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Does Environmental Education Matter? Evidence from Provincial Higher Education Institutions in China

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Abstract: Environmental education pedagogy is divided into two categories: teacher-driven pedagogy and student-driven pedagogy. Their impacts on the environmental awareness of college students are analyzed using the propensity score matching method. The analysis results for 485 survey data points from college students show that both of these two pedagogies influence college students' environmental awareness positively, and the effect of student-driven pedagogy is higher. The conclusion provides insight for the further development of college students' environmental education.

Keywords: environmental awareness; teacher-driven pedagogy; student-driven pedagogy; propensity score matching; higher education institution

1. Introduction

Environmental education refers to the process of raising environmental awareness within the human communities of a college or university [1,2]. It is particularly important for two reasons. First, as some research points out, pollution problems often result from the aggregation of a multitude of small daily behaviors [3]; such infusion can improve students' environmental behaviors and prevent daily pollution [4]. Second, environmental education can help integrate environmental concern into college students' future professional context such that it guarantees future sustainability after their graduation [5–7]. As a special group with a high level of knowledge, the environmental awareness of college students has an important impact on the ecological environment [5–7]. Higher education institutions shoulder the important responsibility of cultivating talent for society [8–10].

In the domain of education practices, environmental education is more popular in universities and colleges in developed countries. The United Nations Conference on the Human Environment, held in Stockholm, Sweden in 1972, issued the epoch-making Declaration of the United Nations Conference on the Human Environment. The declaration stated that education was indispensable and necessary in order to solve the growing environmental problems. Since then, the United Nations has held a series of conferences highlighting the important role of environmental education [11]. These declarations and conferences marked a demand for the reorientation of universities and colleges to embrace the responsibility of sustainability [12]. In 1990, some university presidents signed the Talloires Declaration in Talloires, France, providing guidance for higher education institutions in establishing environmental goals and environmental measures. There were 675 colleges and universities in the United States that joined alliances related to sustainable development up to 2012, covering one-third of college students [11]. Similarly, the University Sustainability Initiative launched by British universities also brought together more than 300 colleges from around the world [13]. So far, universities from more

than 50 countries have joined these programs [14], with member schools coming mainly from the United States, Canada, the Netherlands, the United Kingdom, New Zealand and other developed countries. However, environmental education is still an emerging area in higher education institutions so far [15], especially in Asia [3].

In the domain of academia, some scholars have conducted investigations into environmental education in local universities and colleges [16–22] and compared the education practices between countries [23]. Some scholars emphasize the significance of environmental education in higher institutions [24,25]. Others focus on introducing specific education pedagogies adopted in environmental education [26–30]. Studies have reported that education pedagogies such as service-learning, exploratory learning and experiential learning play an important role in cultivating environmental awareness among college students [16,18,26,27,31–35]. Most of the extant research focuses on qualitative descriptions of educational methods. The quantitative analysis of education's effect is lacking. To our knowledge, only few works in the literature have mentioned quantitative analysis, such as Heeren et al. [2] and Tang [35].

This article addresses the gap by considering two questions. First, does environmental education play a significant role in improving the environmental awareness of college students? Second, which pedagogy works better? Scholars have determined that two different education pedagogies exist, namely, teacher-driven pedagogy and student-driven pedagogy [28,36]. The former is more concerned with transferring information and knowledge from teachers to students, while the latter is more constructive [37]. Although both pedagogies are widely used, comparisons of their effectiveness are lacking.

