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Exploring the Moderating Role of Environmental Education in Promoting a Clean Environment

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Abstract: Environmental education plays a significant role in improving environmental knowledge and shaping the eco-friendly lifestyles of young people. Young people's daily actions and habits will determine the future of the Earth as a planet. The literature regarding youths' environmental knowledge, climate change awareness, environmental attitude, and their impact on pro-environmental intentions and sustainable household consumption practices is very scarce. Therefore, this study explored the relationship between environmental knowledge, climate change awareness, environmental attitude, and the pro-environmental intentions of university students. The study also assessed the moderating effect of environmental education on pro-environmental behavior and sustainable household consumption practices, providing a comparative analysis of students with and without environmental education, which is unique in the literature. The data were collected from 2137 Chinese university students selected through a purposive and random sampling method through survey questionnaires. Descriptive statistics and partial least squares structural equation modeling (PLS-SEM) were used to analyze the collected data. The findings revealed that environmental knowledge, climate change awareness, and environmental attitudes of the students positively affected their pro-environmental intentions. Moreover, pro-environmental intentions also positively affected the adoption of sustainable practices. The result also showed that the impact of pro-environmental intentions on sustainable consumption practices was greater for those whose education included environmental courses than for those whose education did not. Therefore, it is suggested that environment-related courses be incorporated into the study plans of each discipline as a compulsory subject for promoting green intentions and shaping eco-friendly lifestyles for environmental sustainability.

Keywords: environmental education; eco-friendly lifestyles; pro-environment behavior; climate change awareness; environmental knowledge; PLS-SEM

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1. Introduction

Human civilization's impact on the earth system, which is seen as a complex and sensitive organism in an unstable balance, is a major worry among politicians and scientists in the modern day. Many people are aware of and concerned about global warming, but fewer realize that human activity is now considerably more powerful, and its impacts may be far more harmful than we currently anticipate [1]. Thus, academics and policymakers believe that encouraging pro-environmental behavior will aid in resolving these issues because many environmental problems are the result of human activity [2]. Households have progressively evolved into a geological force that is profoundly affecting the planet in ways that are greater than those caused by natural forces. These changes have significant ramifications for the earth's trajectory as well as for the Earth's systems and social decision-making. This perspective holds that humanity's most important task is to design a stabilized

earth route that directs the earth system away from its present course of climate catastrophe. Without human stewardship to develop and sustain it, this solution is unlikely to exist in the stability landscape of the earth system [3]. Unsustainable consumption of goods and services is a major contributor to climate change, environmental degradation, and economic instability, which are all considered to be the grand challenges of the 21st century [4].

A sustainable house is a success, the outcome of a certain social and cultural context that offers sufficient opportunity to reduce emissions. Some households may not be able to think of ways to be more sustainable because of the social settings, rituals, and habits they have every day, even if they understand the science behind sustainability problems like climate change [5]. Alternately, "the environment" could be only one of the responsibilities being juggled, e.g., in addition to being a mother and other responsibilities. While households may be aware of environmental sustainability, how they act is another matter. Specific material, technological, and economic limitations and opportunities may also limit their willingness to take action, in addition to cultural and conventional norms regarding what constitutes acceptable consumption practices [6]. The adoption of sustainable practices in this context refers to a resourceful process of juggling, trading off, and modifying daily routines, purchasing habits.

The amount of goods and services that people purchase and consume has a significant effect on the use of resources and the environment worldwide [7]. Households use a lot of natural resources either directly (by doing laundry and cooking meals) or indirectly (because of the effects of preparing daily household necessities) [8]. Moreover, approximately 75% of the world's greenhouse gas releases come from homes, with an average carbon footprint of 6 tCO2eq per person [9,10]. Households in industrialized nations have higher average carbon footprints per person than the rest of the world. So, how and what people buy affects the amount of natural resources, the quality of the environment, and climate change [11]. Carbon emissions from homes could be cut by up to 15 billion tons by 2060 if people avoided flying or ate less meat [12]. This suggests that families have a considerable opportunity to increase conservation efforts in order to make better use of efficient scarce natural resources and reduce ecological footprints [13].

Consumers have great potential to contribute clean and green development by participating in long-term sustainable behaviors. Households use food, energy, and water as part of their daily habits. Traditional techniques rarely consider how different individuals use these facts in their daily routines. Individuals, for example, often do not take into account energy usage when performing their daily works such as preparing food, showering, heating and cooling their houses. Some studies stated that [14,15] argue that the family should be stressed as a structural unit when considering sustainability. This is done in order to highlight the situated meanings of consuming habits, which occur in households. Governments all around the globe are attempting to discover feasible solutions for lowering carbon emissions and pollution, with residential household use being one of the key sources.

Therefore, how people use things at home is an important part of global policy. The future of earth planet depends on how willing families are to change the way they use food, energy, and water over time [16]. Behavior change has often been left out of discussions about world environmental policy because of the focus on technical and economic incentives. So, we need to work on both supply-side and demand-side solutions. Demand-side remedies, such as reduced consumption, should get significantly greater attention. Furthermore, we must see lifestyles as policy goals (and modeling efforts) rather than volunteer participations made by individuals. In reality, if the world is to accomplish its targets of lowering CO_2 from 40 gigatonnes to 5 gigatonnes and achieving net zero emissions, CO_2 output must be drastically reduced. This effectively implies that emissions must fall by 50% every two to ten years until the midpoint of this century, reaching a particular threshold and being further decreased by introducing so-called negative greenhouse gas emission policies by 2100 [17]. Then, we must take a more balanced

approach to household consumption behaviors pertaining to inventorying emissions and mitigating methods.

The necessity to change people's behavior and consumption habits in order to contribute to the preservation of the environment is one of the major topics of debate on how society will make the transition to a clean environment and green economy. One of the most important ways to reach the UN's 12th Sustainable Development Goal is through responsible consumption and production of goods and services. This purpose is founded on the notion that current environmental problems are the result of lifestyles, desires, and goals that use a large amount of resources [18,19]. People should use food, energy, and water in ways that contribute to enhancing and promoting a cleaner environment since the increasing industrialization of human behavior has increased environmental concerns [20].

The students of today will have a significant impact on the future environment. This makes it very important to include sustainability problems in education and make sustainability problems a part of education [21–24]. Universities face a big challenge: combining different points of view and the idea of sustainability requires systemic and comprehensive thinking as well as fundamentally new ways of teaching [21,25]. The significance of understanding students' attitudes and behaviors toward the environment, as well as developing effective strategies to affect this behavior via education, is therefore undeniable. In China, scarce literature is explicitly available on students' environmental awareness and consumption behaviors. The current study was planned to fill this gap. Thus, the main objective of this study was to determine how students really behave in their daily routines and what factors affect their adoption of sustainable practices for promoting a greener and cleaner environment.

Understanding how students see climate change and how they respond to environmental sustainability is one of the main concerns for environmentalists [26,27]. According to Wachholz et al. [28], even though students' worries about the environment are acknowledged, they are nonetheless ignorant about the causes and effects of environmental deterioration. Despite the students' positive attitudes toward environmental sustainability, Whitley et al. [29] found that they may not be aware of the behavioral factors that have an impact on how those attitudes are shaped and lead to sustainable outcomes. This finding reflects the gap between the students' current knowledge, environmental attitude, pro-environmental intentions, and actual adoption sustainable household practices.

This is the first study to investigate university students' sustainable habits for consumption. It would help a lot to reach targets 12.7 and 12.8 of Sustainable Development Goal 12 (SDG 12), which are about sustainable consumption and production. Green intentions, knowledge of climate change, and environmental education are a few factors that have an impact on students' sustainable consumption patterns. This research looks at the degree of change in students' environmental behaviors for sustainable household consumption. This study gives vital information for policymakers to consider when observing students' environmental habits for sustainable home consumption. This research study adds considerably to the developing scientific literature by assisting us in understanding, predicting, and avoiding any detrimental implications on students' environmental inspirations and behaviors caused by a lack of information and environmental awareness. This research has crucial implications for higher education policymakers who want to raise awareness among university students about the harmful effects of climate change on sustainable development. Higher education institutions, climate change stakeholders, and non-governmental organizations (NGOs) are among the possible beneficiaries of this research. These organizations are largely responsible for developing climate policies and university curricula related to environmental education.

