



Environmental attitudes of Chinese students in higher education institutions

Xiaoyao Yue¹

Weichi Wanglee²

Ying Yin³

Yan Ye⁴

Ting Cai⁵



(✉ Corresponding Author)

^{1,2,3,4,5} Graduate School of Education, Stamford International University, Bangkok, Thailand.

¹Email: sandyue.xiaoyao@gmail.com

²Email: bestqinli@163.com

³Email: 2012230022@students.stamford.edu

⁴Email: yan.ye@stamford.edu

⁵Email: vvian0719c@gmail.com

Abstract

This study investigates the influence of environmental attitudes of Chinese students in higher education institutions (HEIs). It included 988 students at ten higher education institutions and administered an "environmental attitudes inventory" questionnaire to investigate gender, grade level of study, institution level, parental educational background, scholarships, annual household income, students' leadership experience and the extent to which variables such as participation in environment-related courses affect students' attitudes towards the environment. Furthermore, the study relied on descriptive and analytical methods. The results show significant differences in grade, school level and parents' educational backgrounds on students' environmental attitudes. In contrast, gender, scholarship, annual family income and student leader experience related to the environment did not appear as significant factors. This paper suggests that education policymakers incorporate these influences into a vision of environmental educational reform to inform the remedial actions needed by higher education institutions.

Keywords: Environmental attitudes inventory, Environmental attitudes, Environmental education, Higher education institutions, Students' environmental attitudes.

Citation | Yue, X., Wanglee, W., Yin, Y., Ye, Y., & Cai, T. (2023). Environmental attitudes of Chinese students in higher education institutions. *Journal of Education and E-Learning Research*, 10(2), 165-174. 10.20448/jeelr.v10i2.4491

History:

Received: 12 December 2022

Revised: 25 January 2023

Accepted: 6 February 2023

Published: 23 February 2023

Licensed: This work is licensed under a Creative Commons

Attribution 4.0 License

Publisher: Asian Online Journal Publishing Group

Funding: This study received no specific financial support.

Authors' Contributions: All authors contributed equally to the conception and design of the study.

Competing Interests: The authors declare that they have no conflict of interest.

Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.

Ethical: This study followed all ethical practices during writing.

Contents

1. Introduction	166
2. Literature Review	166
3. Method	167
4. Results	168
5. Discussion.....	171
6. Conclusion	173
References.....	173

Contribution of this paper to the literature

This study fills the gaps in the theory of the environmental attitudes of students in Chinese higher education institutions. It provides empirical evidence for the study of the environmental attitudes of college students.

1. Introduction

In recent years, research related to environmental problems has been polarized. Conservatives face policies intended to preserve the environment and liberals position themselves as guardians of the climate (Feinberg & Willer, 2012). It is reasonable to consider that people's environmental behaviors often cause ecological issues. People's environmental attitudes and behaviors are as important as enhancing pro-environmental behaviors through exploring reforms (Casaló & Escario, 2018).

Environmental attitudes have been noticeable in the literature on ecological psychology. Newhouse (1991) stated that environmental attitudes are formed from life experiences rather than exposure to any specific course or program. According to Ernst, Blood, and Beery (2015), environmental attitudes refer to taking environmental action (Ernst et al., 2015). Moreover, environmental attitudes could also be regarded as a form of psychological inclination indicated by assessing the environment for levels of like or dislike (Milfont, 2007; Milfont & Duckitt, 2010). Environmental attitudes are difficult to operate and theorize as they are a crucial concept in environmental behavior. Irresponsible environmental behavior is the basis for most environmental issues and problems. One of the most important influences on behavior is attitude (Bradley, Waliczek, & Zajicek, 1999). Over the past several decades, China has become an economic power globally. Still, the country's economy has brought about severe environmental problems (Gu, Gao, Wang, Jiang, & Xu, 2018; Yu, 2014). This study investigated student environmental attitudes at Chinese HEIs. Furthermore, a multi-group analysis was applied to identify differences in students' environmental attitudes based on their demographic characteristics.

2. Literature Review

2.1. Environmental Attitudes

Environmental attitudes refer to personal interests and sensitivities that are influenced by severe and consistent commitment, responses and activities. (Alföldi & Alföldi, 2019; Gifford & Sussman, 2012). Environmental attitude is influenced by multiple factors such as perception, cognitive ability, rational and emotional motivation-driven information decision-making and it is significantly influenced by gender, age, substance, socioeconomic status as well as experience, quality of education, cultural, religious and other spiritual influences (Kuvac & Koc, 2019).