Survey data from Chinese provincial college students were used to test the effect of environmental education. As the largest developing country, China stated the need for environmental education in China's Agenda 21, released in 1994. President Xi Jinping delivered a report to the 19th National Congress of the Communist Party of China in 2017 advocating for creating green homes, green schools and green communities. It should be noted that there is a significant stratification among China's universities. Although some universities have started environmental education [3,26], there is still significant variation in the source of funding and the basis of the subject across higher education institutions in China [10]. High-level universities directly under the administration of the Ministry of Education have access to adequate funding. These universities have a strong scientific and financial basis for cultivating students' green literacy. In comparison with these universities, the scientific research conditions and capabilities of provincial universities are feeble. The extant literature mainly explores environmental education in these high-level universities in China, such as Tsinghua University, Tongji University and Shandong University [22,23]. However, provincial colleges are dominant in China [4]. It is of universal significance to focus on environmental education in provincial higher education institutions [22].

The main question this article focuses on is the effect of environmental education on students' environmental awareness in higher education institutions. The potential contributions of this article are twofold. First, considering other factors may influence students' environmental awareness, propensity score matching (PSM) is used to analyze the net effect of environmental education on students' environmental awareness. Second, the effects of the two different pedagogies are compared. The empirical results show that both of these two pedagogies have significant effects on the cultivation of students' environmental awareness, and the effect of student-driven pedagogy is larger. Understanding the extent to which environmental education actually influences college students' environmental awareness, in addition to the influence of other factors, could help strengthen or guide environmental education practice.

2. Materials and Methods

2.1. Survey and Respondents

Survey data are used in this article. The survey was carried out in Qingdao, Shandong province. Located on the eastern coast of China, Qingdao is one of the 15subprovincial cities. In 2018, the per capita disposable income of urban residents in this city was 47,176 Chinese yuan, ranking seventh among the 15 subprovincial cities, at the intermediate level. There are 25 higher education institutions located or having branches in Qingdao. Student enrollment in 2018 was 398,000 [38]. To promote the implementation of the Green China strategy, the Chinese government selected this region as a pilot site for switching from old growth drivers to new ones. In this context, universities in this area possess a strong motivation to advance environmental education. To our knowledge, universities and colleges in this area have provided environmental curricula and encouraged related practices for students. Therefore, picking this area to conduct our survey was suitable and could help us get more valuable conclusions.

The survey was conducted from May to June 2019. College students from Shandong University of Science and Technology, Qingdao University of Science and Technology and Qingdao University of Technology were randomly selected to fill out the questionnaire; 600 questionnaires were issued. Incomplete and inconsistent answers were deleted, and 485 valid questionnaires were retained. The demographic traits of these respondents are shown in Table 1. Fifty-two percent of the respondents were male, which was slightly more than the percentage of females because the universities where the questionnaires were issued were predominantly engineering schools. Seniors were relatively fewer because they usually interned off campus during the survey period.

Table 1. Demographic traits of respondents.

Item	Traits	Frequency	Ratio	Item	Trait	Frequency	Ratio
Gender	Male	252	52.0%	Discipline	Engineering	206	42.5%
	Female	233	48.0%		Science	96	19.8%
Year of study	Freshman	155	32.0%		Economics	32	6.6%
	Sophomore	143	29.5%		Management	58	12.0%
	Junior	118	24.3%		Arts	36	7.4%
	Senior	69	14.2%		Law	26	5.4%
					Others	31	6.3%

2.2. Variables

Dependent variable: The focus of this article is on whether environmental education has an effect on students' environmental awareness. The dependent variable was students' environmental awareness. It was measured from three dimensions, namely, beliefs, values and intentions [7,35,39]. Referring to Tang [35], nine items were included in the questionnaire. All the items were measured by a five-point Likert scale (1=strongly disagree, 2= disagree, 3= do not care, 4= agree, 5= strongly agree). In order to avoid social desirability bias, which is always a problem in this context, reverse items were included in the scale.

