emphasizing the interconnectedness of education and sustainability [40]. Environmental education thereby is essential for supporting sustainable environmental management and is a controlling factor in preventing environmental damage [41]. In the Philippines, environmental education is incorporated into educational programs across all grade levels. This integration focuses on a fundamental understanding of environmental concerns and regulations, as well as both international and local policies related to the environment. It also highlights the role of citizens in engaging with environmentally responsible practices and promoting sustainable development. [42]. Science education in the Philippines maintains a multidisciplinary curriculum integration envisioning learners to be environmentally literate, critical problem solvers and responsible stewards of nature [43].Environmental education will be made relevant to the local community by incorporating local cultural values, issues and situations specific to the country at the provincial or national levels [42].

Education serves as the most significant indicator of an individual's awareness regarding climate change. [44]. The role of education in achieving the Sustainable Development Goals (SDGs) is vital, particularly in fostering knowledge and skills necessary for sustainable practices [40, 45, 22 , 25]. A varying level of awareness could be due to school curriculum [46,47]. the extent of climate literacy [48] , demographic backgrounds [49] denial theories [50] skepticism and distrust to climate science [51]. Emphasis is placed on the participatory, interdisciplinary, creative, and affective-driven approach [50] holistic and multidisciplinary climate change education [52] with action-focused rather than fear-based approach [22]. Drawing from these discussion, we propose the following hypotheses:

H_1 Education has a significant influence on climate change awareness.

H_2 Education has a significant influence on biodiversity conservation awareness

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Religiosity ranks as one of the most significant and widespread social institutions that plays a crucial role in shaping virtually every culture and society[35]. As a marker of identity that transcends national borders, religion influences many environmentally- relevant behavior. Culture is broadly defining the behavior of society, including its reaction to climate change and associated implications and such its plays a part in framing climate change as a phenomenon of concern to society [53]. But there remained a highly contested cultural issue of climate change over the interpretation of the problem and the necessity of solutions [54]. Society's response to every dimension of global climate change is mediated by culture and found to be important for understanding both mitigation and adaptation to climate change [55].The interwoven cultural and religious beliefs can also influence awareness leading to stronger pro-environmental attitudes and practices as impacted by religious affiliations [56], religious attendance [57, 58], stewardship belief and belief in controlling god [57],religion exposure, climate outcome and generation [59]. From the literature emerged as well the religious determinist (or fatalist) who believes climate to be a 'natural' process and not artificial under human control and therefore leave it to God, and the religious participants that do not deny this naturalness and accept human's born impacts on climate (60). Conversely, religiosity was associated with lower knowledge and concern about climate issues. This found that some religious beliefs, particularly among people with literalist Christian beliefs, are more likely to lead to a "development stewardship" worldview which tends to dismiss policy responses to climate change mitigation, creating climate apathy [61]. Religious individuals were observed to exhibit lower levels of commitment towards environmental issues and climate change, while atheism was shown to have a positive impact on recycling habits and identification with climate-related concerns [62]. Furthermore, no direct correlation has been established between Catholic identity and environmentally friendly behavior. It was found that self-identified Catholics reported significantly less connectedness to nature compared to their nonreligious counterparts [63]. Considering the conflicting theoretical perspectives and the various country- and religion-specific variations, it is likely that there is a limited agreement at present on whether religion has a strong negative correlation, a positive relationship, or no significant connection with pro-environmental beliefs and behaviors [59].Hence, these proposals;

H_3 Religious and cultural beliefs have a significant influence on climate change awareness.

H_4 Religious and cultural beliefs have a significant influence on biodiversity conservation awareness.

Public awareness is a prerequisite for effective climate action, as it influences the acceptance and implementation of policies to mitigate climate change impacts [64]. Unless governments enact effective and potentially costly environmental policies ,environmental problems will likely persist and intensify [65]. Effective climate governance requires a multi-faceted approach integrating local, regional, and national strategies to enhance public understanding and engagement with climate issues. Local governments, in particular, are instrumental in driving climate change initiatives implementing innovative governance strategies that address local climate challenges and raise community awareness about climate issues [66].These localized efforts are essential, as they often fill the gaps left by national policies, which may be inadequate or slow to respond to the urgency of climate change. Higher governance quality correlates with better environmental performance [67] public awareness and support for conservation efforts for eco-innovation [68] and sustainability of a green future [69] . Political stability and regulatory quality positively influence environmental performance at the national level [67]. Good environmental performance is linked to increased competitiveness, even challenged by the idea that economic growth and environmental protection are mutually exclusive. Government policies and regulations appertaining to policy-driven curriculum integration , community -level environmental conservation efforts such as promoting sustainable practices, engaging in local clean-ups and raising awareness about environmental issues through educational initiatives and tree-planting programs have been shown to increase awareness [70]. Effective environmental communication promotes awareness of specific environmental government policies and regulations ensuring accessible language and content However, the

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advancement in implementing and enforcing environmental legislation can be hindered by various factors. These laws may not have well-defined standards or essential mandates, nor are they always adapted to specific national and local situations. Research conducted among college students revealed that their familiarity with environmental laws was rated as "not very familiar," while their understanding of violations and penalties was considered "fair." Additionally, there was a noted deficiency in knowledge regarding the procedures for reporting these violations [71]. Thus, challenges persist in effectively enforcing environmental regulations [72].This highlights the importance of clear and consistent policy frameworks that are effectively communicated to students. Henceforth, these hypotheses are proposed:

H_5 Government policies and regulations have a significant influence on climate change awareness.

H_6 Government policies and regulations have a significant influence on biodiversity conservation awareness.

Environmental awareness is closely linked to an individual's subjective perception of their relationship with the environment which evolves through personal experiences and psychological processes [73]. Awareness matures due to one's psychological process, corresponding to the connected emotions and experiences about a specific action [74]. Natural disaster experiences can generally have physical and psychological effects on people [10]. Extreme weather experiences affect attitude and pro-environmental concerns through the experience-perception link [75]. Outdoor learning experiences enhances connections to local ecosystem [76]. Personal experiences and observations of extreme weather exhibited intentions to engage in mitigation actions [77] and disaster-preparedness [78]. In contrast to immediate threats, climate change is frequently perceived as an abstract and large-scale issue that unfolds slowly and often seems disconnected from our everyday experiences [10] which gives weight on the contrasting role of experience. For instance, students may observe variations in weather patterns or encounter localized environmental challenges but might not connect these occurrences with the broader notion of global climate change. Notably, exposure to extreme weather events has not been linked to a corresponding rise in concern for environmental issues [79]. A meta-analysis found that although self-reported experiences of severe weather had a limited positive impact on individuals' belief in climate change, changes in local weather patterns did exert a moderate influence [80], This implies that extreme weather events can heighten awareness when they involve unusual local temperatures ,temporary proximal or result in immediate financial losses [81]. Following these contentions, we are proposing these hypotheses:

H_7 Personal experiences and observations have a significant influence on climate change awareness.

H_8 Personal experiences and observations have a significant influence on biodiversity conservation awareness.

Media and access to technology can be powerful tools for raising awareness, mobilizing action, and promoting sustainable practices in an environmental context [82, 83].A robust set of literature showed the effective role of mass media [84, 85], digital evolution [86],knowledge management and innovative culture [87], integration of technology in educational curriculum [88] varied media exposure [89] digital platforms [83, 90] or citizen science [91]in facilitating conservation communication, in shaping young people's perceptions of climate change , improving awareness thus encouraging proactive engagement in sustainability efforts [89] . These tools are crucial for building scientific knowledge, mobilizing youth action, and developing robust conservation strategies [92,93, 94,17] However, while the media has the potential to inform, it does not automatically translate into increased awareness or action regarding climate change or biodiversity conservation. The actual engagement and behavioral change among users can be minimal, particularly if the content does not resonate with their pre-existing beliefs or if it lacks credibility [95] ; can be undermined by the overwhelming volume of information and the prevalence of misinformation; moderated by factors such as subjective norms and perceived value [96] and

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when it is presented as distant with threatening message framings based on a non-resilient and political narrative leading to social apathy and disengagement [97]. With these differing influences, these hypotheses are proposed:

$H_{9.}$ Media and access to technology have a significant influence on climate change awareness.

$H_{10.}$ Media and access to technology have a significant influence on biodiversity conservation awareness.

Climate change awareness is fundamentally linked to biodiversity conservation, as it informs adaptive management strategies, enhances spatial planning, and supports an integrated policy framework [13]. Previous studies have reported that heightened awareness of biodiversity issues and climate change can significantly influence individuals' environmental attitudes and behaviors, leading to pro-environmental behavior [98,99,100,101,102,89]. This relationship can be largely attributed to the interconnected nature of ecological systems and mutual dependence of environmental issues. A significant level of awareness and a positive attitude among high school students regarding climate change issues indicated their readiness to address this global challenge [103,104]. Such an optimistic perspective is likely to encourage participation in biodiversity conservation initiatives [104]. Individuals with a strong connection to nature were likelier to engage in pro-environmental behavior such as conservation efforts and sustainable practices [105]. Relating from these studies,we proposed

H_{11} Biodiversity conservation awareness has a significant influence on climate change awareness

H_{12} Climate change awareness has a significant influence on environmental attitude

H_{13} Biodiversity conservation awareness has a significant influence on environmental attitude

H_{14} Environmental attitude has significant influence on environmental practice.