The rest of this article is structured as follows: Section 2 of the article discusses the literature review and hypothesis development. Section 3 of the article discusses the study's materials and methods. The study results are presented in Section 4. Section 5 presents a discussion about the study's findings. Section 6 contains the conclusions of the study.

2. Literature Review and Hypothesis Development

According to Nemcsicsné Zsóka [30], environmental knowledge, attitudes, intentions, and actual behaviors are the most crucial aspects of a person's environmental protection actions. These factors can include intentional and situational elements. Due to the possible impacts of various individual activities on ecological footprints, environmental education, climate change awareness, and attitudes rooted in a strong value system are crucial.

Environmental knowledge refers to awareness and understanding of environmental concerns as well as potential solutions to such problems. The conventional definition of environmental knowledge encompasses factual information about environmental systems, operations, and mechanisms [31]. People's awareness of environmental concerns may rise, but this does not always result in behavioral changes [32]. Although changes in attitudes and beliefs are essential motivators for engaging in any activity, they are inadequate to reliably impact behavior [33]. According to Bamberg [34], ecological knowledge and green attitudes are closely interrelated; they support each other, particularly in seeking information about environmental concerns. Asunta [35] revealed that the number of sources students utilize to gather information about the ecology grows with the educational level. Michalos et al. [36] examined pro-environmental in a sample of Canadian adults and students. Kagawa [37] stated that adults' attitudes towards environmentally friendly development were considerably more imperative predictor of actions than information about these problems.

Individuals do not often understand how harmful their consumption habits are and how even the most fundamental waste of commonplace items, e.g., fresh vegetables, may have serious negative effects on our ecology [38]. Environmental knowledge is one of the most powerful predictors of environmentally friendly actions [39]. If one is oblivious of the issues, it is unlikely that one would consciously care about them or behave in an environmentally friendly manner [40]. When one has erroneous or no information, it is difficult to make sensible environmental decisions [41]. Therefore, we hypothesize that:

Hypothesis (H1). *Environmental knowledge (EKN) positively affects the pro-environmental intentions (PEI).*

Hypothesis (H2). *Environmental knowledge (EKN) positively affects the environmental attitude (EAT).*

Awareness of climate change and the significance of this issue are crucial for sustainable lifestyles. Ecological concern has been revealed to have a major effect on behavioral intention, which in turn impacts sustainable consumption behavior. The secret to sustainable consumerism and eco-friendly behavior is awareness of climate change. The importance of ecological and climate change information as the main motivator of green consumer behavior was highlighted in many studies [5,42,43]. The adoption capacity of strategies depends on the level of climate change awareness [44]. Major organizations throughout the globe now include climate change as a top issue on their agendas to overcome environmental issues worldwide [45]. Thus, we hypothesize that:

Hypothesis (H3). *Climate change awareness (CCA) positively affects the pro-environmental intentions (PEI).*

Hypothesis (H4). *Climate change awareness (CCA) positively affects the environmental attitude (EAT).*

Attitude is a psychological tendency that demonstrates as a degree of preference or disfavor for a particular entity [46]. An individual's attitude can be defined as the way in which they are predisposed to respond to a certain stimulus [47]. Attitudes, according to Ajzen [47], have evaluative dimensions and can be measured along measurable dimensions. He also acknowledged that, although attitude is inaccessible to observation because it is latent, it is within a person's mind. However, it can be measured through the responses

of a person to a certain event or situation that could be favorable or unfavorable. One's attitude can be defined as their way of thinking towards a given situation or individual [48]. As a result, attitude is central to many theories aimed at understanding human behavior, including TRA and TPB. It is considered to be a crucial factor in behavior prediction. Previous research has shown that behavioral intention is directly impacted by attitude [49]. Individual attitudes may be a key factor in environmental conservation, according to both theoretical and empirical studies [50]. Thus, we proposed:

Hypothesis (H5). *Environmental attitude (EAT) positively affects the pro-environmental intentions (PEI).*

According to Boyes et al. [51], environmental education has the best chance of encouraging behavioral changes with activities, e.g., cutting back on meat consumption or investing more money in renewable energy, where students initially show little interest but show a significant increase in interest as the perceived value of the action rises. Environmental education undoubtedly has the potential to influence students' pro-environmental behavior in a variety of ways, including through the transmission of information and beliefs, as well as by setting an example and influencing the social climate of the school. Environmental education continues to be a key component in promoting environmental literacy [52]. Saripah et al. [53] and Varela Candamio et al. [54] suggested that the government should prioritize environmental education for individuals and increase the degree of public environmental awareness in order to increase the volume of environmentally friendly actions taken by the general population. According to Hungerford and Volk [55], environmental education differs from other general education in that awareness does not always lead to actions. We hypothesized, in this research, that:

Hypothesis (H6). *Environmental education (EE) moderates between the pro-environmental intentions (PEI) and adoption of sustainable household consumption practices (SHCP).*

Pro-environmental activities are those that create the least amount of environmental damage or are even beneficial to the ecosystem [56]. Moreover, the theory of reasoned action states that people's actions are dictated by their intentions to perform that behavior [57,58]. Therefore, we hypothesized that:

Hypothesis (H7). *Pro-environmental intentions (PEI) positively affect the adoption of sustainable consumption practices (SHCP).*

The research model in Figure 2 summarizes the aforementioned hypotheses.

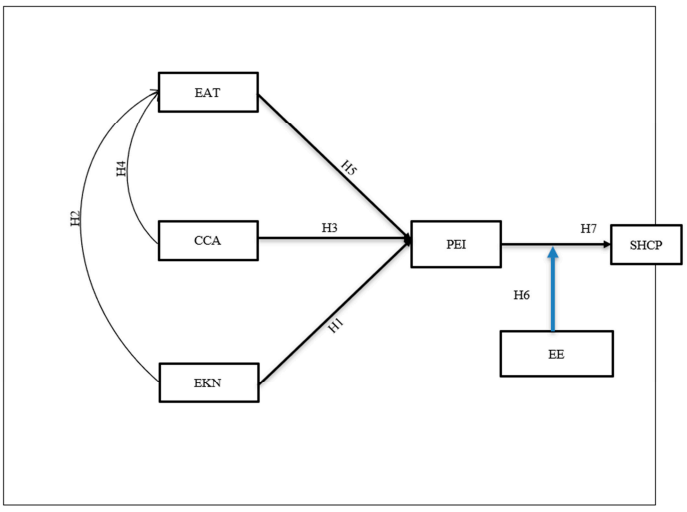

Figure 1. Conceptual framework and study hypotheses. EKN = Environmental knowledge, CCA = Climate

change awareness, EAT = Environmental attitude, PEI = Pro-environment intentions, EE = Environmental education and SHCP = Sustainable household consumption practices.

3. Materials and Methods

3.1. Data Collection and Measures

China has approximately 400 million young people aged 14–35 as of the seventh national census in 2020, constituting 28.4% of the country's population. China's educational system is still expanding, and the gross enrolment rate for higher education has been steadily increasing since 2016, reaching 54.4% in 2020. The plan's target of more than 50% was reached earlier than expected in 2019 for the gross enrolment rate of higher education [58]. If properly educated and used, this youth bulge will have a significant influence on the economic structure of the nation over the next several years and may function as a driving force in the achievement of the SDGs. According to the most recent information from the Ministry of Education, China will have around 3000 higher education institutions by 2022. The nation has 2759 general institutions of higher education, comprising 1270 universities and 1489 higher vocational colleges and academies, in addition to more than 200 adult colleges. Beijing, Wuhan, Guangzhou, Chongqing, and Zhengzhou are the top five cities with the most higher education institutions in China [59,60]. They were purposefully chosen for this research to gather data from registered university students. A quantitative research approach was used to gather data from a total of 20 of the province's 395 institutions, which were chosen at random to participate in the data collection. Key ideas from earlier literature were used to guide the construction of constructs, and their opinions were supplemented by those of subject-matter specialists.