Since environmental attitudes are overwhelmingly based on people's cognitive level, the number of studies on ecological perspectives has increased in recent years. Numerous studies have investigated participants' current environmental attitudes. For example, Strong (1998) pointed out that sensitivity to ecological states is formed in childhood and is high if one lives a near-natural lifestyle. Kellert (1996) studied the increase in ecological and moral values based on the previously acquired knowledge of adolescents (13-17 age range) in his ecopsychological research. White and Stoecklin (2008) observed an increased social sensitivity at the age of 12. Yilmaz, Boone, and Andersen (2004) found gender differences when assessing primary school students' environmental attitudes. Levine and Strube (2012) found that college students moderately prefer tolerable explicit attitudes, intentions and behaviors. Furthermore, their findings showed that explicit attitude dominated the effect of intention were strongly associated with self-reported behavior. Ugulu, Sahin, and Baslar (2013) observed that girls (13 to 17 years) had higher environmental attitudes than boys. Saricam (2014) showed that men and women did not differ in their perception of the environment but their relationship to nature appeared to vary significantly (Alföldi & Alföldi, 2019).

There are many benefits to humans from being in contact with nature: the closer people are to nature, the more they have the ability to develop rich cognitive and emotional relationships. According to Christmas, Wright, Morris, Watson, and Miskelly (2013), "we all live in an ecosystem, i.e., nature does not just happen 'out there.'" Nature can be a source of well-being (Alföldi & Alföldi, 2019; Nisbet & Zelenski, 2011; Nisbete & Zelenskijm, 2009). For example, developing a close relationship with nature from early childhood can depend on frequent and profound experiences in healthy natural environment (Alföldi & Alföldi, 2019; Thompson, Aspinall, & Montarzino, 2007) and outdoor walking activities can help to establish natural kinship (Nisbet & Zelenski, 2011). These positive effects promote environmentally conscious attitudes and pro-environmental behaviors (Alföldi & Alföldi, 2019; Nisbet & Zelenski, 2011). However, knowledge and environmental questions do not necessarily predict environmental behavior (Alföldi & Alföldi, 2019; Nisbete & Zelenskijm, 2009).

Environmental education can be effective in changing human perceptions, attitudes and conservation of nature (Pontes-da-Silva, Pacheco, Pequeno, Franklin, & Kaefer, 2016). According to Capra (2007), making teachers and students more active in ecological practice will improve ecological literacy, strengthen conservation practices and create new approaches. Creative environmental education programs have implications for professionals including changes in human awareness and attitudes towards ethical behavior (Alföldi & Alföldi, 2019; Nates Jimenez & Lindemann-Matthies, 2015).

Therefore, looking at the current state of interest, attitudes and values towards the environment and monitoring changes in the environment through environmental expressions are considered necessary steps and behaviors to understand how educational experiences contribute to ecological commitment. It is essential for future research in well-known new approaches to science education development (Sutton & Gyuris, 2015).

2.2. Environmental Education

Over the past few decades, policymakers, funders, nonprofit leaders and others have provided evidence that environmental education can improve environmental quality.(Ardoin, 2019; Johnson, 2013). Several researchers and practitioners have also highlighted the relationship between the impact of ecological educators' investigations

and direct environmental outcomes. For example, improving air quality, eradicating invasive species or increasing populations of targeted threatened species. At the same time, stakeholders have also highlighted support for such contribution processes, understanding the finer-grained mechanisms (Ardoin, 2019; Johnson, Duffin, & Murphy, 2012) and accusing the nature of embedded relationships (Ardoin, Clark, & Kelsey, 2013; Ardoin, 2019; Toomey, Knight, & Barlow, 2017).

Environmental education (EE) has long been recognized as crucial to improve world ecosystems (Unesco, 1978). These initiatives support various activities selected or designed by teachers and students to enhance students' general environmental knowledge, attitudes and behaviors. In studies of these effective emotional expression initiatives, most participants were given techniques to facilitate learning content, learning strategies or skills more suited to standard design (Bergman, 2016; Rickinson, 2001). However, teachers and students enthusiasm strongly influences emotional expression outcomes. In addition, the inclusion of relevant topic is considered a fundamental foundation for practical and emotional expression (Bergman, 2016; North American Association for Environmental Education (NAAEE), 2004), requiring flexible curriculum applicable to projects spanning extensive geographic areas. Thus, variability in emotional expression experiences may continue to be an essential attribute of many initiatives funding emotional expression across many schools (Bergman, 2016).