Socio-economic context also affects conservation behaviors, particularly gender and type of residence. Awareness of climate change among students varied notably based on factors such as gender, age, birth order, and the educational level of their parents [107]. Females showed stronger influence to climate change awarenesss [108,109] and biodiversity conservation awareness [110,111]. But it was higher for the male respondents due to their better education and access to mass communication [11]. Nonetheless, no significant differences emerged between male and female undergraduate students regarding their awareness of environmental conservation [113].Rural households typically have a more direct relationship with the environment, making them particularly sensitive to changes in climate. Rural farming households in regions like South Africa have reported significant access to information sources such as radios and local newspapers, positively impacting their awareness of climate change [114] crucial to distinguish between natural and anthropogenic influences. Rural communities are often more vulnerable to the adverse effects of climate change due to their economic reliance on agriculture, which is highly susceptible to climatic variations [115]. Urban households may have different levels of awareness regarding climate change and biodiversity conservation, often influenced by their lifestyle and access to educational resources. Urban residents typically engage less directly with natural ecosystems, which may lead to a lower perception of biodiversity's importance [11]. However, urban areas can also serve as hubs for biodiversity conservation initiatives, where awareness campaigns can leverage higher educational levels and access to diverse information sources to foster greater environmental consciousness [117]. To identify how these variable moderates relationships, these hypotheses are proposed:

H_{15} Sex is a moderating variable to climate change awareness and environmental attitude .

H_{16} Type of residence is a moderating variable between climate change awareness and environmental attitude .

H_{17} Sex is a moderating variable between biodiversity conservation awareness to environmental attitude .

H_{18} Type of residence is a moderating variable between biodiversity conservation awareness to environmental attitude .

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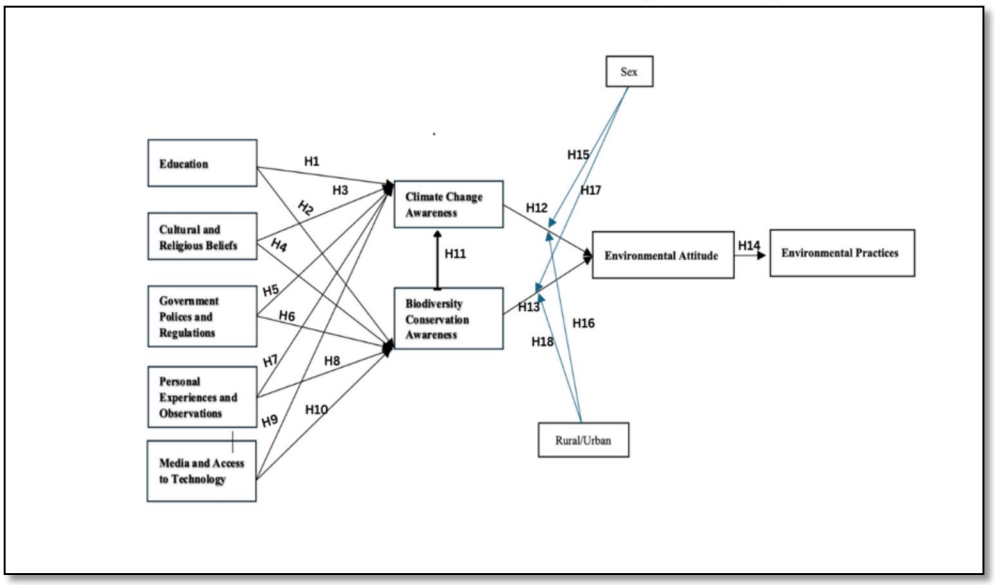

Figure 1. Conceptual Modell

3. Methodology

3.1 Data and Sample

This research was conducted in the Caraga Region of the Philippines. This region is strategically located in the Southern part of the Philippines, located in northeastern part of Mindanao Island, bordering the Philippine Sea and the Davao Gulf .

A total of 26 secondary schools ,with 1478 Grade 10 student participants were included in this study obtained through a cross-sectional survey conducted from January-April 2025 (Table 1). Following an inclusion criteria, the school's locations were categorized to have (a) moderate to very high susceptibility to flood as determined by the Philippines Mines and Geosciences Bureau Hazard Map, (b) a public national high school (c) located in schools' divisions of Agusan del Sur, Agusan Del Norte, Surigao del Sur, Surigao del Norte and Dinagat Islands.

3.2 Research Instrument

The questionnaire for the survey was created following a thorough examination of current literatures and recognized measurement scales, ensuring that it effectively represented the relevant constructs of interest. While some items were adapted to fit the context of each construct and the objective of the study, a total of five (5) determinants influencing climate change and biodiversity conservation awareness: formal education, personal experiences and observation, religious and cultural belief, government policy and regulation, media and access to technology were proposed. The influence of awareness to attitude and practices were subsequently assessed.The survey was divided into two segments: Part 1 focused on identifying the demographic characteristics of participants, as shown in Table 1. Part II employed a 5-point Likert scale, where responses ranged from 1 (strongly disagree) to 5 (strongly agree).The content validity of the questionnaire was assessed by four experts, who provided feedback on grammar, word choice, and phrase placement. Based on these recommendations, certain items were removed, and statements were revised to ensure appropriateness for the participants and academic soundness. The questionnaire instrument were pilot tested and showed good internal consistency level of Cronbach’s alpha of 0.816.

3.3 Analysis of Data

Partial Least Square Structural Equation Modeling (PLS-SEM)was utilized for data and hypotheses analysis. This comprehensive multivariate technique allows for the simultaneous

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examination of relationships among multiple variables (three or more) within a conceptual model, considering both measurement and structural aspects.

4. Results

4.1 Measurement Model Assessment

4.1.1 Confirmatory Factor Analysis (CFA)

To check the reliability and validity of the constructs, confirmatory factor analysis was employed. Results of the analysis are presented in Table 2, 3 while graphical representation of CFA is presented in Figure 2 . All factor loadings are above 0.6, suggesting a reasonably strong association between the items and their constructs [118]. These indicate that these items were good indicators of the underlying latent variables. Cronbach's alpha values, which assess the internal consistency of the scales are all above the commonly recommended threshold of 0.70, indicating good internal consistency. This means that the items within each scale were measuring the same underlying construct reliably. Composite Reliability (CR) values, which provide another measure of internal consistency are above 0.70. All of the CR values exceeded the recommended value of 0.70.

Table 1. Demographic Profile

Variable	Sub-group	Frequency	Percent
Sex	Male	531	35.93
	Female	890	60.22
Type of Residence	Rural	722	48.85
	Urban	320	21.65
Religious Affiliation	Roman Catholic	914	61.84
	Seventh-day Adventist	41	2.77
	Iglesia ni Cristo	91	6.16
	Islam	5	0.34
	Others	355	24.02

To evaluate the overall model fit in the CFA (Table 4),five goodness of fit indices (GFIs) were examined .Notably, as presented , the chi-square test is statistically significant suggesting that the model does not perfectly reproduce the observe data. However, due to the sensitivity of the chi-square test to sample size, other fit indices were given greater emphasis. All other indices indicate a good model fit to the data despite the significant p-value with the following values: CFI = 0.987, TLI = 0.986, RMSEA = 0.043, SRMR = 0.047. This result indicated that the model adequately represents the relationships between the observed variables and the latent constructs in the study.