Independent variable: The independent variable was pedagogy. A prominent question about environmental education is which pedagogy is more conducive to learning. Scholars have determined that two different education pedagogies exist, namely, teacher-driven pedagogy and student-driven pedagogy [28,36]. The main difference between the two pedagogies is the change agent [29]. The change agents in teacher-driven pedagogy are teachers. Teachers are the most important in deciding on teaching activities and are concerned with transferring information and knowledge [37].The change agents in student-driven pedagogy are learners [40,41]. Students take an active role in which they propel their own learning [29]. Considering the difference between the two pedagogies, two questions

were adopted in the questionnaire: "Do you select any curriculum or lectures that your college prepares for you that relate to environmental protection, including independent courses or the integration of relevant content within a course?" (1 = yes, 0 = no) [7] and "Do you freely carry out or participate in a plan related to environmental issues (by yourself or in a team), such as environmental investigation, environmental design and other social activities?" (1 = yes, 0 = no) [29].

Besides pedagogy in higher education institutions, other factors may also affect students' environmental awareness. Family conditions are seen as a foundation for later education [42]. Three items in the questionnaire corresponded to these factors: the mother's education level (1 = primary school, 2 = junior high school, 3 = senior high school, 4 = junior college, 5 = undergraduate, 6 = graduate), the father's education level (1 = primary school, 2 = junior high school, 3 = senior high school, 4 = junior college, 5 = undergraduate, 6 = graduate) and the economic condition of the family (1 = poor, 2 = normal, 3 = better). Other demographic attributes about the respondents are included in the questionnaire, such as gender, year of study and discipline.

In summary, there were 17 questions in the questionnaire: 9 items related to environmental awareness, and the other 8 questions corresponded to family background, demographic traits and environmental education. More details are exhibited in Appendix A.

2.3. Methodology

2.3.1. Propensity Score Matching Method

The main question this article focuses on is the effect of environmental education on students' environmental awareness in higher education institutions. A comparison between two groups of students was needed: the group of students that are involved in environmental education and the group of students that are not. It should be noted that many courses and practices in higher education institutions are elective; prior education experience and personal perceptions can affect students' selection. That is to say, whether students participate in environmental education or not is not random. If the comparison between these two groups were done directly, it would lead to an overestimation or underestimation of the effect of environmental education. Therefore, PSM was used [43]. The steps are as follows.

(1) Establish the logit regression model.

Select a series of covariances (represented by x) that can influence both students' environmental awareness (represented by Y) and participation in environmental education (represented by d; $d = 1$ for participation in related courses or practices, $d = 0$ for nonparticipation). Carry out the logit regression using x as the independent variable and d as the dependent variable. The regression model can be expressed as Formula (1). $\hat{p}(x_i)$ is the estimated propensity value (also called probability) that the student "i" participates in environmental education in given conditions x. $\hat{\beta}$ is the estimated coefficient.

$$\hat{p}(x_i) = \Pr(d_i = 1|x_i) = \frac{\exp(x_i\hat{\beta})}{1 + \exp(x_i\hat{\beta})} \quad (1)$$

(2) Match the participating student with the nonparticipating one.

The student who participates in the courses (practices) is matched with that who does not participate in them according to their estimated propensity values. That is, if one nonparticipating student's propensity value is equal to or close to that of a participating one, they are matched. The matched students form the sample in subsequent analysis.

(3) Estimate the net effect of environmental education.

In order to calculate the net effect of environmental education on environmental awareness, the difference is used between the participating students and their matched nonparticipating ones, which is called the average treatment effect on the treated (ATT, shown in Formula (2)). If environmental education has a positive effect on environmental awareness, the difference will be positive.

$$ATT = E(Y_i^1 - Y_i^0 | d_i = 1) \quad (2)$$

In Formula (2), Y_i^1 represents the environmental awareness of the student "i" who participates in environmental education, while Y_i^0 represents the nonparticipating student's environmental awareness. It is obvious that Y_i^0 is unobservable. The PSM method is used to replace the antifact result with the score of its matching object to estimate the average effect of environmental education on environmental awareness.