The researchers looked at the outcomes of environmental education in different contexts. In a review of 206 residential environmental education programs, Ardoin, Biedenweg, and O'Connor (2015) found and expected outcomes to include environmental awareness, attitudes, skills and behaviors including civic engagement. A review of 66 studies evaluating environmental education programs for adolescents by Stern, Powell, and Hill (2014) found that they were positively associated with outcomes of knowledge, awareness, skills, attitudes and intentions. Ardoin, Bowers, Roth, and Holthuis (2018) reviewed 119 studies on K-12 environmental education programs and reported 121 discrete outcomes categorized into knowledge domains, personality, abilities, behaviors and personal characteristics. Monroe, Plate, Oxarart, Bowers, and Chaves (2019) described these items measuring knowledge, attitudes and behaviors in their systematic review of environmental education. Thomas, Teel, Bruyere, and Laurence (2019) reported cognitive, behavioral, social and ecological outcomes in their evaluation of 79 environmental education programs. He also discussed the need to improve the relationship between the environmental issues addressed by the project, the measurement of project effectiveness and the actual reported results. The aforementioned findings suggest a range of expected outcomes for environmental education but there are also few programs that articulate environmental quality or conservation improvement goals. Environmental education programs are often designed to influence knowledge, attitudes and behaviors rather than document direct ecological impacts (Ardoin, 2019).

Environmental education can provide opportunities for scientists, policymakers, community members and other stakeholders to communicate together as it is a conservation strategy that creates collaborative spaces. Environmental education is usually based on the local environment such as local knowledge, experience, values, and practices. In this way, many groups are encouraged to be effectively included in the research (Ardoin, 2019; Toomey et al., 2017). Actions should be taken to eliminate complexities in environmental education such as methods, programs and tools that foster and support environment-related attitudes, values, awareness, knowledge and skills (Ardoin, 2019; Monroe & Krasny, 2016; Unesco, 1978). The results of the educational environment concern scale are also different such as at the individual level (individual environmental attitudes or behaviors), the social level (community capacity building) and the ecosystem level (the number of endangered species, etc.).

2.3. The Problem

The aforementioned discussion indicates that understanding student' environmental attitudes and topic is significant focusing on students' environmental attitudes. To investigate Chinese' students' environmental attitudes, the following two questions were raised:

1. To what extent are student environmental attitudes in HEIs of China?
2. Is there any significant difference in student environmental attitudes concerning their gender, grade, institutional level, parent education background whether they won a scholarship, family year income, whether they were student leaders and whether they attended environment-related curriculum?

3. Method

3.1. Approval by the Ethics Committee

The participants of this study were reviewed and approved by the Sichuan Institute of Technology, Inner Mongolia Art College, Xing an Music Branch of Inner Mongolia Normal University, Hunan Institute of Humanities and Science, Hunan Shao yang College, Hunan City College, Guangdong Huizhou Vocational and Technical College of Economics and Hunan Vocational and technical college. These ten HEIs do not allow for the display of their names in this study.

3.2. Consent Procedures

Written informed consent to participate in this study was provided by the students and teachers in these ten HEIs.

3.3. Research Design

A well-transcribed Likert scale was used to measure the Chinese students' environmental attitudes. As stated by Lunenburg and Irby (2008), a "descriptive research study" is a basic form of research that involves the description of a phenomenon in the world. The 'environmental attitudes inventory' (EAI) created by Milfont and Duckitt (2010) was administered to 988 students across 10 HEIs in five provinces of China.

3.4. Participants

The study participants included 988 students (754 female and 234 male) from 10 HEIs (including eight universities and two college schools) in five provinces of China. A convenience sampling method was used for the data collection. The participants were divided into four groups according to their current study level.

3.5. Instrumentation

The questionnaire used in this study is a transcribed Chinese version of the Environmental Attitudes Inventory (EAI) scale, initially developed by Milfont and Duckitt (2010). The questionnaire has two sections: demographic information and subscales to measure students' environmental attitudes. The questionnaire used a seven-point Likert scale ranging from "strongly disagree" to "strongly agree." This study examines twelve dimensions of environmental perspectives: (1) enjoyment of nature (2) support for and intervention in conservationist policies (3) focus on radical environmental activism (4) focus on and drive for anthropocentric conservation (5) confidence in science and technology (6) concern about the fragility of the environment (7) support for people to change nature (8) concern for individual conservation behavior (9) concern for people's domination of nature (10) support for people's use of nature (11) focus on ecological centers (12) focus on population growth policies. Each dimension had six indicators to be demonstrated. The total score of the six indicators in each size presented the levels of students' environmental attitudes.

The total score of Cronbach's alpha was used to test the reliability of EAI. According to Milfont and Duckitt (2010), the values of Cronbach's alpha ranged from 0.63-0.87.

3.6. Data Analysis

After data collection, descriptive and inferential statistical analysis will be performed on the data with SPSS software. First, descriptive statistics will present the results of each variable's frequency, percentage, mean, standard deviation and the dimension of students' environmental attitudes. Second, t-test results are presented for one sample to explain the first research question. Finally, the second research question is answered which will be deal with an independent samples t-test, a one-way ANOVA and Duncan's post hoc test.