Table 2. Assessment Result of Measurement Model of Determinants of Awareness

Construct	Items	Loadings	Cronbach's alpha	Composite reliability (CR)
Education Influence (EI)	EI5	0.668	0.747	0.751
	EI6	0.637		
	EI7	0.616		
	EI8	0.629		
	EI9	0.711		
	EI10	0.723		
Religious and Cultural Belief (RCI)	RCI2	0.658	0.773	0.773
	RCI3	0.633		
	RCI5	0.641		
	RCI6	0.633		

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	RCI7	0.651		
	RCI8	0.643		
	RCI9	0.682		
Government Policies and Regulations	GPRI2	0.702	0.780	0.780
	GPRI4	0.730		
	GPRI5	0.739		
	GPRI6	0.752		
	GPRI7	0.723		
Personal Experiences and Observation	PEOI1	0.682	0.810	0.818
	PEOI2	0.810		
	PEOI3	0.774		
	PEOI4	0.680		
	PEOI6	0.706		
	PEOI7	0.643		
Media and Access to Technology	MATI2	0.712	0.735	0.739
	MATI4	0.701		
	MATI5	0.713		
	MATI6	0.714		
	MATI8	0.637		

Table 3. Assessment of Measurement Model on Awareness, Attitude and Practice

Construct	Items	Loadings	Cronbach's alpha	Composite reliability (CR)
Biodiversity Conservation Awareness (BCA)	BCA2	0.612	0.747	0.749
	BCA5	0.682		
	BCA6	0.668		
	BCA8	0.654		
	BCA9	0.724		
	BCA10	0.645		
Climate Change Awareness (CCA)	CCA3	0.651	0.781	0.782
	CCA4	0.674		
	CCA5	0.697		
	CCA6	0.727		
	CCA9	0.698		
	CCA10	0.697		
Environmental Attitude(EA)	EA1	0.634	0.836	0.837
	EA2	0.681		
	EA3	0.678		
	EA5	0.720		
	EA6	0.690		
	EA7	0.691		
	EA8	0.665		
	EA9	0.691		
Environmental Practices (EP)	EP3	0.625	0.836	0.838
	EP4	0.645		
	EP5	0.689		
	EP6	0.684		
	EP7	0.720		
	EP8	0.715		

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	EP9	0.702		
	EP10	0.679		

Five goodness of fit indices (GFIs) were examined to evaluate the overall model fit in the CFA (Table 4). Notably,as presented , the chi-square test is statistically significant suggesting that the model does not perfectly reproduce the observe data. However, due to the sensitivity of the chi-square test to sample size, other fit indices were given greater emphasis. All other indices indicate a good model fit to the data despite the significant p-value with the following values: CFI = 0.987, TLI = 0.986, RMSEA = 0.043, SRMR = 0.047. This result indicated that the model adequately represents the relationships between the observed variables and the latent constructs in the study

Table 4. Model data fit indices results

Model fit indices	Proposed threshold value /Source	Result
CFI	> 0.80/ [115]	0.987
TLI	> 0.85/[116]	0.986
RMSEA	< 0.08/[117]	0.043
SRMR	< 0.08/ [118]	0.047
X^2/df	> 0.05/[119]	0.000

For discriminant validity, all HTMT values are below this threshold < 0.90 [119]. This indicates that each construct in the study is empirically distinct from the others, suggesting that they are measuring unique aspects of the phenomena under investigation .

Table 5. Discriminant Validity (HTMT) of the measurement model

	BCA	CCA	RCI	EI	EA	EP	GPRI	MATI	PEOI
BCA									
CCA	0.875								
RCI	0.782	0.714							
EI	0.842	0.745	0.815						
EA	0.782	0.718	0.800	0.734					
EP	0.503	0.399	0.615	0.592	0.616				
GPRI	0.643	0.500	0.715	0.653	0.606	0.516			
MATI	0.654	0.491	0.731	0.716	0.703	0.671	0.640		
PEOI	0.803	0.736	0.765	0.745	0.806	0.526	0.586	0.698	

Note: Heterotrait-monotrait (HTMT) < 0.90

For discriminant validity, all HTMT values are below this threshold < 0.90 [114]. This indicates that each construct in the study is empirically distinct from the others, suggesting that they are measuring unique aspects of the phenomena under investigation.

4.1.2 Structural Model Assessment

In structural model evaluation, path coefficients significance and the R^2 values for endogenous constructs are to be examined and reported. Each hypothesis corresponds to a causal relationship within the structural model, illustrating how pairs of constructs are interconnected. The model includes computed path coefficients for every relationship along with their associated p-values. Although it is crucial that these path coefficients show significance, the determination of R^2 values significantly varies based on the specific research area . A suggested values of 0.19, 0.33, and 0.67 0 respectively, were interpreted as weak, moderate and substantial measures of R [125].

For the determinants influencing climate change awareness, two hypotheses (H1 and H5) were not supported while other hypotheses, where negatively correlated (Table 6). For biodiversity conservation awareness, two hypotheses (H6 and H10) were not supported while other hypotheses,

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where positively correlated (Table 7). Climate change awareness is positively influenced by biodiversity conservation awareness (H11), but negatively correlated with environmental attitude (H12), while result further revealed a positive direct effect of Environmental Attitude (EA) on Environmental Practice (EP) as shown in Table 8.

Table 6. Assessment of Structural Model for the Determinants of Climate Change Awareness

Hypothesized Path		β	Standard Error	*p*-value	Decision
H_1	EI → CCA	-0.0263	0.0357	0.461	Not supported
H_3	RCI → CCA	-0.1653	0.0419	0.000	Supported
H_5	GPRI → CCA	-0.0321	0.0189	0.115	Not supported
H_7	PEOI → CCA	-0.1435	0.0408	0.000	Supported
H_9	MATI → CCA	-0.2081	0.0358	0.000	Supported

Table 7. Assessment of Structural Model for the Determinants of Biodiversity Conservation Awareness

Hypothesized Path		β	Standard Error	*p*-value	Decision
H_2	EI → BCA	0.3393	0.0436	0.000	Supported
H_4	RCI → BCA	0.2893	0.0467	0.000	Supported
H_6	GPRI → BCA	0.019	0.0275	0.549	Not supported
H_8	PEOI → BCA	0.4107	0.0349	0.000	Supported
H_{10}	MATI → BCA	-0.0653	0.0358	0.104	Not supported

Table 8. Assessment of Structural Model on Constructs Biodiversity Conservation Awareness (BCA), Climate Change Awareness (CCA), Environmental Attitude (EA), Environmental Practices (EP).

Hypothesized Path		β	Standard Error	*p*-value	Decision
H_{11}	BCA → CCA	1.4163	0.107	0.000	Supported
H_{12}	CCA → EA	-1.4167	0.2228	0.000	Supported
H_{13}	BCA → EA	2.1876	0.236	0.000	Supported
H_{14}	EA → EP	0.6608	0.0366	0.000	Supported

For the moderating effect of sex on the CCA-EA link, the significant negative beta coefficient suggests that the positive impact of climate change awareness on environmental attitude is weaker for one gender compared to the other. This suggest that male have a stronger influence on positive attitude and may imply that the link between female awareness and their attitude might be slightly less pronounced than for males. Conversely, for the moderating effect of sex on the BCA-EA link, the significant positive beta coefficient indicates that the positive impact of biodiversity conservation awareness on environmental attitude is stronger for one gender than the other. For this present study, this suggest that female have a stronger influence on positive attitude and may imply that the link between male awareness and their attitude might be slightly stronger pronounced than for females. In contrast, type of residence did not significantly moderate the relationship for both type of awareness (Table 9)

Table 9. Assessment of Structural Model of Moderating Variables

Hypothesized Path		β	Standard Error	*p*-value	Decision
H_{15}	Sex as moderating variable of CCA to EA	-0.1322	0.059	0.025	Supported
H_{16}	Type of Residence as moderating variable of CCA to EA to EA	-0.0601	0.0747	0.421	Not supported

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H_{17}	Sex as moderating variable to of BCA to EA	0.1443	0.0625	0.021	Supported
H_{18}	Type of Residence as moderating variable of BCA to EA	0.1373	0.0767	0.073	Not supported

The R-squared values associated with the endogenous latent variables (CCA,BCA, EA, EP) indicate the proportion of variance in these variables explained by the predictors in the model (Fig.2) . The value of the R2 coefficient depends on the field of research .In this present work, the R2 coefficients for CCA, BCA , EA, EP were 0.529, 0.531 , 0.439 and 0.274, respectively.

Approximately 52.9% and 53.1 % of the variance (or the changes) in climate change awareness and biodiversity conservation awareness , can be explained by the independent variables included in the model, respectively. This suggest that the model accounts for more than half of the factors that influence how aware these students are. The remaining 47.1 % and 46.9 % of the variance in both issues of awareness were likely due to other factors not included in the model or can be caused by random error. Approximately 43.9% of the variance in environmental attitude is explained by CCA, BCA, Sex, and Type of Residence while 27.4% of the variance in environmental practices is explained by Environmental Attitude, Sex, and Type of Residence.