In Formula (3), the superscript "~" indicates the matched sample. $E(\widetilde{Y}^1 \middle| \widetilde{d} = 1)$ denotes the mean of the environmental awareness of those students who participate in environmental education, while $E(\widetilde{Y}^0 \middle| \widetilde{d} = 0)$ is the mean of those who do not participate in the matched sample. The two matched subsamples of students achieve a balance between the covariance, and the comparison between them can curb the influence of selection errors on the research results and thereby achieve an unbiased estimation of the ATT.

$$\hat{ATT} = E(\widetilde{Y}^1 \middle| \widetilde{d} = 1) - E(\widetilde{Y}^0 \middle| \widetilde{d} = 0) \quad (3)$$

2.3.2. Test of Scale

Environmental awareness belongs to personal psychological perceptions, which can be measured by scales only. Therefore, a reliability test and validity test were needed to ensure the "environmental awareness" scale could meet the needs of the research. Reliability refers to the stability and consistency of a scale. The α coefficient established by Cronbach (also called Cronbach's α coefficient) is often used to test reliability [44]. A Cronbach's α coefficient greater than 0.7 indicates that the reliability of a scale is acceptable generally [34]. Validity refers to the degree of consistency between the items used by the scale designer and the behavioral traits to be measured. The most commonly used method for validity testing is exploratory factor analysis, and the scale's validity is acceptable if the common factors extracted by factor analysis are very close to the behavioral traits to be measured [45].

3. Results

3.1. Reliability and Validity

The dependent variable environmental awareness was measured by a scale that included nine items. The Cronbach's α coefficient of this scale was 0.857, which shows good reliability [46]. Exploratory factor analysis was conducted to measure the construct validity. Three factors were extracted corresponding to the three dimensions of environmental awareness mentioned in Section 2.2, and the Search Results Web results Kaiser Meyer Olkin (KMO) index was 0.786. These results give evidence that the scale has good validity [46].Details are depicted in Table 2.

Table 2. Cronbach's α coefficients and factor analysis results.

Items	Components		
	Beliefs	**Values**	**Intentions**
EA1	0.753		
EA2	0.787		
EA3	0.603		
EA4		0.691	
EA5		0.720	
EA6		0.794	
EA7			0.710
EA8			0.713
EA9			0.744
% Explained variance	42.429	12.916	12.580
% Accumulated variance	42.429	55.345	67.925
Cronbach's	0.883	0.851	0.812
KMO		0.786	

3.2. Descriptive Statistics

The main variables are depicted in Table 3. The mean of the father's education level was 2.95, higher than that of mother. Seventy-three percent of the respondents reported that they attended curricula related to environmental issues that their institutions offered, while 62% students actively took part in plans and practices related to environmental protection. The mean of students' environmental awareness was 3.829, indicating that students had relatively high environmental awareness.

Table 3. Descriptive statistics of main variables.

Variables	Minimum	Maximum	Mean	Standard Deviation
ME	1	6	2.55	1.435
FE	1	6	2.95	1.475
EC	1	3	2.05	0.512
Gender	0	1	0.52	0.494
TCP	0	1	0.73	0.447
SDP	0	1	0.62	0.443
EA	1.67	5	3.829	0.454

Note: ME = mother's education level, FE = father's education level, EC = family economic condition, TCP = teacher-driven pedagogy, SDP = student-driven pedagogy, EA = environmental awareness.

3.3. Effect of Environmental Education

Matching methods can be divided into one-to-one matching, k-nearest neighbor matching and nuclear matching. Each of the matching methods has no discrimination in terms of good or bad [33]. To maximize the retention of sample data, one-to-one matching was used in this article. Since there are two pedagogies mentioned in this article, namely, teacher-driven pedagogy and student-driven pedagogy, the effects were depicted separately.

3.3.1. The Effect of Teacher-Driven Pedagogy

Setting teacher-driven pedagogy as the dependent variable in Formula (1), the logit regression result is depicted as Model 1 in Table 4. The results show that the mother's education level could significantly influence the student's course selection in college. If the mother's education level was high, the student's propensity to attend environmental courses was high. However, other factors, such as the father's education level and family economic condition, had no significant effects on the student's environmental course selection. Gender did not affect college students' course selection, either.