Before beginning the actual field survey, a two-step approach was used to assess the suitability and rationality of the constructs. First, to ensure that the suggested constructs are supported by relevant data and technical words, the constructs were reviewed by four field specialists in the fields of sustainability behavior, SDGs, climate change, and environment. The questionnaire was then finalized and pre-tested on 60 students from ten different institutions in preparation for real data collection.

Because the emphasis of this study was mostly on adolescents, the age range for respondents was limited to 18–35 years. Furthermore, the sample frame included all higher education students, irrespective of their degree programs, semesters, and levels of study. Thus, data from 2137 respondents were collected in total by purposefully distributing questionnaires and requesting them to fill out the information.

To gather data from the students, a well-designed data collection tool with several parts was employed. The measuring items in this study are drawn from or adapted from those in earlier environment, climate change, and sustainable household practices research studies, using Churchill's [61] work as a reference. The first part of the data gathering instrument included questions about the students' socioeconomic and educational backgrounds. The second component of the data collection instrument included questions about students' environmental knowledge and climate change awareness. The third section of the data collection instrument included questions about students' attitudes towards the environment, followed by a section containing questions related to their pro-environmental intentions. The last section of the data collection instrument was about the adoption of sustainable practices. Except for the questions in Section 1, all were answered on a 5-point Likert scale. The whole research procedure is explained in Figure 2.

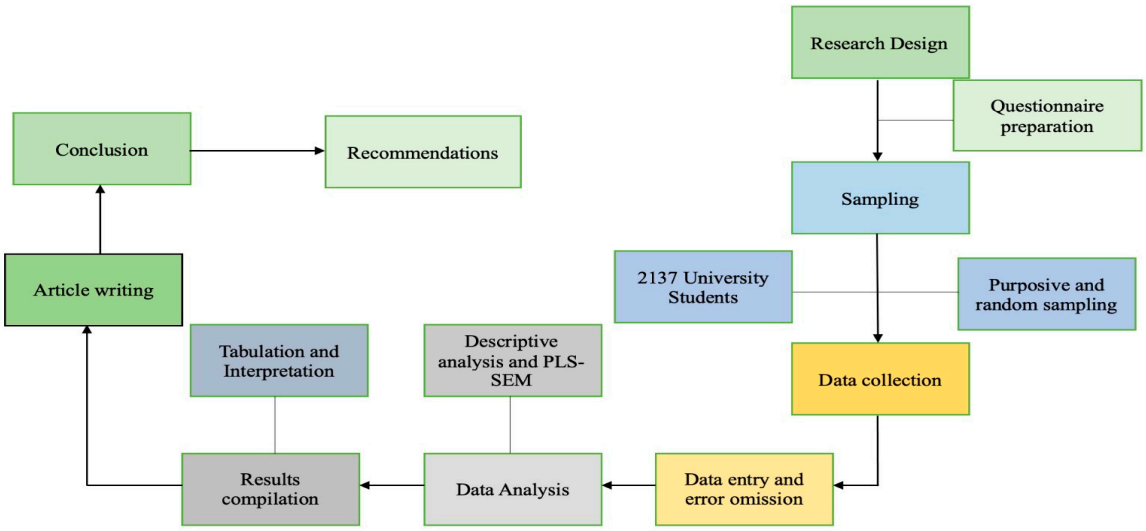

Figure 2. Research procedure.

3.2. Empirical Analysis

The structural equation model (SEM) combines the strengths of factor and path analysis into a single powerful multivariate statistical tool. SEM can examine the association between multiple effects, multiple influences, and latent variables, and it incorporates regression analysis, analysis of variance, factor analysis, and path analysis [62–64]. All of the variables in this research were interrelated in some way, either as latent variables or through the interaction between the two. PLS-SEM is a second-generation multivariate structural equation modeling approach. Even for small sample size studies, it eliminates distribution assumptions and has superior statistical power [65]. The validity of items employed in constructs is readily checked using PLS due to a reduction and validation procedure performed prior to building the final structural model for each manifest variable. Prior work specifies 100 as the minimal respondents for obtaining unbiased findings by using this model [66]. Furthermore, Hair et al.'s [67] ten times rule and G*power revealed the sufficiency of this study's respondents for this model. This work relied heavily on the approach to analysis proposed by Hair et al. [67]. The PLS-SEM approach consists of a measurement model and a structural model [68].

4. Results

4.1. Background of Respondents

Table 1 presents the socio-demographic background of study participants. These characteristics provide important information about the respondents' backgrounds, such as their age, education, current residence, permanent residence, gender, and educational level. More than one-third of the students reported that they have taken at least one course related to the environment during their studies. More than 90% of the participating students were between the ages of 16 and 25. More female students participated in this study compared to males. A large majority of the participating students were living in dormitories. More than one third of the students belong to rural areas. A large majority of the participants were undergrad students.

Table 1. Socio-demographic characteristics.

Characteristics	Aspects	Percentage
Education	With an environment related course	38.41
	Without environment related course	61.59

Table 1. *Cont.*

Characteristics	Aspects	Percentage
Study level	Bachelor	79.00
	Master	20.50
	Ph.D.	0.50
Age	16–20 years	43.33
	21–25 years	48.22
	>25 years	8.45
Gender	Male	40.60
	Female	59.40
Current residence	Dormitory	73.75
	House	26.25
Residential background	Rural	36.68
	Urban	63.32
Level of education	Undergraduate	75.50
	Master/doctorate	24.50

4.2. Descriptive Statistics of the Constructs

Descriptive data for all variables and items used in this analysis are presented in Table 2. The students reported high EKN, and their knowledge related to the individual item also varied from a low to very high level in the EKN construct. According to the descriptive findings, the CCA of the students indicated that they had a high level of awareness of climate change. Similarly, they depicted their awareness level as being very high in the majority of individual items of the CCA construct. Overall, the students displayed a moderate EAT, with an average score of 3.40. Most of these individual items also describe a moderate attitude in the EAT construct. The students reported low PEI, and most of the individual items also described the low level of intention of the students. At last, SHCP indicates that their adoption level is low, while the very low level of adoption of some individual SHCP is also observed among the students. In short, the adoption of individual items under SHCP varies from low to very high.

Table 2. Constructs and their items.

Construct	Items	Abbreviation	Mode/Mean
Environmental Knowledge [69]		EKN	3.75 (1.78)
	Global warming is mostly caused by the sun radiation	EKN1	3
	CO_2, CH_4 and water vapor are main greenhouse gases	EKN2	4
	Everyone should respond to sustainable natural resource use	EKN3	5
	The energy used by households have a huge impact on the environment *	EKN4	4
	Ozone layer in absorbing harmful solar radiation	EKN5	3
	Deforestation will not affect our daily lives	EKN6	4
	Environmental protectionist often oppose the use fossil fuels	EKN7	4
Climate change awareness [70]		CCA	4.14 (1.53)
	Climate change is a consequence of ozone layer depletion	CCA1	4
	Climate change is caused by greenhouse gasses emissions	CCA2	3
	Individuals can do a lot to lessen climate change	CCA3	4
	Human activities are the main cause of climate change **	CCA4	5
	Climate change is a major hurdle in sustainable economic development	CCA5	4

Table 2. *Cont.*

Construct	Items	Abbreviation	Mode/Mean
Environmental attitude [71]		EAT	3.4 (1.29)
	Worried about the consumption behaviour and environment ***	EAT1	3
	Feel mortified when I find that in my surrounding no care is given to ecology	EAT2	4
	I often pay attention to environmental issues	EAT3	3
	People have the responsibility to protect the environment	EAT4	4
	Major sociopolitical changes are required to protect environment	EAT5	2
	Human beings should live in harmony with nature	EAT6	3
	Everyone should do enough to save scarce natural	EAT7	4
Pro-Environmental intentions [39]		PEI	3.23 (1.77)
	I always intend to save food, water, and energy as much as I can	PEI1	4
	I always intend to save as much natural resources as I can	PEI2	4
	I always intend prefer to travel as environmentally friendly as possible	PEI3	3
	I always intend to sift trash and recycle as much as possible	PEI4	2
	I always intend to buy green products	PEI5	3
	I would like to spend more on environmentally friendly products rather than conventional products.	PEI6	3
	If I will have the opportunity to take part in environmental oriented organization, I always will be ready to become an active member	PEI7	3
Sustainable household consumption practices [72,73]		SHCP	3.16 (1.89)
	I manage my kitchen with FIFO strategy	SHCP1	3
	I avoid using disposable tissue papers	SHCP2	3
	I eat food without packaging	SHCP3	2
	I clean the kitchen with clothing rather than paper.	SHCP4	4
	I avoid using disposable plates, spoons, forks and glasses for eating/drinking	SHCP5	3
	I conserve energy by implementing energy-saving practices (turning off lights when not in use, using natural light throughout the day, using regular water, and so on)	SHCP6	3
	I use renewable energy source (solar energy)	SHCP7	4
	I save water by adopting saving techniques (Turn off the tap whilst cleaning teeth, soaping body, combing laundry etc.).	SHCP8	2
	I buy local and domestic products	SHCP9	2
	I try to use decomposable products	SHCP10	4
	I avoid using plastic bags for shopping	SHCP11	2
	I avoid buying food items already present	SHCP12	4