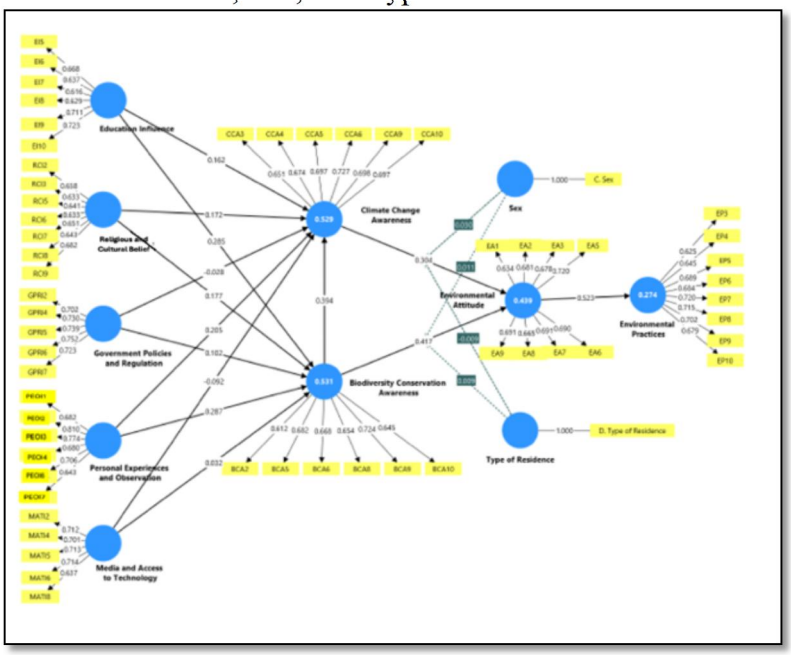

Figure 2. Structural Model

5. Discussion

The findings of the study generally support the growing evidence espousing that environmental awareness for climate change and biodiversity conservation has an influenced on attitude and practice [126,127,128,129,130]. Further, the result on the moderating role played by sex in these relationships has to be given weight in contemplating on strengthening policy interventions following the assumption that while an increased awareness might generally lead to a more positive attitude, the strength of relationship is not uniform across sex. This study revealed that female has weaker influence in terms of climate change awareness. Opposing result showed women typically have higher levels of concern and action towards climate change [108,109]. Women were more inclined to modify household practices in response to climate change by adopting measures like reducing energy consumption or utilizing alternative energy sources. Female has stronger influence in terms of biodiversity conservation awareness [110, 111]. Similarly, the lack of moderating effect of type of residence(rural or urban) may arise from a shared regional dependence on natural resources such that both communities within the region are intertwined with the surrounding ecosystem, relying on them for sustenance, livelihood and cultural identity potentially homogenizes

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the impact of awareness to attitude. While number of literature do not agree with this result [114, l15 ,116, 117] understanding these effect can help tailor environmental education and awareness campaigns.

The positive influence of biodiversity conservation awareness to climate change awareness strengthened the contention that climate change awareness is fundamentally linked to biodiversity conservations, as it informs adaptive management strategies, enhances spatial planning and supports integrated policy framework [13]. This relationship can be largely attributed to the interconnected nature of ecological systems and the mutual dependence of environmental issues [131 , 132] . Educational initiative can leverage on this result on highlighting the benefits and interdependencies of biodiversity, their awareness of climate change and its associated risks increases in tandem illustrating synergy and that both forms of awareness are mutually reinforcing.

Unlike immediate dangers, climate change is often perceived as abstract, distant, and disconnected from daily life [10]and difficult to visualize as it is being presented as a global, long-term phenomenon involving complex scientific concepts like greenhouse gases, atmospheric circulation, and feedback loops. Studies emphasized that human actions, their impact on climate, and resulting feedback loops were non-linear and spatially/temporally disconnected [133]. This disconnect between perceived and actual effects and delayed results from climate-friendly actions [I34] led to frustration and reduced motivation [135]. Understanding climate change relies heavily on interpreting scientific data and models, which can be challenging for those without a strong science background. The complexity and the uncertainty of projected data make climate research field exciting but confront the population with major challenges [11].These may explain the counterintuitive results appertaining to climate change awareness in relation to the identified determinants which were either not significant (H1 and H5) or negatively correlated (H3 , H7, H9)as well as to environmental attitude (H12). Addressing the intricate and abstract challenges of climate change begins with strengthening the role of education. Environmental education has been offering an effective approach to improving the environmental knowledge, attitudes, intentions, and behavior among children and adolescents [25,136, 53] however, despite strong consensus in the scientific community that the current climate development is a sign of human-driven changes to the global environment, climate change skepticisms and denial theories persist [137 , 50]. Henceforth, broader curricular integration to enhance engagement which recommendations include institutionalizing immersion activities, recalibrating systemic practices, monitoring and evaluating programs, integrating environmental education across subjects, and providing leadership training has been recommended [138] . Many studies made emphasis to make climate change education participatory, interdisciplinary, creative, and affect-driven approaches to climate change education and thus called for a development of new forms of climate change education that directly involve young people in responding to the scientific, social, ethical, and political complexities of climate change [50]. In the Philippine context, the educational material has been characterized as concentrating on strategies for climate adaptation, given that the Philippines routinely encounters typhoons, droughts, and various other climate-related occurrences [22]. Hence, while eco-anxiety propels pro-environmental behavior [77], however a correlation between distress and information overload regarding climate change may suggest that increased exposure can leads heightened negative feelings [139] . These findings illustrate a broader pattern where awareness, instead of fostering positive action, can also lead to increased emotional distress and diminished resilience .

While environmental issues are mutually reinforcing, the positive and significant correlations affecting biodiversity conservation awareness can be attributed to its tangible and highly observable nature (H2,H4, H8). Biodiversity conservation is an integrated framework of coordinated off-site and on- site strategies that safeguard biological variety in its whole [16] . Biodiversity , therefore can be regarded as a concrete and tangible concept in contrast with the abstract nature of climate change. Local examples of biodiversity loss can be observable, and one can relate them to specific actions as the local environment is readily accessible [140] . In effect, the causes are direct, and the impacts are often more immediate and localized; solutions can seem more straightforward.

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Localizing the issue and action allows for easier measurement of direct outcomes and lessens the complexities of scale [140]. Hence, observations and experiences can be relied on to evoke a sense of responsibility and promote the importance of protecting local ecosystems and species. Caraga Region is rich in biodiversity, with diverse ecosystems. This could lead to a stronger and easy emphasis on local biodiversity in the curriculum, making it more relatable and impactful for students . Local examples of biodiversity conservation efforts might be more readily available and visible, reinforcing classroom learning . Incorporating local wisdom in biodiversity management can significantly influence students' thinking about contextual issues, thereby building their character and social virtues through education [141] .

By acknowledging the potential for positive and negative influences, environmental education and advocacy efforts can be tailored to resonate with diverse religious and cultural perspectives, fostering a more inclusive and practical approach to environmental protection. This requires building bridges between faith- based communities and environmental organizations, promoting interfaith collaboration, and highlighting the shared values that underpin environmental stewardship.

Additionally, the tendency of media outlets to focus on global environmental issues, rather than localized concerns, can create a disconnect between students and their immediate environment. High levels of exposure to climate change information via global and local news outlets, social media platforms, and various other forms of media. may lead to a difficulty in relating to abstract global statistics when there is lack of localized content that connects biodiversity conservation to the specific ecosystems of the community can diminish the relevance of online information . Students are more likely to engage with content that directly relates to their experiences and addresses the environmental challenges facing their communities.

6. Conclusion

This study established the nuanced relationship between awareness, attitude, and practice from the traditional linear model that often assumes that increased awareness of any environmental issue leads to greater pro-environmental behavior. However, while BCA and CCA are correlated , the pathways to achieving awareness for each environmental issues appear distinct. This implies that any environmental education planning, policy action.

and communication strategies must be tailored differently for these interconnected but conceptually different issues.

The positive influences on biodiversity conservation can be utilized by educational programs to intensify the incorporation of local examples of biodiversity, hands-on experiences in nature, and integrating cultural values and indigenous knowledge related to environmental stewardship into the curriculum. Conversely, the lack of influence of these factors on CCA indicates a need for different pedagogical approaches given that climate change's abstract and global nature is cited as a key reason for the findings. Practical communication strategies should focus on making climate change more relatable and locally relevant. This could involve highlighting local impacts (e.g., changes in weather patterns affecting local ecosystems), connecting them to tangible experiences, and framing them within a culturally sensitive context in consideration on building on strong awareness about biodiversity conservation to enhance climate change awareness. Government may ensure that policies and regulation are geared towards the implementation of transparent, accessible, and contextually pertinent climate change information campaigns, while media outlets may work on conveying climate change in a manner that connects with local populations, fostering a sense of urgency and the potential for action.

Recognizing that sex moderates the relationship between awareness and attitude implies that environmental education and outreach efforts might need to be gender-sensitive. Exploring the reasons behind these differences could inform the development of more targeted and effective interventions for different groups.

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Limitations and Future Studies

Longitudinal approach can be done to track the development of environmental awareness, attitudes, and practices over time to understand the long-term impact of educational interventions and other influences and incorporate objective measures of pro-environmental behavior to complement self-reported practices and increase the reliability of findings.

7. References

[1] Ani, P. A. & Castillo, M. Revisiting the state of Philippine biodiversity and the legislation on access and benefit sharing. Food and Fertilizer Technology Center for the Asian and Pacific Region Agricultural Policy Platform. 2020. https://ap.fftc.org.tw/article/1836

[2] Frege, I. A. . World Risk Report 2023: Focus: Diversity. PreventionWeb, 2023 https://www.preventionweb.net/publication/world-risk-report-2023-focus-diversity

[3] Seronay, Romell & Lador, Richie & Demetillo, Meljan & Apdohan, Arnold.Occurrence of Threatened species in Lake Mainit Key Biodiversity Area: Basis for the Strict Protection Zone of the Proposed Protected Area. 34-40 ,2020.