Table 4. Logit regression results.

	Model 1					Model 2				
	B	S.D.	Wald	Sig.	E(B)	B	S.D.	Wald	Sig.	E(B)
Intercept	1.805	0.591	0.342	0.002	6.082	2.089	0.622	11.277	0.001	8.074
Gender	−0.018	0.214	0.007	0.932	0.982	0.022	0.225	0.009	0.924	1.022
ME	0.757	0.267	8.005	0.005	2.132	1.573	0.272	33.482	0.000	4.822
FE	0.127	0.279	0.208	0.648	1.136	−1.189	0.306	15.131	0.000	0.305
EC	−0.518	0.222	0.509	0.475	0.854	−0.522	0.233	5.028	0.025	0.593

Note: ME = mother's education level, FE = father's education level, EC = family economic condition, S.D. = standard deviation, Sig. = significance level.

The propensity value of each student was calculated based on the logit regression. Participating students were matched with nonparticipating students if their propensity values were close (tolerance = 0.002); 133 paired samples were retained. Among them, 27 pairs were perfectly matched, and 106 pairs were fuzzy matched. The average environmental awareness of participating students was 3.920, while that of nonparticipating students was 3.608. The $\hat{ATT}$ value was 0.312. A further

paired sample *t*-test shows that the difference was significant. The positive effect of teacher-driven pedagogy on students' environmental awareness was confirmed. For more details, see Table 5.

Table 5. The comparison results for paired samples.

	Teacher-Driven Pedagogy		**Student-Driven Pedagogy**	
	Participation	**Nonparticipation**	**Participation**	**Nonparticipation**
Mean	3.920	3.608	3.955	3.633
Standard deviation	0.381	0.474	0.394	0.330
ATT	0.312		0.322	
95% confidential interval	(0.208, 0.415)		(0.228, 0.418)	
t-test	5.913		6.699	
Significance level	0.000		0.000	

3.3.2. The Effect of Student-Driven Pedagogy

Model 2 in Table 4 depicts the logit regression results with student-driven pedagogy as the dependent variable. The results show that the mother's education level, father's education level and family economic condition could all influence the student's participation in student-driven plans significantly. There was still no difference between males and females.

Students that freely carried out environmental plans were matched with those who did not if their propensity values were close (tolerance = 0.002); 114 paired samples were retained. Among them, 31 pairs were perfectly matched, and 83 pairs were fuzzy matched. The average environmental awareness of participating students was 3.955, while that of nonparticipating students was 3.633. The $\hat{ATT}$ value was 0.322. A further paired sample *t*-test shows that the difference was significant. The positive effect of student-driven pedagogy on students' environmental awareness was confirmed. For more details, see Table 5.

3.3.3. A Comparison between Teacher-Driven Pedagogy and Student-Driven Pedagogy

The results above show that the marginal effect of student-driven pedagogy on students' environmental awareness was 0.322, a little higher than that of teacher-driven pedagogy, which was 0.312. In order to test the robustness of this result, the bootstrap method was employed to calculate the confidence interval of the difference between these two marginal effects (draw 5000 times randomly with a confidential level of 95%). A confidential interval located on the right side of zero was gotten, verifying a higher marginal effect of student-driven pedagogy.

4. Discussion and Implications

4.1. Discussion

Firstly, results of the covariances are discussed. The father's education level was higher than that of the mother generally in our sample. We attribute this phenomenon to Chinese culture. Chinese culture is far from androgynous, and gender inequality does exist [3]. It is usually the strong men and the weak women in the Chinese traditional concept, and women are inclined to look for more educated spouses.