Values in parenthesis are standard deviation. 1.00–1.80 = very low; 1.81–2.60 = low; 2.61–3.40 = moderate; 3.41–4.20 = high and 4.21–5.00 = very high. EKN = Environmental knowledge, CCA = Climate change awareness, EAT = Environmental attitude, PEI = Pro-environment intentions, and SHCP = Sustainable household consumption practices. *, **, and *** items reversed (1 strongly agree, 5 strongly disagree).

4.3. Measurement Model

The measurement model was evaluated using six different goodness-of-fit indices and convergent and discriminant validity analyses. These were the composite reliability (CR) and the average variance extracted (AVE). In order to determine whether or not the items employed in the measurement of latent variables or constructs had convergent validity, the factor loading of each item was taken into consideration and compared to the threshold value. The literature recommends that the factor loading of individual items should not be less than 0.70 when attempting to measure the convergent validity and that items of all constructs with a lower value than threshold value should be removed [68,74]. By following this rule, we removed all individual items which had factor loading less than the recommended value. All above conditions were satisfied for including items in the respective constructs (Table 3).

Table 3. Measurement model (confirmatory factor analysis) and validity confirmation parameters.

Construct/Items	Factor Loadings	Cronbach Alpha	CR	AVE
EKN		0.873	0.967	0.806
EKN1	0.935			
EKN2	0.921			
EKN3	0.913			
EKN4	0.895			
EKN5	0.864			
EKN6	0.82			
EKN7	0.811			
CCA		0.893	0.947	0.782
CCA1	0.921			
CCA2	0.892			
CCA3	0.878			
CCA4	0.823			
CCA5	0.816			
EAT		0.893	0.974	0.843
EAT1	0.932			
EAT2	0.903			
EAT3	0.897			
EAT4	0.845			
EAT5	0.832			
EAT6	0.834			
EAT7	0.829			
PEI		0.932	0.948	0.724
PEI1	0.945			
PEI2	0.921			
PEI3	0.915			
PEI4	0.874			
PEI5	0.839			
PEI6	0.83			
PEI7	0.821			
SHCP		0.877	0.971	0.739
SHCP1	0.932			
SHCP2	0.902			
SHCP3	0.897			
SHCP4	0.863			
SHCP5	0.854			
SHCP6	0.851			
SHCP7	0.849			
SHCP8	0.834			
SHCP9	0.828			
SHCP10	0.819			
SHCP11	0.812			
SHCP12	0.809			

The CR coefficient was computed in order to evaluate the construct's validity. It is essential that the value of the CR coefficient be greater than 0.60 [75,76]. Otherwise, the construct validity of the models will be compromised. In addition, a CR value >0.70 is sufficient to characterize the model that should be used for further analysis [77]. The model's suitability for confirmatory purposes may be represented by a CR value ≥0.80 [78]. The value of the CR for each of the variables is >0.94 and the study satisfies all of the conditions outlined above for continuing the research. Moreover, one additional convergent validity assessment parameter, known as the AVE, whose values for each construct should be greater than the threshold level of 0.50 [68,79], was also confirmed. The AVE is considered to >0.50 when the explained variance is found to be greater than the error variance [80]. Based on these findings, it was found that both the convergent validity and the construct validity of the measurement model are satisfactory.

The Cronbach's alpha, Nuder–Richardson equations, and split-half reliability are the three techniques that are frequently used to assess the homogeneity of indicators. The strong association of the assessed items results in a higher alpha score, which illustrates homogeneity. The Nunnally's norm, which is appropriate when the alpha value is at or above 0.70, has largely gained acceptance among researchers [81]. Cronbach's alpha associated with the latent variable must be >than the threshold of 0.70 [82,83]. The results showed that the value for all of the constructs where was >0.85, which confirmed the typical internal consistency and stability of the constructs.

The latent variables must be independent of one another [68] and this can be evaluated through discriminant validity (DV). The DV states that each latent variable or construct is unique from all of the rest latent constructs in the model. By comparing a latent variable's correlation coefficient with those of all other latent variables, the square root of AVE quantifies the DV of that variable. A constructs' AVE must have a square root bigger than its correlation coefficient with each other [84]. The diagonal line shown in Table 4 supported DV: the greater the square root of AVE value in contrast to the correlation values with other constructs, the greater the variance explained by the construct with its own measure in comparison to other measures [80]. Additionally, the discriminant validity of the heterotrait-monotrait ratio (HMR) values was examined [85]. The fact that the HMR is less than 0.90 [77] also lends support to its discriminant validity.

Table 4. Discriminant validity of the latent variables included in the model.

Fornell-Larcker Criterion					
	EAT	**CCA**	**EKN**	**PEI**	**SHCP**
EAT	0.918				
CCA	0.456	0.884			
EKN	0.542	0.603	0.898		
PEI	0.432	0.302	0.673	0.851	
EED	0.374	0.539	0.534	0.468	
SHCP	0.563	0.552	0.493	0.605	0.860
Heterotrait-Monotrait Ratio (HTMT)					
	EAT	CCA	EKN	PEI	SHCP
EAT					
CCA	0.634				
EKN	0.477	0.511			
PEI	0.452	0.439	0.457		
SHCP	0.761	0.472	0.621	0.503	

4.4. Goodness of Fit Indices

Model fit indices were examined before testing the research hypotheses to determine the overall fit of the models. All index values for the final suggested model indicated an acceptable match (χ^2/df ratio = 3.13, GFI = 0.970, CFI = 0.950, NFI = 0.927, AGFI = 0.942, RMSEA = 0.049). The validation of these statistics/indices adds to the case for further investigation. The findings of statistical indicators are shown in Table 5.

Table 5. Goodness of fit measures.

Goodness of Fit Measures	Structural Model
χ^2/df	3.13
GFI	0.970
CFI	0.950
AGFI	0.942
NFI	0.927
RMSEA	0.049

4.5. Hypotheses Testing

The results obtained from testing hypotheses (H1–H7) are presented in Table 6. Similarly, the significant and positive impact of environment knowledge on the pro-environment intentions (H1) was confirmed by the coefficient value (β = 0.684, t-value = 9.50, $p < 0.01$), while the impact of environmental knowledge on environmental attitude (H2) was also supported by the path analysis (β = 0.342, t-value = 2.923, $p < 0.01$). The coefficient value of H3 (β = 0.549, t-value = 4.463, $p < 0.01$) also confirmed the positive impact of climate change awareness on the students' pro-environment intentions. The impact of climate change awareness on environmental attitude (H4) was not supported based on the coefficient value (β = 0.202, t-value = 0.415, $p > 0.01$). The hypothesis H5 is supported according to the value of the coefficient (β = 0.653, t-value = 14.32, $p < 0.01$). This implies that the environmental attitude of the students has a significant positive impact on their pro-environment intentions.

Table 6. Path coefficients and hypothesis testing.