[4] NEDA. Philippine Development Report 2024, 2024 https://depdev.gov.ph/wp. content/uploads/2025/01/PDR2024.pdf

[5] Muluneh, M. G. Impact of climate change on biodiversity and food security: a global perspective—a review article. Agriculture & Food Security, 10(1), 1-25.

[6] Adom Philip Kofi (2024) "The Socioeconomic Impact of Climate Change in Developing Countries in the Next Decades: A Review." CGD Working Paper 681. Washington, DC: Center for Global Development. https://www.cgdev. org/ publication/socioeconomic-impact-climate-change-developing-countries-next-decades-review

[7] Moore, B., Geese, L., Kenny, J., Dudley, H., Jordan, A., Prados Pascual, A., Lorenzoni,I., Schaub, S., Enguer, J., & Tosun, J. (2024). Politicians and climate change: A systematic review of the literature.WIREs Climate Change, 15(6), e908. https://doi.org/10.1002/wcc.

[8] Cianconi P, Betrò S and Janiri L (2020) The Impact of Climate Change on Mental Health: A Systematic Descriptive Review. Front. Psychiatry 11:74. doi: 10.3389/fpsyt.2020.00074

[9] IPCC. Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)].

[10] Bergquist, M., Nilsson, A., & Schultz, P. W. (2019). Experiencing a Severe Weather Event Increases Concern About Climate Change. Frontiers in psychology, 10, 220. https://doi.org/10.3389/fpsyg.2019.00220

[11] Schauss, M., & Sprenger, S. (2021). Students' conceptions of uncertainties in the context of climate change. International Research in Geographical and Environmental Education, 30(4), 332–347.https://doi.org/10.1080/10382046.2020.1852782

[12] Gehlbach, H., Mu, N., Arcot, R. R., Chuter, C., Cornwall, K. J., Nehring, L., Robinson, C. D., & Vriesema, C. C. (2022). Addressing the vexing educational challenges of biodiversity loss: A photo-based intervention. Contemporary Educational Psychology, 71, 102096. https://doi.org/10.1016/j.cedpsych.2022.10209

[13] Suraci, J. P., Farwell, L. S., Littlefield, C. E., Freeman, P. T., Zachmann, L. J., Landau, V. A., Anderson, J. J., & Dickson, B. G. (2023). Achieving conservation targets by jointly addressing climate change and biodiversity loss. Ecosphere, 14(4). https://doi.org/10.1002/ecs2.4490

[14] Ado, A. M., Leshan, J., Savadogo, P., Bo, L., & Shah, A. A. (2018). Farmers' awareness and perception of climate change impacts: case study of Aguie district in Niger. Environment Development and Sustainability, 21(6), 2963–2977. https://doi.org/10.1007/s10668-018-0173-4

[15] Ibrahim MSN, Assim MISA, Johari S, Mohammad SKW, Afandi SHM, Hassan S. .(2023) Public awareness on biodiversity conservation and well-being: case of Gunung Mulu National Park, Sarawak. GeoJournal;88(3):3471-3496. doi: 10.1007/s10708-022-10818-x. Epub 2022 Dec 28. PMID: 36591568; PMCID: PMC9795449.

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[16] Jurkus, E., Povilanskas, R., & Taminskas, J. (2022). Current Trends and Issues in Research on Biodiversity Conservation and Tourism Sustainability. Sustainability, 14(6), 3342. https://doi.org/10.3390/su14063342

[17] Kuthe, A., Keller, L., Körfgen, A., Stötter, H., Oberrauch, A., & Höferl, K. (2019). How many young generations are there? – A typology of teenagers' climate change awareness in Germany and Austria. The Journal of Environmental Education, 50(3), 172–182. https://doi.org/10.1080/00958964.2019.1598927

[18] Baltodano-Nontol, L.; Alvarado-Silva, C.; FernándezMantilla, M.; Gálvez-Carrillo, R.; Acevedo-Duque, Á. Measuring Urban Environmental Awareness: Instrument Validation and Analysis in Urban Contexts. Sustainability 2024, 16, 11153. https://doi.org/10.3390/ su162411153

[19] Agustin, M. (2022). Development and Validation of a Test to Measure Student's Climate Change Awareness (CCA) Toward Sustainable DevelopmentGoals. Psychology and Education: A Multidisciplinary Journal, 5(8), 1-9. https://doi.org/10.5281/zenodo.7337032

[20] Baykara Mat, S. T., & Yilmaz, B. N. (2024). Is awareness of climate change a predictor of eco-anxiety? Research within the scope of nursing students. Nurse education today, 140, 106274. https://doi.org/10.1016/j.nedt.2024.106274

[21] Ibrahim MSN, Assim MISA, Johari S, Mohammad SKW, Afandi SHM, Hassan S. .(2023) Public awareness on biodiversity conservation and well-being: case of Gunung Mulu National Park, Sarawak. GeoJournal;88(3):3471-3496. doi: 10.1007/s10708-022-10818-x. Epub 2022 Dec 28. PMID: 36591568; PMCID: PMC9795449.

[22] Aruta, J. J. B. R., & Guinto, R. R. (2022). Climate anxiety in the Philippines: Current situation, potential pathways, and ways forward. The Journal of Climate Change and Health, 6, 100138. https://doi.org/10.1016/j.joclim.2022.100138

[23] CCE in the Philippines | Department of Education. (n.d.). https://www.deped.gov.ph/climate-change-education/cce-in-the-philippines/

[24] Zeeshan, M., Sha, L., Tomlinson, K. W., & Azeez, P. A. (2021). Factors shaping students' perception of climate change in the western Himalayas, Jammu & Kashmir, India. Current Research in Environmental Sustainability, 3, 100035

[25] Van De Wetering, J., Leijten, P., Spitzer, J., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. Journal of Environmental Psychology, 81, 101782. https://doi.org/10.1016/j.jenvp.2022.101782

[26] Akintunde, E. A. (2017). Theories and concepts for human behavior in environmental preservation. Journal of Environmental Science and Public Health, 1(2), 120-133.

[27] Ajzen, I. (1991). The Theory of planned behavior. Organizational Behavior and Human Decision Processes.

[28] Stern, P.C. Toward a Coherent Theory of Environmentally Significant Behavior. J. Soc. Issues 2000, 56, 407–424.

[29] Kumar, P., and Ghodeswar, B. M. (2015). Factors affecting consumers' green product purchase decisions. Mark. Intell. Plan. 33, 330–347. doi: 10.1108/ MIP-03-2014-0068

[30] Verma, V. K., and Chandra, B. (2018). An application of theory of planned behavior to predict Young Indian consumers' green hotel visit intention. J. Clean. Prod. 172, 1152–1162. doi: 10.1016/j.jclepro.2017.10.047

[31] García-Salirrosas, E. E., Niño-de-Guzmán, J. C., Gómez-Bayona, L., and Escobar-Farfán, M. (2023). Environmentally responsible purchase intention in Pacific Alliance countries: geographic and gender evidence in the context of the COVID-19 pandemic. Behav. Sci. 13:221. doi: 10.3390/bs1303022

[32] Savari, M., and Khaleghi, B. (2023). Application of the extended theory of planned behavior in predicting the behavioral intentions of Iranian local communities toward Forest conservation. Front. Psychol. 14:1121396. doi: 10.3389/fpsyg.2023.1121396

[33] Gómez-Bayona, L., Valencia-Arias, A., García-Salirrosas, E. E., Espinoza-Requejo, C. C., and Moreno-López, G. (2023). Perception of green product consumption in the context of the COVID-19 pandemic in an emergingeconomy. Sustainability 15:9090. doi: 10.3390/su15119090

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[34] Arundati, R., Sutiono, H. T., and Suryono, I. A. (2020). Effect of ecological awareness, personal norms and ecological attitude to conservation behavior. Proc. Eng. Sci. 2, 187–196. doi: 10.24874/PES02.02.009

[35] Karimi, S., Liobikienė, G., & Alitavakoli, F. (2022). The effect of religiosity on pro- environmental behavior based on the theory of planned Behavior: A Cross- Sectional Study among Iranian rural female facilitators. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.745019

[36] Karimi, S., & Saghaleini, A. (2021). Factors influencing ranchers' intentions to conserve rangelands through an extended theory of planned behavior. Global Ecology and Conservation, 26, e01513. https://doi.org/10.1016/j.gecco.2021.e01513

[37] Perugini, M., & Bagozzi, R. P. (2001). The role of desires and anticipated emotions in goal-directed behaviours Broadening and deepening the theory of planned behaviour. British Journal of Social Psychology, 40(1), 79–98. https://doi.org/10.1348/014466601164704

[38] Liu J & Green RJ (2024) Children's pro-environmental behaviour: A systematic review of the literature. Resources, Conservation and Recycling,Volume 205,2024,107524,ISSN 0921-3449,https://doi.org/10.1016/j.resconrec.2024.107524.