4. Results

Table 1 shows the results of the demographic information. The number of female students participating in this study was far greater than the number of male students who accounted for 76.3% of the whole population.

Table 1. Frequency and percentage of the variables of the study

Variables	Categories	Frequency	Percentage	Cumulative percentage
Gender	Male	234	23.7	23.7
	Female	754	76.3	100.0
Institutional level	University	750	75.9	75.9
	Vocational college	238	24.1	100.0
Grade	Freshman	176	17.8	17.8
	Sophomore	484	49.0	66.8
	Junior	216	21.9	88.7
	Senior	112	11.3	100.0
Parents education Background	Below high school	525	53.1	53.1
	High school	303	30.7	83.8
	Higher education	160	16.2	100.0
Whether they won scholarship	Yes	176	17.8	17.8
	No	812	82.2	100.0
Family annual income	0- 50 Thousand Yuan	649	65.7	65.7
	51-100 Thousand Yuan	234	23.7	89.4
	101-150 Thousand Yuan	59	6.0	95.3
	More than 151 thousand Yuan	46	4.7	100.0
Whether they were student leaders	Yes	417	42.2	42.2
	No	571	57.8	100.0
Whether they attended environment related-curriculum	Yes	432	43.7	43.7
	No	556	56.3	100.0

Most students were from universities (N=750, 75.9%) and only a few came from vocational colleges (N=238, 24.1%). The number of students in second-year study accounted for nearly half of the population (N=484, 49%). First year and fourth year students accounted for 176 (17.8%) and 112 (11.3%). The number of third-year students were less than the second-year taking up 21.9% (N=216).

As for the parents education background, nearly half of student's parents have not accepted high school education (N=525, 53.1%) while the other half accepted (N=303, 30.7%). Most students (N=812, 82.2%) needed experience to get scholarships. The annual family income indicated that 65.7% of families have low-incomes. Their yearly income is less than fifty thousand. Interestingly, the proportional distribution of whether students were leaders and whether they enrolled in any environment-related courses was the same.

The mean and standard deviations of each dimension are provided in Table 2. The highest mean score was on the enjoyment of nature dimension (mean= 5.37, SD = 0.970). The personal conservation behavior dimension (mean . 5.24, SD .1.065), the environmental movement activism dimension (mean.5.22, SD.0.968), ecocentric concern dimension (mean. 4.78, SD. 0.757), the environmental fragility dimension (mean . 4.71, SD. 0.850), the support for interventionist conservation policies dimension (mean.4.58, SD.0.841), support for population growth policies dimension (mean . 4.44, SD. 0.808), confidence in science and technology dimension (mean 0.4.39, SD. 0.779), conservation motivated by anthropocentric concern dimension (mean. 3.82, SD. 0.705), altering nature

dimension (mean . 3.49, SD. 0.752) and the human utilization of nature dimension (mean . 3.22, SD. 0.923). The lowest mean score was on the human dominance over nature dimension (mean= 2.86, SD. 1.088). Additionally, this table showed the overall students' environmental attitudes with a mean score of 4.34 (SD. 0.272).

Table 2. the mean subscale scores and standard deviations of each dimension.

Mean	SD	Dimensions
5.37	0.970	Enjoyment of nature
4.58	0.841	Support for interventionist conservation policies
5.22	0.968	Environmental movement activism
3.82	0.705	Conservation motivated by anthropocentric concern
4.39	0.799	Confidence in science and technology
4.71	0.850	Environmental fragility
3.49	0.752	Altering nature
5.24	1.065	Personal conservation behavior
2.86	1.088	Human dominance over nature
3.22	0.923	Human utilization of nature
4.78	0.757	Ecocentric concern
4.44	0.808	Support for population growth policies
4.34	0.272	Overall

When analyzing students' environmental attitudes using descriptive statistics frequency and percentage are used for each dimension calculation. Table 3 shows the specific analysis results which are as follows: 8.4% of the participants chose "strongly disagree", 13.4% chose "disagree",9.9% chose "somewhat disagree", 20.8% did not disagree, 12.8% chose "somewhat agree, " 12.2% of the participants selected the " agree" option and 13.6% preferred the " strongly agree" option. Therefore, the option " neither agree nor disagree" has the highest percentage among the seven options (see Table 3).

The data results in Table 4 show that the students' environmental attitudes remain moderate with an average score of around 4.3. It can be seen from the table that there is no significant difference between universities and vocational colleges. In addition, according to the significance level and mean value obtained from the data, the environmental attitudes of students in universities and vocational colleges neither “agree” nor “disagree” with the above description but are closer to somewhat agreeing.