Path Coefficients								
Hypotheses	**Direction**	**β**	**SD**	**t-Value**	**f2**	**Q2**	**R2**	**Decision**
H1	EKN → PEI	0.684	0.072	9.500	0.277	0.362	0.689	Accepted
H2	EKN → ATT	0.342	0.117	2.923	0.259	0.467	0.522	Accepted
H3	CCA → PEI	0.549	0.123	4.463	0.050	0.301	0.643	Accepted
H4	CCA → ATT	0.202	0.487	0.415	0.100	0.103	0.582	Rejected
H5	ATT → PEI	0.653	0.046	14.320	0.184	0.276	0.691	Accepted
H6	PEI → SHCP	0.823	0.098	8.398	0.463	0.398	0.702	Accepted
H7					With Courses	0.645 *	Accepted	
					Without courses	0.232 *		
					ΔZ scores	3.57 *		

Note: t-value ≥ 2.32 reflects statistically significant level at * 1%. SD is standard deviation.

The crucial ratios for the changes in regression weights between education type groups (with and without environment courses) were calculated in order to test the categorical moderation hypothesis (H7). *p*-values were derived from these key ratios to assess the statistical significance of the finding. Results are summarized in Table 6 of the hypotheses summary. The findings showed that pro-environmental intentions of the students had a positive and statistically significant effect on sustainable household consumption practices for both the education type with environment courses (β = 0.645, $p < 0.01$) and the education

type without environment courses ($\beta = 0.223$, $p < 0.01$). It was also shown that the impact of pro-environmental intentions on sustainable household consumption practices was greater for those whose education included environmental courses than for those whose education did not. Therefore, H7 hypothesis can be accepted.

5. Discussion

This study was planned to provide a broad overview of the association between students' environmental knowledge (EKN), climate change awareness (CCA), environmental attitudes (EAT), and pro-environmental intentions (PEI) toward the adoption of sustainable consumption practices (SHCP). Moreover, the moderating role of environmental education between PEI and SHCP was also assessed in this study. The relative analysis of learners with different educational backgrounds (with and without environmental sources) on the adoption of SHCP is distinctive, as surveys usually aiming at student environmental behavior ignore the students' educational backgrounds. Thus, the study would add to the literature and assist policymakers in controlling environmental degradation in China as well as the rest of the world. The students had a high level of EKN, which described that the university students knew about environment-related changing factors and local and international sustainability issues and were aware of causes of environmental degradation. This might be a result of the environmental issues brought about by current development activities having an impact on the young generation. Similarly, Zsóka et al. [71] stated that university students had higher levels of EKN than high school students. Our results are in line with Cheung et al. [86], who also reported the highest mean score of students related to their EKN compared to other constructs of the study.

The students in the current study had a high level of CCA. The reason for climate change is the most urgent and important subject widely discussed on electronic, social, and print media. Lee [87], Robelia et al. [88], Westerman et al. [89], and Petrovic et al. [90] also described the role of social media in the dissemination of climate change related information. Moreover, universities around the globe also actively keep organizing different awareness seminars, symposiums, and awareness walks about climate change throughout their calendars these days. The attitude is one of the most important determinants of the personal intentions toward the adoption of any stimuli. Fielding et al. [91] considered attitude an important indicator of intentions toward environmental activism. It would appear that the students who participated in this study have a less positive or moderate attitude level towards environmental issues. This is especially obvious when it comes to the environmental challenges that are more closely tied to their lives [70].

The study findings depicted that ATT, CCA, and EKN had a positive and significant influence on the PEI of students. The positive impact of students' attitudes describes the young generation's positive thinking and beliefs toward environmental issues and shows their concerns about environmental degradation on planet Earth. According to Ajzen and Fishbein [92], specific attitudes toward a certain behavior will be a stronger predictor of the intention to engage in that behavior. They claim that this will be the case because specific attitudes predict the intention to engage in behavior more precisely. Dunlap et al. [93] also reported the same results, and they described the environmental attitudes as anticipating activism intentions. Therefore, the students' attitude is a significant predictor of their PEI. Our results are also in line with the findings of Fielding et al. [91], e.g., in that having a positive attitude causes greater intentions to engage in the behavior. De-Leeuw et al. [94] also propose attitude as a significant predictor of PEI. Moreover, Yadav [95] also reported the significant influence of attitude on eco-friendly buying intentions.

EKN is not fully revealed in everyday life [32,96,97]. According to Frick et al. [98], those who have an extensive knowledge of environmental issues would be able to identify viable solutions and appreciate the value of eco-friendly practices. Various studies have explored the role of EKN on environmental intentions and purchasing behavior. Liu et al. [39] noted in their study that the effect of EKN positively and significantly affects environmentally responsible behaviors. The casual relationship between EKN and environmentally oriented

acts may have possible intermediaries, and intentions can mediate the relationship between knowledge and behavior. Thus, intention also mediates the causal relationship between factual knowledge and behaviors [39]. For example, EKN is an important factor in consumers' intentions to make eco-friendly purchases [99,100]. According to Molina et al. [101], the ecological knowledge of the students influences their environmental-oriented intentions and behaviors. Moreover, in the case of marine ecology, the knowledge of the visitors about the conservation of marine environments drastically promotes marine environmental protection intentions [102]. Consumers who have a greater knowledge of the environment and are aware of climate change over the long term are more likely to spend more money on environmentally friendly products [103] and are more eager to buy environmentally friendly items [104]. Our results corroborate with those of Molina et al. [101] regarding the role of environmental knowledge and environmental intentions.

The positive impact of EKN on the overall attitude of the students is an important implication of the results. The students with good EKN tend to have a more environmentally oriented attitude. The EKN plays a vital role in forming the students' attitudes. Many studies have explored the role of knowledge in the formation of the attitude and have concluded that knowledge can promote the environmental attitude [94,105,106]. Liu et al. [39] describe that knowledge is a fundamental element of developing an attitude, and intention plays an intermediary role between knowledge and pro-environmental behavior. The EKN and attitude are strongly associated, and they reinforce one another [34] particularly when people are looking for information on environmental problems. Barber et al. [107] and Flamm [105] stated that increased EKN leads to a positive shift in environmental attitudes, which in turn motivates individuals to make green purchases. Similarly, Polonsky et al. [108] reported that more knowledge leads to a change in people's attitudes toward green products. The study results also correlated with that Zsóka et al. [71], who also affirmed that environmental knowledge is the foundation for creating favorable environmental attitudes.

The study's findings also corroborated the moderating role of EE between PEI and the adoption of SHCP. The impact of PEI on SHCP was greater for those students whose education background included environmental studies than for those whose education did not. Understanding environmental challenges while in school or in daily life is likely to have a significant impact on students' views. The EE significantly causes the behavioral change that may promote the behavioral changes, and it fosters the students' intentions toward the adoption of SHCP. According to Boyes et al. [51], environmental education has the greatest potential for influencing student behavior via ecofriendly actions.

6. Conclusions

A large majority of the world population consists of young people, China alone has over 400 million, and their daily actions regarding the environment will determine the future of their country as well as the world. The literature regarding youths' environmental knowledge, climate change awareness, environmental attitude, pro-environmental intentions, and sustainable household consumption practices is very scarce. Therefore, this study was intended to deliver an inclusive overview of the association between students' environmental knowledge, climate change awareness, environmental attitudes, and pro-environmental intentions toward the adoption of sustainable household consumption practices. Moreover, the moderating role of environmental education between pro-environmental intentions and the adoption of sustainable consumption practices was also assessed in this study.

The descriptive results showed that students have higher environmental knowledge and climate change scores, but their pro-environmental and adoption scores are comparatively lower. This depicts an important conclusion: higher environmental knowledge and climate change awareness do not always fully translate into environmental protection actions. The results of PLS-SEM revealed that environmental knowledge, climate change awareness, and environmental attitudes all positively affect pro-environmental intentions.

The findings further revealed that environmental education moderated pro-environmental intentions toward the adoption of sustainable consumption practices. Moreover, environmental knowledge and climate also significantly influence the environmental attitudes of the students. The findings of the current study provide clear insights about the students' willingness to adopt sustainable household practices for promoting a cleaner environment and minimizing environmental degradation. It was also shown that the impact of pro-environmental intentions on sustainable household consumption practices was greater for those whose education included environmental courses than for those whose education did not.