[39] UNESCO. (2021). Learn for our planet: A global review of how environmental issues are integrated in education. UNESCO Publishing.

[40] Kioupi, V., & Voulvoulis, N. (2019). Education for Sustainable Development: systemic framework for connecting the SDGs to educational outcomes. Sustainability, 11(21), 6104

[41] Wulandari, S., Suwondo, N., & Haryanto, R. (2019). Implementation of environmental education based local potential to increase environmental knowledge student. Journal of Physics Conference Series, 1351(1), 012054. https://doi.org/10.1088/1742-6596/1351/1/012054

[42] Chandran, R., & Gunawardena, C. (2017). The National Environmental Education Action Plan,2018-2040.

[43] Department of Education (2019). K-12 Curriculum Guide . Retrieved fromdeped.gov.ph/wp-content/uploads/2019/01/K-12 Curriculum Guide.

[44] Lee, T., Markowitz, E., Howe, P. et al. (2015) Predictors of public climate change awareness and risk perception around the world. Nature Clim Change 5, 1014–1020 . https://doi.org/10.1038/nclimate2728

[45] Børresen, S. T., Ulimboka, R., Nyahongo, J., Ranke, P. S., Skjaervø, G. R., & Røskaft, E. (2023). The role of education in biodiversity conservation: Can knowledge and understanding alter locals' views and attitudes towards ecosystem services?. Environmental Education Research, 29(1), 148-163.

[46] Eze, E. (2020). Sociographic analysis of climate change awareness and proenvironmental behaviour of secondary school teachers and students in Nsukka Local Government Area of Enugu State, Nigeria. International Research in Geographical and Environmental Education, 29(1), 89–105. https://doi.org/10.1080/10382046.2 019.1657683

[47] Eilam, Efrat (2022) Climate change education: the problem with walking away from disciplines. Studies in Science Education. pp. 1-34. ISSN 0305-726

[48] Oliver, M. C., & Adkins, M. J. (2020). "Hot-headed" students? Scientific literacy, perceptions and awareness of climate change in 15-year olds across 54 countries. Energy Research and Social Science, 70. https://doi.org/10.1016/j.erss.2020. 101641

[49] Libelo, H., & Tracy, S. (2022). Establishing a relationship between demographic factors and students' environmental awareness. Journal of Student Research, 11(1). https://doi.org/10.47611/jsrhs.v11i1.2282

[50] Cutter-Mackenzie, A., & Rousell, D. (2018). Education for what? Shaping the field of climate change education with children and young people as co-researchers. Children's Geographies, 17(1), 90–104. https://doi.org/10.1080/14733285.2018.1467556

[51] 51 Hoekstra, A. G., Noordzij, K., De Koster, W., & Van Der Waal, J. (2024). The educational divide in climate change attitudes: Understanding the role of scientific knowledge and subjective social status. Global Environmental Change, 86, 102851. https://doi.org/10.1016/j.gloenvcha.2024.102851

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[52] Tolppanen, S., & Aksela, M. (2018). Identifying and addressing students' questions on climate change. The Journal of Environmental Education, 49(5), 375–389. https://doi.org/10.1080/00958964.2017.1417816

[53] Nakayama, M., Drinkall, S., and Sasaki, D. (2019) Climate Change, Migration, and Vulnerability: Overview of the Special Issue.J. Disaster Res. Vol.14. No.9, pp 1246-1253

[54] Hoffman, A. J. (2011). The culture and discourse of climate skepticism. Strategic Organization, 9(1), 77–84. https://doi.org/10.1177/1476127010395065

[55] Adger, W., Barnett, J., Brown, K. et al. Cultural dimensions of climate change impacts and adaptation. Nature Clim Change 3, 112–117 (2013). https://doi.org/10.1038/nclimate1666

[56] Nche George. (2023). The Influence of Religious Affiliation and Church Attendance on Climate Change Awareness, Perception, and Action: The Role of Churches through Environmental Education in Nigeria. Didaktika: Jurnal Kependidikan, 12(4), 1087-1102. https://doi.org/10.58230/27454312.453

[57] Eom, K., Tok, T. Q. H., Saad, C. S., & Kim, H. S. (2021). Religion, environmental guilt, and pro-environmental support: The opposing pathways of stewardship belief and belief in a controlling god. Journal of Environmental Psychology, 78, 101717. https://doi.org/10.1016/j.jenvp.2021.101717

[58] Ives, C., Kidwell, J., Anderson, C., Arias-Arévalo, P., Gould, R., Kenter, J., & Murali, R. (2024). The role of religion in shaping the values of nature. Ecology and Society, 29(2). https://doi.org/10.5751/es-15004-290210

[59] Major-Smith D, Halstead I, Golding J, Major-Smith K (2025) Associations between religiosity and climate change beliefs and behaviours in the Avon Longitudinal Study of Parents and Children (ALSPAC). PLOS Clim 4(4): e0000469. https://doi.org/10.1371/ journal.pclm.0000469

[60] Schuman, S., Dokken, J-V., Van Niekerk, D. & Loubser, R.A., (2018) 'Religious beliefs and climate change adaptation: A study of three rural South African communities', Jàmbá: Journal of Disaster Risk Studies 10(1), a509. https:// doi.org/10.4102/jamba. v10i1.

[61] Morrison, M., Duncan, R., & Parton, K. (2015). Religion does matter for climate change attitudes and behavior. PLoS ONE, 10(8), e0134868. https://doi.org/10.1371/journal.pone.0134868

[62] Arli, D., van Esch, P. & Cui, Y. Who Cares More About the Environment, Those with an Intrinsic, an Extrinsic, a Quest, or an Atheistic Religious Orientation?: Investigating the Effect of Religious Ad Appeals on Attitudes Toward the Environment. J Bus Ethics 185, 427–448 (2023). https://doi.org/10.1007/s10551-022-05164-4

[63] Neaman, A., Díaz-Siefer, P., Burnham, E., Castro, M., Zabel, S., Dovletyarova, E. A., Navarro-Villarroel, C., & Otto, S. (2021b). Catholic religious identity, prosocial and pro-environmental behaviors, and connectedness to nature in Chile. GAIA - Ecological Perspectives for Science and Society, 30(1), 44–50. https://doi.org/10.14512/gaia.30.1.9

[64] Wu, J., Qu, J., Li, H., Xu, L., Zhang, H., Aryal, S., … & Liu, X. (2018). What affects chinese residents' perceptions of climate change?. Sustainability, 10(12), 4712. https://doi.org/10.3390/su10124712

[65] Kulin, J., & Johansson Sevä, I. (2019). The Role of Government in Protecting the Environment: Quality of Government and the Translation of Normative Views about Government Responsibility into Spending Preferences. International Journal of Sociology, 49(2), 110–129. https://doi.org/10.1080/00207659.2019.1582964

[66] Chou, M. (2020). Australian local governments and climate emergency declarations: reviewing local government practice. Australian Journal of Public Administration, 80(3), 613-623. =https://doi.org/10.1111/1467-8500.12451

[67] Handoyo S. (2024). Public governance and national environmental performance nexus: Evidence from cross-country studies. Heliyon, 10(23), e40637. https://doi.org/10.1016/j.heliyon.2024.e40637

[68] Achmad, G. N., Yudaruddin, R., Nugroho, B. A., Fitrian, Z., Suharsono, S., Adi, A. S., Hafsari, P., & Fitriansyah, F. (2023). Government support, eco-regulation and eco-innovation adoption in SMEs: The mediating role of eco-environmental. Journal of Open Innovation Technology Market and Complexity, 9(4), 100158. https://doi.org/10.1016/j.joitmc.2023.100158

[69] Naruetharadhol, P., ConwayLenihan, A., & McGuirk, H. (2024). Assessing the role of public policy in fostering global Eco-Innovation. Journal of Open Innovation Technology Market and Complexity, 10(2), 100294. https://doi.org/10.1016/j.joitmc.2024.100294

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[70] Punzalan, C. H. (2020). Evaluating the Environmental Awareness and Practices of Senior High School Students: Basis for Environmental Education Program. Aquademia, 4(1), ep20012. https://doi.org/10.29333/aquademia/8219

[71] Ibanez, L., & Roussel, S. (2021). The effects of induced emotions on environmental preferences and behavior: An experimental study. PLoS ONE, 16(9), e0258045.https://doi.org/10.1371/journal.pone.0258045

[72] Barreda, A. B. (2022). Assessment on the level of implementation of environmental laws in the Philippines. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.6816697

[73] Wang, C., Yang, X., & Chen, D. (2023). Exploring the changes and influencing factors of chinese public environmental awareness: a diachronic analysis based on css2006, 2013, and 2019. Polish Journal of Environmental Studies, 32(6), 5365- 5372. https://doi.org/10.15244/pjoes/169390

[74] Gu, Z., Malik, H. A., Chupradit, S., Albasher, G., Borisov, V., and Murtaza, N. (2022). Green supply chain management with sustainable economic growth by CS-ARDL technique: perspective to blockchain technology. Front. Public Heal. 9, 818614. doi: 10.3389/fpubh.2021.818614