The mother's education level could affect both participation in teacher-driven courses and student-driven practices. This implies that the influence of mothers on their children is comprehensive, including passive knowledge learning and active exploration. The father's education level could only affect participation in student-driven practices. This suggests that fathers have an important influence on the development of children's operational and exploratory capabilities. The results show how parents influence their children differently. We also attribute this phenomenon to the traditional culture in China. Chinese families always have the tradition that men go out and women stay in. Mothers spend more time with their children and have a broader impact than fathers, while fathers influence children's practical abilities more [47]. Family economic condition could only

affect student-driven practices. Teacher-driven pedagogy has been the norm for decades, regardless of the family's economic circumstances. The student-driven pedagogy requires students to have a certain spirit of initiative and hands-on ability and has a certain threshold for the basic quality of students. Therefore, students with good family conditions are more inclined to take part.

Secondly, the status quo of teacher-driven pedagogy is discussed. More than 70% of college students in our sample took environmental courses their colleges offered, almost all in the form of classroom teaching. This is not a high participation rate given the general social and public demand for sustainable development. Among the students involved in environmental courses, 55% indicated that they had modules related to sustainable development in a certain course, and 69% of students demonstrated that knowledge regarding sustainable development was mixed with their existing courses, but only 43% of students stated that they had a specific environmental curriculum. The above data show the non universality of environmental courses in China's provincial universities. The possible explanations for this phenomenon may be as follows. On the one hand, the rigidity of the governance system of Chinese universities makes schools have less autonomy in updating the curriculum, resulting in a slow update rate. On the other hand, the high energy expenditure in updating and setting up new courses and the lack of corresponding incentive measures generate insufficient motivation in teachers, even in the context in which environmental issues have received greater attention [22].

Then, the status quo of student-driven pedagogy is discussed. Nearly 60% of the respondents have freely taken part in environmental plans. A popular environmental social practice in China is the National Energy Conservation and Emissions Reduction Competition for college students (NECERC). Students can submit their creative inventions or investigations on environmental issues. This competition is held once a year. Students participate spontaneously as a team. Success in the competition helps students apply for scholarships and find jobs. College students are highly motivated to take part in the competition. It will take these students about half a year's spare time to prepare for the competition. During the preparing process, students go into the community, collect data, look for problems and explore countermeasures. Other examples of these student-driven practices include initiatives that focus on changing college students' behavior for the benefit of decreasing their carbon footprint [19,23].

Lastly, a comparison of the effects of these two pedagogies is discussed. The change agents in teacher-driven pedagogy are teachers. Teachers have the responsibility to design and update their teaching content and focus on knowledge transfer, while the learners are always passive recipients [30]. The change agents in student-driven pedagogy are students. When students freely participate in environmental plans, they usually form teams, choose their topics, collect materials and design research methods. They also turn to their teachers for help spontaneously. Students have a higher degree of autonomy during the learning process [28]. When adopting a student-driven pedagogy, students play an active role. In the process of selecting topics, they will consult a large number of news reports and research materials to deepen their understanding of environmental issues. In order to solve these environmental problems, they need to conduct social research and experiments, which in turn provide an opportunity to train their professional skills. Thus, students become transformative thinkers capable of futures thinking [29]. The effect of this kind of learning is better than the indoctrination of classroom knowledge. Our research supports the standpoint of Murray, who states that the active involvement of students is essential in cultivating talents for sustainable development [35]. The results also respond to Ely's appeal for a move from memorizing knowledge to the ability to apply knowledge to new policy problems [23].

4.2. Implications

Considering the conclusions and research background, we can get the following implications.

Environmental education does play an important role in cultivating college students' environmental awareness. The responsibility of higher education institutions in environmental education is to cultivate students' environmental morality and reserve of environmental knowledge

for their future career. System wide and transformative change in higher education institutions is a prerequisite in order to facilitate sustainability.