Based on the findings, it may be suggested that environment-related courses be incorporated into the study plans of each discipline as a compulsory subject. This may give the students basic knowledge of environmental issues and their solutions, which may play an important role in shaping their green intentions and environment-protecting actions. Moreover, education institutes should frequently organize environmental-related seminars and sessions with environmental experts to improve the young generation's, i.e., university students, secondary school students, and even children from kindergartens, environmental behavior. In this regard, environmental departments at the university need to play a pro-active and leading role in environmental awareness programs to make students aware of the environment's problems. It is also suggested that each university should have an environment department or at least have one environmental expert as a faculty member for guiding students. Additionally, extensive use of social media by students can also provide a means of informal education by arranging a competition among the students for environmental-oriented videos or speeches that must give an awareness message toward the adoption of sustainable practices. Thus, we conclude that environmental knowledge and environmental education can play an important role in shaping an environmentally friendly lifestyle for a clean environment to meet the requirements of both the current and future generations. Future studies can verify and expand the findings of the current study by collecting longitudinal data using other sampling techniques in other developing countries.

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References

1. Bouman, T.; Verschoor, M.; Albers, C.J.; Böhm, G.; Fisher, S.D.; Poortinga, W.; Steg, L. When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Glob. Environ. Chang.* **2020**, *62*, 102061. [CrossRef]
2. Thondhlana, G.; Hlatshwayo, T.N. Pro-environmental behaviour in student residences at Rhodes University, South Africa. *Sustainability* **2018**, *10*, 2746. [CrossRef]

3. Lubowiecki-Vikuk, A.; Dąbrowska, A.; Machnik, A. Responsible consumer and lifestyle: Sustainability insights. *Sustain. Prod. Consum.* **2021**, *25*, 91–101. [CrossRef]
4. Davidson, E.A.; Suddick, E.C.; Rice, C.W.; Prokopy, L.S. More food, low pollution (Mo Fo Lo Po): A grand challenge for the 21st century. *J. Environ. Qual.* **2015**, *44*, 305–311. [CrossRef] [PubMed]
5. Waitt, G.; Caputi, P.; Gibson, C.; Farbotko, C.; Head, L.; Gill, N.; Stanes, E. Sustainable household capability: Which households are doing the work of environmental sustainability? *Aust. Geogr.* **2012**, *43*, 51–74. [CrossRef]
6. Burgess, J.; Bedford, T.; Hobson, K.; Davies, G.; Harrison, C. (Un)sustainable consumption. In *Negotiating Environmental Change*; Scoones, I., Leach, M., Eds.; Edward Elgar: Cheltenham, UK, 2003; p. 26191.
7. EEA. Household Consumption. Available online: https://www.eea.europa.eu/archived/copy_of_households/intro (accessed on 25 May 2022).
8. Fox, N.; Ward, K. Health, ethics and environment: A qualitative study of vegetarian motivations. *Appetite* **2008**, *50*, 422–429. [CrossRef]
9. Hertwich, E.G.; Peters, G.P. Carbon footprint of nations: A global, trade-linked analysis. *Environ. Sci. Technol.* **2009**, *43*, 6414–6420. [CrossRef]
10. Ivanova, D.; Barrett, J.; Wiedenhofer, D.; Macura, B.; Callaghan, M.; Creutzig, F. Quantifying the potential for climate change mitigation of consumption options. *Environ. Res. Lett.* **2020**, *15*, 093001. [CrossRef]
11. OECD. *Greening Household Behaviour: The Role of Public Policy*; OECD Publishing: Paris, France, 2011.
12. Cafaro, P. Beyond business as usual: Alternative wedges to avoid catastrophic climate change and create sustainable societies. In *The Ethics of Global Climate Change*; Arnold, D.A., Ed.; Cambridge University Press: Cambridge, UK, 2011.
13. Krizanova, J.; Rosenfeld, D.L.; Tomiyama, A.J.; Guardiola, J. Pro-environmental behavior predicts adherence to plant-based diets. *Appetite* **2021**, *163*, 105243. [CrossRef]
14. Reid, L.; Sutton, P.; Hunter, C. Theorizing the meso level: The household as a crucible of pro-environmental behavior. *Prog. Hum. Geogr.* **2010**, *34*, 309–327. [CrossRef]
15. Lane, R.; Gorman-Murray, A. Introduction. In *Material Geographies of Household Sustainability*; Lane, R., Gorman-Murray, Eds.; Ashgate Publishing, Ltd.: Surrey, UK, 2011.
16. Williamson, K.; Satre-Meloy, A.; Velasco, K.; Green, K. *Climate Change Needs Behavior Change: Making the Case For Behavioral Solutions to Reduce Global Warming*; Rare: Arlington, VA, USA, 2018.
17. IPCC. *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK, 2021.
18. Vita, G.; Hertwich, E.G.; Stadler, K.; Wood, R. Connecting global emissions to fundamental human needs and their satisfaction. *Environ. Res. Lett.* **2019**, *14*, 014002. [CrossRef]
19. VaÃÅsquez, F.; Vita, G.; MuÃàller, D.B. Food security for an aging and heavier population. *Sustainability* **2018**, *10*, 3683. [CrossRef]
20. Elmqvist, T.; Andersson, E.; Frantzeskaki, N.; McPhearson, T.; Olsson, P.; Gaffney, O.; Takeuchi, K.; Folke, C. Sustainability and resilience for transformation in the urban century. *Nat. Sustain.* **2019**, *2*, 267–273. [CrossRef]
21. Lozano, R. Incorporation and institutionalization of SD into universities: Breaking through barriers to change. *J. Clean. Prod.* **2006**, *14*, 787–796. [CrossRef]
22. Wright, T.S.A. Developing research priorities with a cohort of higher education for sustainability experts. *Int. J. Sustain. High. Educ.* **2007**, *8*, 34–43. [CrossRef]
23. Waas, T.; Hugé, J.; Verbruggen, A.; Wright, T. Sustainable development: A bird's eye view. *Sustainability* **2011**, *3*, 1637–1661. [CrossRef]
24. Zilahy, G.; Huisingh, D. The roles of academia in Regional Sustainability Initiatives. *J. Clean. Prod.* **2009**, *17*, 1057–1066. [CrossRef]
25. Svanström, M.; Lozano-Garzia, F.J.; Rowe, D. Learning outcomes for sustainable development in higher education. *Int. J. Sustain. High. Educ.* **2008**, *9*, 339–351. [CrossRef]
26. Chuvieco, E.; Burgui-Burgui, M.; Da Silva, E.V.; Hussein, K.; Alkaabi, K. Factors affecting environmental sustainability habits of university students: Intercomparison analysis in three countries (Spain, Brazil and UAE). *J. Clean. Prod.* **2018**, *198*, 1372–1380. [CrossRef]
27. Dagiliut, R.; Liobikien, G.; Minelgait, A. Sustainability at universities: Students' perceptions from green and non-green universities. *J. Clean. Prod.* **2018**, *181*, 473–482. [CrossRef]
28. Wachholz, S.; Artz, N.; Chene, D. Warming to the idea: University students' knowledge and attitudes about climate change. *Int. J. Sustain. High Educ.* **2014**, *15*, 128–141. [CrossRef]
29. Whitley, C.T.; Takahashi, B.; Zwickle, A.; Besley, J.C.; Lertpratchya, A.P. Sustainability behaviors among college students: An application of the VBN theory. *Environ. Educ. Res.* **2018**, *24*, 245–262. [CrossRef]
30. Nemcsicsné Zsóka, Á. Consistency and awareness gaps in the environmental behaviour of Hungarian companies. *J. Clean. Prod.* **2008**, *16*, 322–329. [CrossRef]
31. Schahn, J.; Holzer, E. Studies of individual environmental concern: The role of knowledge, gender, and background variables. *Environ. Behav.* **1990**, *22*, 767–786. [CrossRef]
32. Bamberg, S.; Möser, G. Twenty years after Hines, Hungerford, and Tomera: A meta-analysis of psycho-social determinants of pro-environmental behavior. *J. Environ. Psychol.* **2007**, *27*, 14–25. [CrossRef]