Table 3. Frequency and percentage of the selected options in the twelve dimensions of the questionnaire.

Strongly disagree		Disagree		Somewhat disagree		Neither agree or disagree		Somewhat agree		Agree		Strongly agree		Dimensions
%	F	%	F	%	F	%	F	%	F	%	F	%	F	
3.5	210	4.3	253	5.6	331	11.6	686	15.7	933	32.2	1906	27.1	1609	Enjoyment of nature
7.4	441	12.4	738	9.4%	557	17.4	1029	11.9	703	22.1	1312	19.4	1148	Support for interventionist conservation policies
2.2	132	4.1	245	3.9	233	19.7	1167	17.7	1049	33.6	1994	18.7	1108	Environmental movement activism
13.7	814	19.8	1174	12.9	766	15.9	940	10.5	625	15.9	941	11.3	668	Conservation motivated by anthropocentric concern
4.6	274	10.1	598	11.3	667	28.5	1689	16	950	20.5	1216	9	534	Confidence in science and technology
3.7	218	8.1	479	9.3	552	22.6	1342	17.9	1059	25.4	1505	13.0	772	Environmental fragility
12.7	750	20.5	1218	16.1	953	25.4	1506	10.9	647	9.8	582	4.6	272	Altering nature
2.6	156	5.4	323	5.7	337	16.8	996	12.5	739	34.8	2063	2.22	1314	Personal conservation behaviour
24.2	1435	29	1722	12.1	718	18.6	1101	6.3	374	6.5	385	3.3	193	Human dominance over nature
15.2	902	25.7	1522	15.6	922	23.9	1415	8.6	512	7.2	428	3.8	226	Human utilization of nature
6.2	370	11.1	656	6.9	411	18.6	1100	9.8	579	26.3	1558	21.2	1254	Ecocentric concern
4.1	242	9.8	578	10.1	599	30.5	1810	15.6	923	19.9	1177	10.1	599	Support for population growth policies
8.4		13.4		9.9		20.8		12.8		12.2		13.6		Total%

Table 4. Descriptive statistics and one sample t-test result for students' environmental attitudes at universities and vocational colleges.

Institutional level	N	Mean	SD	Std error mean	T	Df	Sig. (2-tailed)	Mean differences
Universities	750	4.359	0.268	0.010	445.448	749	0.000	4.359
Vocational colleges	238	4.295	0.278	0.018	239.660	237	0.000	4.295

Table 5. T-test result of students' environmental attitudes and gender.

T test for equality of means				Levene's test for equality of variances		
Mean difference	Sig. (2-tailed)	Df	T	Sig.	F	
-0.01733	0.383	986	-0.873	0.155	2.025	Equal variances assumed
-0.01733	0.399	369.78	-0.845			Equal variances not assumed

Table 6. The one-way ANOVA results for students' environmental attitudes scores and variables of grade, institutional level, parents education background, whether they won scholarships, whether they are single child family, family annual income, whether they were student leaders, whether they attended environment related- curriculum.

Sig.	F	Mean square	Df	Variables
0.007*	4.102	0.300	3	Grade
0.042*	2.417	0.170	5	Parents education background
0.002*	9.966	0.278	1	Institutional level
0.628	0.581	0.043	3	Family annual income
0.493	0.471	0.035	1	Whether they won scholarship
0.217	1.527	0.113	1	Whether they were single child family
0.677	0.174	0.013	1	Whether they were student leader
0.358	0.845	0.062	1	Whether they attended environment related curriculum

Note: *p<0.05.

Table 5 presents the t-results of students' environmental attitudes towards gender. As a result, the significance level p was 0.383>0.05 which indicated that students' ecological attitudes showed no differences in gender.

A one-way ANOVA was run to examine the differences based on the students' demographic characteristics. As shown in Table 6 concerning the significance levels obtained from variables: whether they won a scholarship, whether they were single child family, family annual income, whether they were student leaders, whether they attended an environment-related curriculum which was 0.493, 0.217, 0.628, 0.667 and 0.358, respectively. It can be claimed that there were no statistically significant differences in students' environmental attitudes with these variables. However, the significance levels of the variables: grade, institutional level and parents education background which were 0.007, 0.002, and 0.042 respectively indicated differences in students' environmental attitudes concerning gender, institutional level and parents education background that were statistically significant. To find out whether the mean scores for each variable are significantly different from each other, Dugan's post hoc test was run. The results are shown in Tables 7 and 8.

Table 7. Descriptive statistics and Dugan post hoc test results for students' environmental attitudes scores with different grade levels.