Firstly, colleges and universities should highlight the goal of green talent cultivation. However, compared with first-class universities such as Tsinghua University, provincial universities still have much work to do, which calls for a corresponding adaptation in terms of the environmental statement on talent cultivation. Secondly, the incorporation of environmental issues into the academic curriculum is urgent, and interaction among different disciplines is imperative. Considering the complexity of environmental issues, it is indispensable for universities to break down the barriers between colleges and disciplines and encourage interdisciplinary integration to set up environmental courses. The political regime in China is highly centralized. This hierarchical character is embedded in the governance of higher education institutions [23]. Higher education institutions are often divided into discipline departments with little cooperation. These traits contradict the requirements for environmental education. Therefore, a holistic and integrative perspective is required. Thirdly, measures that encourage teachers to develop environmental curricula should be introduced. Most teachers in China are motivation-oriented. Affected by the extant performance assessment indicators, college teachers attach most of their attention to scientific research and paper writing, treating curriculum development as a waste of time and ignoring students' cultivation. Therefore, measures that encourage teachers to develop environmental curricula should be introduced.

The effect of student-driven pedagogy is better than that of teacher-driven pedagogy. It infers that students' engagement is fundamental to environmental education [35]. However, the students who participate in student-driven pedagogy are still fewer compared with those participating in teacher-driven pedagogy. Not only intrinsic enthusiasm but also extrinsic incentives are vital for the success of students' engagement [28]. Support from the institutional level is conducive to this, which can be proved by the success of NECERC. As mentioned above, it is a national competition sponsored by the Higher Education Department of the Ministry of Education, and 12 sessions have been held with advocates from hundreds of universities in mainland China since its launch in 2008. Besides the institutional support, teachers' collaboration is also indispensable. It helps overcome the challenges that students encounter.

The sample data were from Qingdao, a coastal city in East China. Due to the regional economic differences in China, universities in the eastern region are superior to those in the central and western regions in terms of resources and campus literature. Therefore, the research samples may restrict the generalization of our findings. Universities play many roles in sustainable development, such as teaching, research, outreach and operations [48]. Our study only focuses on pedagogy and does not touch upon other aspects. Considering the important responsibility shouldered by universities in talent cultivation, more extensive research is required in the future to provide guidance for practice.

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Appendix A

Table A1. Survey items.

Variables	Items	Scale
Environmental awareness	EA1: I should dedicate my strength to environmental protection. EA2: I believe that nature can be conquered and controlled.(reverse item) EA3: It is my responsibility to realize the sustainable development of society.	1 = strongly disagree 2 = disagree 3 = do not care 4 = agree 5 = strongly agree

Table A1. *Cont.*

Variables	Items	Scale
	EA4: I will prefer environmentally friendly products for consumption if conditions permit. EA5: I carry shopping bags with me when shopping. EA6: Saving water and electricity is a trivial matter in life that requires no special attention.(reverse item) EA7: The environmental impact of a company will be one of the important factors when I choose a job in the future. EA8: I will gradually change my living habits to meet the needs of sustainable development. EA9: I will take initiatives to promote an environmental philosophy to my family and friends.	
Teacher-driven pedagogy	Do you select any curriculum or lectures that your college prepares for you that relate to environmental protection, including independent courses or the integration of relevant content within a course?	0 = no 1 = yes
Student-driven pedagogy	Do you freely carry out or participate in a plan related to environmental issues (by yourself or in a team), such as environmental investigation, environmental design and other social activities?	0 = no 1 = yes
Gender	What is your gender?	0 = female 1 = male
Mother's education level	What is your mother's education level?	1 = primary school 2 = junior high school 3 = senior high school 4 = junior college 5 = undergraduate 6 = graduate
Father's education level	What is your father's education level?	
Economic condition	How about your family economic condition?	1 = poor 2 = normal 3 = better
Year of study	What is your year of study?	1 = freshman 2 = sophomore 3 = junior 4 = senior
Discipline	What is your discipline?	1 = engineering 2 = science 3 = economics 4 = management 5 = arts 6 = law 7 = others

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