33. Szerényi, Z.; Zsóka, Á.; Széchy, A. Consumer behaviour and lifestyle patterns of Hungarian students with regard to environmental awareness. *Soc. Econ.* **2011**, *33*, 89–110. [CrossRef]
34. Bamberg, S. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *J. Environ. Psychol.* **2003**, *23*, 21–32. [CrossRef]
35. Asunta, T. Knowledge sources, attitudes and self-reported behavior of secondary-level science students concerning environmental topics. In *Current Research on Mathematics and Science Education*; Laine, A., Lavonen, J., Meisalo, V., Eds.; Research Report 253; University of Helsinki: Helsinki, Finland, 2004.
36. Michalos, A.C.; Creech, H.; McDonald, C.; Hatch Kahlke, P.M. *Measuring Knowledge, Attitudes and Behaviours towards Sustainable Development: Two Exploratory Studies*; International Institute for Sustainable Development: Winnipeg, CA, USA, 2009.
37. Kagawa, F. Dissonance in students' perceptions of sustainable development and sustainability. *Int. J. Sustain. High. Educ.* **2007**, *8*, 317–338. [CrossRef]
38. Hammett, D. Reworking and resisting globalising influences: Cape Town Hip-Hop. *Geo J.* **2010**, *10*, 1–12. [CrossRef]
39. Liu, P.; Teng, M.; Han, C. How does environmental knowledge translate into pro-environmental behaviors?: The mediating role of environmental attitudes and behavioral intentions. *Sci. Total Environ.* **2020**, *728*, 138126. [CrossRef]
40. Gifford, R.; Nilsson, A. Personal and social factors that influence pro-environmental concern and behaviour: A review. *Int. J. Psychol.* **2014**, *49*, 141–157. [CrossRef] [PubMed]
41. Fielding, K.S.; Head, B.W. Determinants of young Australians' environmental actions: The role of responsibility attributions, locus of control, knowledge and attitudes. *Environ. Educ. Res.* **2012**, *18*, 171–186. [CrossRef]
42. Liu, Q.; Qin, Z. Promoting shift to sustainable consumption behavior of urban residents: An empirical research in six cities. *Soft Sci.* **2011**, *25*, 45–51. (In Chinese)
43. Feng, W.; Reisner, A. Factors influencing private and public environmental protection behaviors: Results from a survey of residents in Shaanxi. *China J. Environ. Manag.* **2011**, *92*, 429–436. [CrossRef] [PubMed]
44. Marshall, N.A.; Park, S.; Howden, S.M.; Dowd, A.B.; Jakku, E.S. Climate change awareness is associated with enhanced adaptive capacity. *Agric. Syst.* **2013**, *117*, 30–34. [CrossRef]
45. Kemp, K.; Insch, A.; Holdsworth, D.K.; Knight, J.G. Food miles: Do UK consumers actually care? *Food Policy* **2010**, *35*, 504–513. [CrossRef]
46. Eagly, A.H.; Chaiken, S. *The Psychology of Attitudes*; Harcourt Brace Jovanovich College Publishers: San Diego, CA, USA, 1993.
47. Ajzen, I. *New Directions in Attitude Measurement*; Walter de Gruyter: New York, NY, USA, 1993.
48. Abun, D.; Magallanes, T.; Encarnacion, M.J.; Alkalde, F.; Somera, K.A. Investigation of Cognitive and Affective Attitude of Students toward Environment and Their Environmental Behavioural Intention to Join Environmental Movement and Energy Conservation. *Int. J. Bus. Manag. Technol.* **2019**, *3*, 110–129.
49. McCarty, J.A.; Shrum, L.J. The influence of individualism, collectivism, and locus of control on environmental beliefs and behavior. *J. Public Policy Mark.* **2020**, *20*, 93–104. [CrossRef]
50. Leonidou, L.C.; Leonidou, C.N.; Kvasova, O. Antecedents and outcomes of consumer environmentally friendly attitudes and behaviour. *J. Mark. Manag.* **2010**, *26*, 1319–1344. [CrossRef]
51. Boyes, E.; Skamp, K.; Stanisstreet, M. Australian secondary students' views about global warming: Beliefs about actions, and willingness to act. *Res. Sci. Educ.* **2008**, *39*, 661–680. [CrossRef]
52. Lambrechts, W.; Paul, W.T.; Jacques, A.; Walravens, H.; Van Liedekerke, L.; Van Petegem, P. Sustainability segmentation of business students: Toward self-regulated development of critical and interpretational competences in a post-truth era. *J. Clean. Prod.* **2018**, *202*, 61–570. [CrossRef]
53. Saripah, A.L.; Yeop Hussin, B.; Zainudin, A. Towards the realization of green cities: The moderating role of the residents' education level. *ASEAN Conf. Environ. Behav. Stud. Hanoi Vietnam* **2013**, *85*, 646–652.
54. Varela-Candamio, L.; Novo-Corti, I.; García-Álvarez, M.T. The importance of environmental education in the determinants of green behavior: A meta-analysis approach. *J. Clean. Prod.* **2018**, *170*, 1565–1578. [CrossRef]
55. Hungerford, H.R.; Volk, T.L. Changing learner behavior through environmental education. *J. Environ. Educ.* **1990**, *21*, 8–21. [CrossRef]
56. Steg, L.; Vlek, C. Encouraging pro-environmental behavior: An integrative review and research agenda. *J. Environ. Psychol.* **2009**, *29*, 309–317. [CrossRef]
57. Fishbein, M.; Jaccard, J.; Davidson, A.R.; Ajzen, I.; Loken, B. Predicting and understanding family planning behaviors. In *Understanding Attitudes and Predicting Social Behaviour*; Ajzen, I., Fishbein, M., Eds.; Prentice Hall: Englewood Cliffs, NJ, USA, 1980.
58. Fishbein, M.; Ajzen, I. Belief, attitude, intention, and behavior: An introduction to theory and research. *Philos. Rhetor.* **1977**, *10*, 177–188.
59. China Daily, 2023. Progress Report on China's Youth Development. Available online: https://www.chinadaily.com.cn/a/202301/15/WS63c28c70a31057c47eba9a08.html (accessed on 11 March 2023).
60. China Daily, 2022. Top 10 Chinese Cities with Most Higher Education Institutions. Available online: https://www.chinadaily.com.cn/a/202208/04/WS62eaf941a310fd2b29e7022c_1.html (accessed on 11 March 2023).
61. Churchill, G.A., Jr. A paradigm for developing better measures of marketing constructs. *J. Mark. Res.* **1979**, *16*, 64–73. [CrossRef]