Subset for alpha. 0.05					
2	1	N	SD	Mean	Grade
4.4048		176	0.275	4.405	Freshman
	4.3314	484	0.260	4.331	Sophomore
	4.3162	216	0.284	4.316	Junior
	4.3518	112	0.279	4.352	Senior

Table 8. Descriptive statistics and Dugan post hoc test results for students' environmental attitudes scores and different parent education background.

Subset for alpha. 0.05					
2	1	N	SD	Mean	Parents education background
4.3572		525	0.269	4.357	Below high school
4.3520		303	0.273	4.352	High school
	4.2823	77	0.276	4.276	Higher education

It can be seen from Table 7 that the environmental attitudes of sophomores, juniors, and seniors are statistically at the same level. In other words, freshman environmental attitudes significantly differed from those of sophomores, juniors and seniors. In addition, Table 8 shows the impact of parents' educational backgrounds on students' environmental attitudes. Differences in the parental educational experience have significant differences in the ecology of higher education students.

5. Discussion

This study uses a questionnaire method to complete the perception of EAI student samples, aiming to investigate students' environmental attitudes. These perceptions were tested using multiple variables of demographic and ecological factors such as gender, grade, institution level, parent's educational background, whether they received a scholarship, whether they belonged to a single child family, annual household income, whether they were student leaders, whether they participated in context-related courses, etc. Furthermore,

descriptive and inferential statistical analyses were performed using SPSS (version 26.0) software and yielded exciting findings.

Table 9. Results of the t-test and a one-way ANOVA

Variable	Df	T	F	Sig.
Gender	986	-0.873	2.025	0.155
Institutional level	1	-	9.966	0.002*
Grade	3	-	4.102	0.007*
Parents education background	5	-	2.417	0.042*
Whether they won scholarship	1	-	0.471	0.493
Family annual income	3	-	0.581	0.628
Whether they were student leaders	1	-	0.174	0.677
Whether they attended environment related -curriculum	1	-	0.845	0.385

Note: *p<0.05.

According to the results of one-sample t-tests of universities and vocational colleges, the environmental attitudes of students in the sample are neither “agree” nor “disagree” but “somewhat agree.” However, the data in Table 3 shows that among the option frequency and percentage of the seven dimensions of the participants, the option “often” has the highest rate among other possibilities. This result may suggest that teachers play an important role in decision-making related to school and students.

The data in Tables 4 and 5 show the one-way ANOVA results for two levels of universities and vocational colleges. The data in Table 4 shows that the average scores of students' environmental attitudes are between 4 and 5 while the highest and lowest average scores can reach 7 and 1 respectively. According to the significance level and mean value, it can be seen that the environmental attitudes of students in universities and vocational colleges neither “agree” nor “disagree” with the above description but are closer to somewhat “agree.”

According to the average scores of the twelve dimensions of students' environmental attitudes, we can see that the highest average score is the dimension of enjoying nature and the lowest average score focuses on people's domination of nature. Other dimensions from high to low are as follows: the dimension of focusing on personal protection behavior, the dimension of focusing on radical environmental activism, the dimension of focusing on ecological centers, the dimension of focusing on environmental fragility, the dimension of supporting and intervening in protectionist policies, the dimension of concern, the dimension of population growth policy, the dimension of confidence in science and technology, the dimension of focusing on and driving anthropocentric conservation, the dimension of supporting people's efforts to change nature and the dimension of supporting people's use of nature. The dimension of enjoying nature with the highest average value indicates that students enjoy spending time in nature. Secondly, in personal conservation behavior, they advise students to pay attention to save resources and protect the environment individually through conservation behavior and prepare to actively support or participate in organized environmental movement activism. Thirdly, in focusing on the ecological center, students have some worries and feelings of emotional loss about destroying and damaging the environment and believe that the domain is fragile and easily damaged by human activities. Damage occurs all the time and they think it may soon have disastrous consequences for both nature and humans (dimension of environmental vulnerability). Fourth, in supporting and intervening in protectionist policies, students support conservation policies that regulate the industry and raw material use and want to promote and support alternative eco-friendly energy sources and practices. Fifth, in the dimension focused on population growth policies, students support policies to regulate population growth and have concerns about overpopulation. Sixth, in the dimension of confidence in science and technology, students believe that human creativity, especially the ability of science and technology will solve all environmental problems. Seventh, in a dimension that focuses on and drives anthropocentric conservation, students support anthropocentric conservation policies and environmental protection that are conservation motivated by anthropocentric concern. Eighth, in supporting people's desire to change nature, students believe that humans should have the right to change their character and transform the environment. Ninth, in the dimension of people's use of nature, students do not think economic growth and development should take precedence over environmental protection. Finally, in the dimension concerned with people's domination of nature, students argue that nature exists primarily for human use.