[75] Lang, C., and Ryder, J. D. (2016). The effect of tropical cyclones on climate change engagement. Clim. Change 135, 625–638. doi: 10.1007/s10584-015-1590-0

[76] Ahn, C. S. (2020). Considering the role of documentary media in environmental education. Journal of the Canadian Association for Curriculum Studies, 17(2), 67-79. https://doi.org/10.25071/1916-4467.40435

[77] Wray Ans, Yoshika S. Crider . (2023) Eco-anxiety and the influence of climate change on future planning is greater for young US residents with direct exposure to climate impacts,

[78] Bollettino, V., Alcayna-Stevens, T., Sharma, M., Dy, P., Pham, P., & Vinck, P. (2020). Public perception of climate change and disaster preparedness: Evidence from the Philippines. Climate Risk Management, 30, 100250. https://doi.org/10.1016/j.crm.2020.100250

[79] Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. J. Risk Res. 11, 351–374. doi: 10.1080/13669870701552235

[80] Hornsey, M. J., Harris, E. A., Bain, P. G., and Fielding, K. S. (2016). Meta-analysis of the determinants and outcomes of belief in climate change. Nat. Clim. Change 6, 622626. doi: 10.1038/nclimate294

[81] Sicso, M. R., Bosetti, V., and Weber, E. U. (2017). When do extreme weather events generate attention to climate change? Clim. Change 143, 227–241. doi: 10.1007/s10584-017-1984-2

[82] Bergman JN, Buxton RT, Lin H-Y,Lenda M, Attinello K, Hajdasz AC, Rivest SA,Tran Nguyen T, Cooke SJ, and Bennett JR. (2022). Evaluating the benefits and risks of social media for wildlife conservation.FACETS 7: 360–397. doi:10.1139/facets2021-0112

[83] Parry, D.A., Davidson, B.I., Sewall, C.J.R. et al. (2021) A systematic review and meta-analysis of discrepancies between logged and self-reported digital media use. Nat Hum Behav 5, 1535–1547 (2021). https://doi.org/10.1038/s41562-021-01117-5

[84] Ausat, Abu. (2023). The Role of Social Media in Shaping Public Opinion and Its Influence on Economic Decisions. Technology and Society Perspectives (TACIT). 1. 35-44. 10.61100/tacit.v1i1.37.

[85] Calvo E. D. &Apilado M.S. (2014)Awareness, knowledge & attitude on climate change of students: Input for the development of ICM on climate change .Retrieved http://www.journalcra.com/article/awareness-knowledge-attitude-climate-change-students-input-development-icm-climat

[86] Xiao D and Su J (2022) Role of Technological Innovation in Achieving Social and Environmental Sustainability: Mediating Roles of Organizational Innovation and Digital Entrepreneurship. Front. Public Health 10:850172. doi: 10.3389/fpubh.2022.8501

[87] Weina A and Yan ling Y (2022) Role of Knowledge Management on the Sustainable Environment: Assessing the Moderating Effect of Innovative Culture. Front. Psychol. 13:861813. doi: 10.3389/fpsyg.2022.861813

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[88] Núñez-Sánchez, S., & Valente, M. J. (2023). Sustainable Development Goals and Climate Change in Spanish Technology Disciplines' Curricula: From LOMCE to LOMLOE. Sustainability, 15(13), 10301. https://doi.org/10.3390/su151310301

[89] Hao, Y., Yasin, M.A.I. and Boon Sim, N. (2023), "A study on the influence of media use on college students' environmental protection behaviors", Management of Environmental Quality, Vol. 34 No. 1, pp. 177-191. https://doi.org/10.1108/MEQ-05-2022-014

[90] Ojala, M., & Bengtsson, H. (2018). Young people's coping strategies concerning climate change: relations to perceived communication with parents and friends and proenvironmental behavior. Environment and Behavior, 51(8), 907–935. https://doi.org/10.1177/0013916518763894

[91] Chozas, S., Nunes, A., Serrano, H.C. et al. Rescuing Botany: using citizen-science and mobile apps in the classroom and beyond. npj biodivers 2, 6 (2023). https://doi.org/10.1038/s44185-023-00011-9

[92] Rushton, E., Dunlop, L., Atkinson, L., Stubbs, J., Diepen, M. T., & Wood, L. (2023). Researching education for environmental sustainability through intergenerational dialogue. International Research in Geographical and Environmental Education, 33(2), 157–172. https://doi.org/10.1080/10382046.2023.2270399

[93] Gunasiri, H., Wang, Y., Watkins, E., Capetola, T., Henderson-Wilson, C., & Patrick, R. (2022). Hope, Coping and Eco-Anxiety: Young People's Mental Health in a Climate-Impacted Australia. International Journal of Environmental Research and Public Health, 19(9), 5528. https://doi.org/10.3390/ijerph19095528

[94] Jones, C. A., & Lucas, C. (2023). 'Listen to me!': Young people's experiences of talking about emotional impacts of climate change. Global Environmental Change, 83, 102744. https://doi.org/10.1016/j.gloenvcha.2023.102744

[95] Vogelaar, A., & Priante, A. (2021). The role of social media normative interventions and environmental awareness in intentions to change Pro-Environmental behaviors. Proceedings of the . .Annual Hawaii International Conference on System Sciences/Proceedings of the Annual Hawaii International Conference on System Sciences. https://doi.org/10.24251/hicss.2021.333

[96] Xie, S., & Madni, G. R. (2023). Impact of Social Media on Young Generation's Green Consumption Behavior through Subjective Norms and Perceived Green Value. Sustainability 2023, 15, 3739.

[97] Tavares, A. O., Areia, N. P., Mellett, S., James, J., Intrigliolo, D. S., Couldrick, L. B., & B erthoumieu, J. -F. (2020). The European Media Portrayal of Climate Change: Implications for the Social Mobilization towards Climate Action. Sustainability, 12(20), 8300. https://doi.org/10.3390/su12208300

[98] Xu, X., Wang, S., and Yugang, Y. (2020). Consumer's intention to purchase green furniture: do health consciousness and environmental awareness matter? Sci. Total Environ. 704:135275. doi: 10.1016/j.scitotenv.2019.135275

[99] Valenzuela-Fernández, L., Guerra-Velásquez, M., Escobar-Farfán, M., and García-Salirrosas, E. E. (2022). Influence of COVID-19 on environmental awareness, sustainable consumption, and social responsibility in Latin American countries. Sustainability 14:12754. doi: 10.3390/su141912754

[100] Kousar, S., Afzal, M., Ahmed, F., & Bojnec, Š. (2022). Environmental awareness and air quality: the mediating role of environmental protective behaviors. Sustainability, 14(6), 3138. https://doi.org/10.3390/su14063138

[101] Stojanova, S., Zečević, M., & Culiberg, B. (2021). From Words to Deeds: How Do Knowledge, Effectiveness, and Personal Relevance Link Environmental Concern and Buying Behavior? Journal of Nonprofit & Public Sector Marketing, 35(4), 329–353. https://doi.org/10.1080/10495142.2021.1953671

[102] Mongula, Angelline & Masnita, Yolanda & Kurniawati, Kurniawati. (2023). Environmental Concern: Does It Drive Green Purchase Intention Of Sustainable Packaging?. Jurnal Ekonomi Bisnis dan Kewirausahaan. 12. 290. 10.26418/jebik.v12i3.67498

[103] Lopez, Joshua Jener & Malay, Christopher.(2019). Awareness and Attitude Towards Climate Change of Selected Senior High Students in Cavite, Philippines. Asia Pacific Journal of Multidisciplinary Research, Vol. 7, No. 2, Part III May 2019

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[104] Narura, A. K., Ssenku, J. E., Kudamba, A., Okurut, S. A., Namuli, A., Nansikombi, N., Nakizito, J., Kafeero, H. M., & Walusansa, A. (2024). The Environmental Conservation Strategies Used in Secondary Schools Align with Guidelines of United Nations Environmental Program: Evidence from a Cross-Sectional Study in a City Setting. Asian Journal of Environment & Ecology, 23(7), 200–230. https://doi.org/10.9734/ajee/2024/v23i7575

[105] Cabras, Jojo L., and Gina Fe G. Israel. 2024. "The Relationship Between Climate Change Attitude and Biodiversity Conservation Practices: The Mediating Role of Environmental Sustainability Awareness". International Journal of Environment and Climate Change 14 (8):173-81. https://doi.org/10.9734/ijecc/2024/v14i84339

[106] Whitburn, J., Linklater, W. and Abrahamse, W. (2020), Meta-analysis of human connection to nature and proenvironmental behavior. Conservation Biology, 34: 180-193. https://doi.org/10.1111/cobi.13381

[107] Magulod G. (2018). Climate change awareness and environmental attitude of College students in one campus of a State University in the Philippines. Journal of Biodiversity and Environmental Sciences. 12. 211-220.