62. Byrne, B.M.; Stewart, S.M. Teacher's corner: The MACS approach to testing for multigroup invariance of a second-order structure: A walk through the process. *Struct. Equ. Model.* **2006**, *13*, 287–321. [CrossRef]
63. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E.; Tatham, R.L. *Multivariate Data Analysis*, 6th ed.; Pearson Prentice Hall: Upper Saddle River, NJ, USA, 2006.
64. Hair, J.F.; Anderson, R.E.; Tatham, R.L.; Black, W.C. *Multivariate Data Analysis*; Pearson Prentice Hall: Upper Saddle River, NJ, USA, 1998.
65. Hair, J.F.; Sarstedt, M.; Ringle, C.M.; Mena, J.A. An assessment of the use of partial least squares structural equation modeling in marketing research. *J. Acad. Mark. Sci.* **2012**, *40*, 414–433. [CrossRef]
66. Reinartz, W.; Haenlein, M.; Henseler, J. An empirical comparison of the efficacy of covariance-based and variance-based SEM. *Int. J. Res. Mark.* **2009**, *26*, 332–344. [CrossRef]
67. Hair, J.F.; Thomas, G.; Hult, M.; Ringle, C.M.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling*, 2nd ed.; Sage: Thousand Oaks, CA, USA, 2017.
68. Chin, W.W. How to write up and report PLS analyses. In *Handbook of Partial Least Squares*; Springer: Berlin/Heidelberg, Germany, 2009; pp. 655–690. [CrossRef]
69. Marx-Pienaar, N.J.; Erasmus, A.C. Status consciousness and knowledge as potential impediments of households' sustainable consumption practices of fresh produce amidst times of climate change. *Int. J. Consum. Stud.* **2014**, *38*, 419–426. [CrossRef]
70. He, X.; Ting, H.; Lan, L.; John, T. A comparative study of environmental knowledge, attitudes and behaviors among university students in China. *Int. Res. Geogr. Environ. Educ.* **2011**, *20*, 91–104. [CrossRef]
71. Zsóka, Á.; Szerényi, Z.M.; Széchy, A.; Kocsis, T. Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *J. Clean. Prod.* **2013**, *48*, 126–138. [CrossRef]
72. Hobson, K. Thinking habits into action: The role of knowledge and process in questioning household consumption practices. *Local Environ.* **2003**, *8*, 95–112. [CrossRef]
73. Shahbaz, P.; Ul Haq, S.; Abbas, A.; Samie, A.; Boz, I.; Bagadeem, S.; Li, Z. Food, Energy, and Water Nexus at Household Level: Do Sustainable Household Consumption Practices Promote Cleaner Environment? *Int. J. Environ. Res. Public Health* **2022**, *19*, 12945. [CrossRef] [PubMed]
74. Hair, J.F.; Ringle, C.M.; Sarstedt, M. PLS-SEM: Indeed a silver bullet. *J. Mark. Theory Pract.* **2011**, *19*, 139–152. [CrossRef]
75. Hock, C.; Ringle, C.M.; Sarstedt, M. Management of multi-purpose stadiums: Importance and performance measurement of service interfaces. *Int. J. Serv. Technol. Manag.* **2010**, *14*, 188–207. [CrossRef]
76. Henseler, J.; Ringle, C.M.; Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [CrossRef]
77. Daskalakis, S.; Mantas, J. Evaluating the impact of service-oriented framework for healthcare interoperability. *eHealth Beyond Horiz.* **2008**, *136*, 285–290.
78. Ringle, C.; Da Silva, D.; Bido, D. Structural equation modeling with the SmartPLS. *Braz. J. Mark.* **2015**, *13*, 56–73. [CrossRef]
79. Rouf, M.A.; Akhtaruddin, M. Factors affecting the voluntary disclosure: A study by using smart PLS-SEM approach. *Int. J. Law Manag.* **2018**, *60*, 1498–1508. [CrossRef]
80. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: Thousand Oaks, CA, USA, 2016.
81. Nunnally, J.C. *Psychometric Theory*, 2nd ed.; Mcgraw-Hill: New York, NY, USA, 1978.
82. Rahman, M.K.; Gazi MA, I.; Bhuiyan, M.A.; Rahaman, M.A. Effect of COVID-19 pandemic on tourist travel risk and management perceptions. *PLoS ONE* **2021**, *16*, e0256486. [CrossRef]
83. MacKinnon, D.P. *Introduction to Statistical Mediation Analysis*; Erlbaum: Mahwah, NJ, USA, 2008.
84. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Marking Res.* **1981**, *18*, 39–50. [CrossRef]
85. Wetzels, M.; Odekerken-Schroder, G.; Van Oppen, C. Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Q.* **2009**, *33*, 177–195. [CrossRef]
86. Cheung, L.T.; Fok, L.; Tsang, E.P.; Fang, W.; Tsang, H.Y. Understanding residents' environmental knowledge in a metropolitan city of Hong Kong, China. *Environ. Educ. Res.* **2015**, *21*, 507–524. [CrossRef]
87. Lee, K. Understanding Hong Kong adolescents' Environmental Intention: The Roles of Media Exposure, Subjective Norm, and Perceived Behavioral Control. *Appl. Environ. Educ. Commun.* **2011**, *10*, 116–125. [CrossRef]
88. Robelia, B.A.; Greenhow, C.; Burton, L. Environmental Learning in Online Social Networks: Adopting Environmentally Responsible Behaviors. *Environ. Educ. Res.* **2011**, *17*, 553–575. [CrossRef]
89. Westerman, D.; Spence, P.R.; Van Der Heide, B. Social Media as Information Source: Recency of Updates and Credibility of Information. *J. Comput. Mediat. Commun.* **2014**, *19*, 171–183. [CrossRef]
90. Petrovic, N.; Jeremic, V.; Petrovic, D.; Cirovic, M. Modeling the Use of Facebook in Environmental Higher Education. In *The Social Classroom: Integrating Social Network Use in Education*; IGI Global: Hershey, PA, USA, 2014; pp. 100–119.
91. Fielding, K.S.; McDonald, R.; Louis, W.R. Theory of planned behaviour, identity and intentions to engage in environmental activism. *J. Environ. Psychol.* **2008**, *28*, 318–326. [CrossRef]

92. Ajzen, I.; Fishbein, M. Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychol. Bull.* **1977**, *84*, 888–918. [CrossRef]
93. Dunlap, R.E.; Van Liere, K.D.; Mertig, A.G.; Jones, R.E. Measuring endorsement of the new ecological paradigm: A revised NEP scale. *J. Soc. Issues* **2000**, *56*, 425–442. [CrossRef]
94. De Leeuw, A.; Valois, P.; Ajzen, I.; Schmidt, P. Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for educational interventions. *J. Environ. Psychol.* **2015**, *42*, 128–138. [CrossRef]
95. Yadav, R.; Pathak, G.S. Intention to purchase organic food among young consumers: Evidences from a developing nation. *Appetite* **2016**, *96*, 122–128. [CrossRef]
96. Kollmuss, A.; Agyeman, J. Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* **2002**, *8*, 239–260. [CrossRef]
97. Arbuthnott, K.D. Education for sustainable development beyond attitude change. *Int. J. Sustain. High. Educ.* **2009**, *10*, 152–163. [CrossRef]
98. Frick, J.; FKaiser, G.; Wilson, M. Environmental Knowledge and Conservation Behavior: Exploring Prevalence and Structure in a Representative Sample. *Personal. Individ. Differ.* **2004**, *37*, 1597–1613. [CrossRef]
99. Aman, A.L.; Harun, A.; Hussein, Z. The influence of environmental knowledge and concern on green purchase intention the role of attitude as a mediating variable. *Br. J. Arts Soc. Sci.* **2012**, *7*, 145–167.
100. Wang, P.; Liu, Q.; Qi, Y. Factors influencing sustainable consumption behaviors: A survey of the rural residents in China. *J. Clean. Prod.* **2014**, *63*, 152–165. [CrossRef]
101. Vicente-Molina, M.A.; Fernández-Sáinz, A.; Izagirre-Olaizola, J. Environmental knowledge and other variables affecting pro-environmental behavior: Comparison of university students from emerging and advanced countries. *J. Clean. Prod.* **2013**, *61*, 130–138. [CrossRef]
102. Wyles, K.J.; Pahl, S.; White, M.; Morris, S.; Cracknell, D.; Thompson, R.C. Towards a marine mindset: Visiting an aquarium can improve attitudes and intentions regarding marine sustainability. *Visit. Stud.* **2013**, *16*, 95–110. [CrossRef]
103. Ogbeide, O.A.; Ford, C.; Stringer, R. The environmental benefits of organic wine: Exploring consumer willingness-to-pay premiums? *J. Food Prod. Mark.* **2015**, *21*, 482–502. [CrossRef]
104. Brosdahl, D.J.; Carpenter, J.M. Consumer knowledge of the environmental impacts of textile and apparel production, concern for the environment, and environmentally friendly consumption behavior. *J. Text. Appar. Technol. Manag.* **2010**, *6*, 1–9.
105. Flamm, B. The impacts of environmental knowledge and attitudes on vehicle ownership and use. *Transp. Res. Part D Transp. Environ.* **2009**, *14*, 272–279. [CrossRef]
106. Casaló, L.V.; Escario, J.J. Heterogeneity in the association between environmental attitudes and pro-environmental behavior: A multilevel regression approach. *J. Clean. Prod.* **2018**, *175*, 155–163. [CrossRef]
107. Barber, N.; Taylor, C.; Strick, S. Wine consumers' environmental knowledge and attitudes: Influence on willingness to purchase. *Int. J. Wine Res.* **2009**, *1*, 59–72. [CrossRef]
108. Polonsky, M.J.; Vocino, A.; Grau, S.L.; Garma, R.; Ferdous, A.S. The impact of general and carbon-related environmental knowledge on attitudes and behavior of US consumers. *J. Mark. Manag.* **2012**, *28*, 238–263. [CrossRef]