From Table 9, we can see that the value of $p < .05$ in the gender variable. A statistically significant difference between the participants' gender and the students' environmental attitudes do not have influence and they are not necessarily restricted by gender.

Similarly, there was no statistically significant difference in students' environmental attitudes concerning whether they won a scholarship. This finding indicates that scholarship does not depend on age. As for family annual income, students' environmental attitudes regarding whether they attended an environment-related curriculum and student leaders, there was no statistically significant difference in students' environmental attitudes.

However, as shown in Table 9 concerning institutional level, grade and parents educational level, the values of F are significant at a threshold of $p < .05$ at levels of 0.002, 0.007, and 0.042, respectively. Therefore, it can be claimed that there are statistically significant differences in students' environmental attitudes concerning their institutional level, grade and parents education level. These findings reflect that students' ecological attitudes may correlate with their institutional level, rates and parent education level.

Concerning students' environmental attitudes at the institutional level, the overall students' ecological attitudes mean scores for university and vocational college which were 4.359 and 4.295, respectively demonstrated that with the increase in educational level, the mean score of students' environmental attitudes decreased.

Results obtained from the Dugan post hoc test and from comparing the mean scores reveal that student parents with higher education are different from parents with high school and below high school education. In this study, when students had parents with higher education, they expressed a lower degree of favor for the natural environment.

Regarding the relationship between students' environmental attitudes and grades, the mean scores and Duncan post hoc test results show significant differences between students in other grades and first-year students which shows that first-year students prefer a natural environment.

6. Conclusion

The educational system has the potential to change students' environmental attitudes. There is still a long way to develop ecological education. The results of this study not only attracted widespread attention but also contributed to the corpus of literature on students' environmental attitudes. Moreover, this study provides educational decision-makers with information about Chinese students' environmental attitudes. More specifically, the results of this study provide educational policymakers with insight into factors that may or may not influence students' environmental attitudes. Educational policymakers can expand these influences into a vision for ecological education reform and inform the remedial actions needed by higher education institutions. Therefore, the findings of this study may lead to better outcomes in environmental education.