[108] Clayton, S. D., Pihkala, P., Wray, B., & Marks, E. (2023). Psychological and Emotional Responses to Climate Change among Young People Worldwide: Differences Associated with Gender, Age, and Country. Sustainability, 15(4), 3540. https://doi.org/10.3390/su15043540

[109] Ross, F., Middleton, C., & Remes, O. (2024). How Gender Influences the Motivation and Action Towards Climate Change: A Qualitative Study of Participants from a UK Construction Company in the UK. Challenges, 16(1), 3. https://doi.org/10.3390/challe16010003

[110] Price, E., Maguire, S., Firth, C., Lumber, R., Richardson, M., & Young, R. (2022). Factors associated with nature connectedness in school-aged children. Current Research in Ecological and Social Psychology, 3, 100037. https://doi.org/10.1016/j.cresp.2022.100037

[111] Dhenge, S. A., Ghadge, S. N., Ahire, M. C., Gorantiwar, S. D., & Shinde, M. G. (2022). Gender attitude towards environmental protection: a comparative survey during COVID-19 lockdown situation. Environment Development and Sustainability, 24(12), 13841–13886. https://doi.org/10.1007/s10668-021-02015-6

[112] Khan K. A, Chattopadhyay A, Ali I. (2022) Gender Differences in Perception and Awareness of Climate Change in the Suru Valley of Western Himalayas, India. Curr World Environ;17(1). DOI:http://dx.doi.org/10.12944/CWE.17.1.

[113] Praimee, U., Wongchantra, P., Junkaew, L., Ongon, S., Sookngam, K., Wongchantra, K., Phothibat, P., Bunnaen, W., & Sommala, L. (2023). Factors affecting awareness of environmental conservation of undergraduate students. World Journal of Education, 13(5), 23. https://doi.org/10.5430/wje.v13n5p23

[114] Samuel, O. O., Micheal, A., & Nkonki-Mandleni, B. (2018). Determinants of Climate Change Awareness among Rural Farming Households in South Africa. J ournal of Economics and Behavioral Studies, 10(5(J)), 116–124. https://doi.org/10.22610/jebs.v10i5(j).250

[115] Wabwire, E., Mukhovi, S., & Nyandega, I. (2020). The perception of rural households on climate change effect on rural livelihoods in lake victoria basin. Ghana Journal of Geography, 12(2), 62-83. https://doi.org/10.4314/gjg.v12i2.3

[116] Caetano, G. H. d. O., Vardi, R., Jarić, I., Correia, R. A., & Veríssimo, D. (2023). Evaluating global interest in biodiversity and conservation. Conservation Biology, 37(5). https://doi.org/10.1111/cobi.14100

[117] Pörtner, H., Scholes, R.J., Arneth, A., Barnes, D.K., Burrows, M.T., Diamond, S.E., .Duarte, C.M., Kiessling, W., Leadley, P., Managi, S., McElwee, P., Midgley, G., Ngo, H.T., Obura, D., Pascual, U., Sankaran, M., Shin, Y.J., and Val, A.L . (2023). Overcoming the coupled climate and biodiversity crises and their societal impacts. SCIENCE Vol. 380, Issue 6642 (21 Apr 2023). DOI: 10.1126/science.abl4881

[118] Field, A. (2005). Discovering statistics using SPSS (2nd ed.). Sage Publications, Inc.

[119] Gold, A. H. Malhotra, A & Segars, A.H. (2001). Knowledge management: An organizational capabilities perspective. Journal of management information systems , 18 (1), 185-214.

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[120] Garson, G. D. (2006). Structural equation modeling. G. David Garson and Statistical Associates Publishing.

[121] Sharma, S., Mukherjee, S., Kumar, A., & Dillon, W. R. (2005). A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models. Journal of Business Research, 58 (7), 935–943. https://doi.org/10.1016/j.jbusres.2003. 10.007

[122] Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2014). The performance of RMSEA in models with small degrees of freedom. Sociological Methods and Research, 44(3), 1–22. https://doi.org/10.1177/0049124114543236

[123] Hu, L. T., & Betler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1–55. http

[124] Barrett, P. (2007), "Structural Equation Modelling: Adjudging Model Fit," Personality and Individual Differences, 42 (5),

[125] Chin, W. W. (1998). The partial least squares approach to structural equation modeling. Advances in Hospitality and Leisure, 8(2), 295–336.

[126] Shafiei, A., & Maleksaeidi, H. (2020). Pro-Environmental Behavior of University Students: Application of Protection Motivation Theory. Global Ecology and Conservation, 22, e00908. https://doi.org/10.1016/j.gecco.2020.e00908

[127] Kountouris, Y., & Williams, E. (2023). Do protests influence environmental attitudes? Evidence from Extinction Rebellion. Environmental Research Communications, 5(1). https://doi.org/10.1088/2515-7620/ac9aeb

[128] Pongpunpurt, P., Navamajiti, N., Sriroongvikrai, K., Onnom, M., Pinitjitsamut, P., Painmanakul, P., Chawaloesphonsiya, N., & Poyai, T. (2021). Analyzing Productivity and Behavior of Plastic Drop-Off Points: A Case Study of Send Plastic Home Project in Plastic Waste Recycling during COVID-19 Outbreak. Engineering Journal, 25(10). https://doi.org/10.4186/ej.2021.25.10.1

[129] Peisker, J. (2023). Context matters: The drivers of environmental concern in European regions. Global Environmental Change, 79. https://doi.org/10.1016/j.gloenvcha.2023.102636

[130] Cabras, Jojo L., and Gina Fe G. Israel. 2024. “The Relationship Between Climate Change Attitude and Biodiversity Conservation Practices: The Mediating Role of Environmental Sustainability Awareness”. International Journal of Environment and Climate Change 14 (8):173-81. https://doi.org/10.9734/ijecc/2024/v14i84339.

[131] Qudrat-Ullah, H. (2025). Enhancing biodiversity education and outreach for conservation awareness and environmental stewardship. Advances in Environmental and Engineering Research, 06(02), 1-7. https://doi.org/10.21926/aeer.2502016

[132] Narura, A. K., Ssenku, J. E., Kudamba, A., Okurut, S. A., Namuli, A., Nansikombi, N., Nakizito, J., Kafeero, H. M., & Walusansa, A. (2024). The Environmental Conservation Strategies Used in Secondary Schools Align with Guidelines of United Nations Environmental Program: Evidence from a Cross-Sectional Study in a City Setting. Asian Journal of Environment & Ecology, 23(7), 200–230. https://doi.org/10.9734/ajee/2024/v23i7575

[133] Feldbacher, E., Waberer, M., Campostrini, L., & Weigelhofer, G. (2023). Identifying gaps in climate change education - a case study in Austrian schools. International Research in Geographical and Environmental Education, 33(2), 109–12https://doi.org/10.1080/10382046.2023.2214042

[134] IPCC. (2021). Climate change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel onClimate Change In V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (Eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896.

[135] Gifford, R. (2013). Dragons, mules, and honeybees: Barriers, carriers, and unwitting enablers of climate change action. Bulletin of the Atomic Scientists, 69(4), 41–48. https://doi.org/10.1177/009634021349325

ISSN: 3007-9659 DOI: https://doi.org/10.70114/ahmer.2025.3.1.P87
[136] Estrada-Araoz, Edwin Gustavo, Néstor Antonio Gallegos Ramos, Yolanda Paredes Valverde, Rosel Quispe Herrera, and Jaime Mori Bazán. 2023. Examining the Relationship between Environmental Education and Pro-Environmental Behavior in Regular Basic Education Students: A Cross-Sectional Study. SocialSciences12: 307. https:// doi.org/10.3390/socsci12050307

[137] Treen, K. M. D., Williams, H. T. P., & O'Neill, S. J. (2020). Online misinformation about climate change. Wiley Interdisciplinary Reviews Climate Change, 11(5). https://doi.org/10.1002/wcc.66

[138] Espinosa, et al. (2024). Do educational initiatives impact climate change mitigation and adaptation? Policy Brief Series 8 (2), pp. 1-5. Philippine Normal University Educational Policy Research and Development Office.

[139] Searle, K., & Gow, K. (2010). Do concerns about climate change lead to distress? International Journal of Climate Change Strategies and Management, 2(4), 362–379. https://doi.org/10.1108/17568691011089891

[140] Ardoin, N. ,Bowers Alison & Gaillard,Estelle (2020) Environmental education outcomes for conservation: A systematic review. Biological Conservation,Volume 241,2020,108224,ISSN 0006-3207,https://doi.org/10.1016/j.biocon.2019.108224.

[141] Anwari, I., Yamada, S., Unno, M., Saito, T., Suwarma, I. R., Mutakinati, L., & Kumano, Y. (2015). Implementation of Authentic Learning and Assessment through STEM Education Approach to Improve Students' Metacognitive Skills. K-12 STEM Education, 1(3), 123–136. https://doi.org/10.14456/k12stemed.2015.24