References

- Alföldi, Z., & Alföldi, P. (2019). Environmental attitudes of Hungarian students and the prospects for environmental education. *Ecocycles*, 5(1), 19-25. <https://doi.org/10.19040/ecocycles.v5i1.134>
- Ardoin, N. M., Biedenweg, K., & O'Connor, K. (2015). Evaluation in residential environmental education: An applied literature review of intermediary outcomes. *Applied Environmental Education & Communication*, 14(1), 43-56. <https://doi.org/10.1080/1533015X.2015.1013225>
- Ardoin, N. M., Bowers, A. W., Roth, N. W., & Holthuis, N. (2018). Environmental education and K-12 student outcomes: A review and analysis of research. *The Journal of Environmental Education*, 49(1), 1-17. <https://doi.org/10.1080/00958964.2017.1366155>
- Ardoin, N. M., Clark, C., & Kelsey, E. (2013). An exploration of future trends in environmental education research. *Environmental Education Research*(499-520). <https://doi.org/10.1080/13504622.2012.709823>
- Ardoin, S. (2019). *Straddling class in the academy: 26 stories of students, administrators, and faculty from poor and working-class backgrounds and their compelling lessons for higher education policy and practice*. Stylus Publishing, LLC.
- Bergman, B. G. (2016). Assessing impacts of locally designed environmental education projects on students' environmental attitudes, awareness, and intention to act. *Environmental Education Research*, 22(4), 480-503. <https://doi.org/10.1080/13504622.2014.999225>
- Bradley, J. C., Waliczek, T. M., & Zajicek, J. M. (1999). Relationship between environmental knowledge and environmental attitude of light school students. *The Journal of Environmental Education*, 30(3), 17-21. <http://dx.doi.org/10.1080/00958969909601873>
- Capra, F. (2007). Sustainable living, ecological literacy, and the breath of life. *Canadian Journal of Environmental Education*, 12(1), 9-18.
- Casaló, L. V., & Escario, J.-J. (2018). Heterogeneity in the association between environmental attitudes and pro-environmental behavior: A multilevel regression approach. *Journal of Cleaner Production*, 175, 155-163. <https://doi.org/10.1016/j.jclepro.2017.11.237>
- Christmas, S., Wright, L., Morris, L., Watson, A., & Miskelly, C. (2013). *Engaging people in biodiversity issues: Final report of the biodiversity segmentation scoping study*. Simon Christmas Ltd. Retrieved from <https://gybinfo.files.wordpress.com/2014/07/1998-08-engaging-the-public-on-biodiversity.pdf>
- Ernst, J., Blood, N., & Beery, T. (2015). Environmental action and student environmental leaders: Exploring the influence of environmental attitudes, locus of control, and sense of personal responsibility. *Environmental Education Research*, 23(2), 149-175. <https://doi.org/10.1080/13504622.2015.1068278>
- Feinberg, M., & Willer, R. (2012). The moral roots of environmental attitudes. *Psychological Science*, 24(1), 56-62. <https://doi.org/10.1177/0956797612449177>
- Gifford, R., & Sussman, R. (2012). *The Oxford handbook of environmental and conservation psychology* Ed.: S.D. Clayton. New York: Oxford University Press.
- Gu, D., Gao, S., Wang, R., Jiang, J., & Xu, Y. (2018). The negative associations between materialism and pro-environmental attitudes and behaviors: Individual and regional evidence from China. *Environment and Behavior*, 52(6), 611-638. <https://doi.org/10.1177/0013916518811902>
- Johnson, B. (2013). *Can education improve the environment? Applying the pressure-state-response environmental indicator framework to environmental education program outcomes*. Antioch University Doctoral Dissertation.
- Johnson, B., Duffin, M., & Murphy, M. (2012). Quantifying a relationship between place-based learning and environmental quality. *Environmental Education Research*, 18(5), 609-624. <https://doi.org/10.1080/13504622.2011.640748>
- Kellert, S. R. (1996). *The value of life*. Washington, D.C. USA Island Press.
- Kuvac, M., & Koc, I. (2019). The effect of problem-based learning on the environmental attitudes of preservice science teachers. *Educational Studies*, 45(1), 72-94. <https://doi.org/10.1080/03055698.2018.1443795>
- Levine, D. S., & Strube, M. J. (2012). Environmental attitudes, knowledge, intentions and behaviors among college students. *The Journal of Social Psychology*, 152(3), 308-326. <https://doi.org/10.1080/00224545.2011.604363>
- Lunenburg, F. C., & Irby, B. J. (2008). *Writing a successful thesis or dissertation: Tips and strategies for students in the social and behavioral sciences*. Thousand Oaks, CA: Corwin Press.
- Marcinkowski, T., & Reid, A. (2019). Reviews of research on the attitude-behavior relationship and their implications for future environmental education research. *Environmental Education Research*, 25(4), 459-471. <https://doi.org/10.1080/13504622.2019.1634237>
- Milfont, T. L. (2007). *Psychology of environmental attitudes: A cross-cultural study of their content and structure*. Unpublished Doctoral Dissertation, University of Auckland, Auckland, New Zealand.
- Milfont, T. L., & Duckitt, J. (2010). The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology*, 30(1), 80-94. <https://doi.org/10.1016/j.jenvp.2009.09.001>
- Monroe, M. C., & Krasny, M. E. (2016). *Across the spectrum: Resources for environmental education* (3rd ed.). Washington, DC: North American Association for Environmental Education.
- Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A., & Chaves, W. A. (2019). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research*, 25(6), 791-812. <https://doi.org/10.1080/13504622.2017.1360842>
- Nates Jimenez, J., & Lindemann-Matthies, P. (2015). Public knowledge of, and attitudes to, frogs in Colombia. *Anthrozoos*, 28(2), 319-332. <https://doi.org/10.1080/08927936.2015.11435405>
- Newhouse, N. (1991). Implications of attitude and behavior research for environmental conservation. *The Journal of Environmental Education*, 22(1), 26-32. <https://doi.org/10.1080/00958964.1990.9943043>
- Nisbet, E. K., & Zelenski, J. M. (2011). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological Science*, 22(9), 1101-1106. <https://doi.org/10.1177/0956797611418527>
- Nisbete, K., & Zelenskij, M. S. A. (2009). The nature-relatedness scale linking individuals' connection with nature, environmental concern and behavior. *Environment & Behavior*, 41(4), 715-740. <https://doi.org/10.1177/0013916508318748>
- North American Association for Environmental Education (NAAEE). (2004). *Excellence in environmental education: Guidelines for learning (K-12)*. Washington, D.C., USA: NAAEE.
- Pontes-da-Silva, E., Pacheco, M. L. T., Pequeno, P. A. C. L., Franklin, E., & Kaefer, I. L. (2016). Attitudes towards scorpions and frogs: A survey among teachers and students from schools in the vicinity of an Amazonian protected area. *Journal of Ethnobiology*, 36(2), 395-411. <https://doi.org/10.2993/0278-0771-36.2.395>

- Rickinson, M. (2001). Learners and learning in environmental education: A critical review of the evidence. *Environmental Education Research*, 7(3), 207-320. <https://doi.org/10.1080/13504620120065230>
- Saricam, S. (2014). Pre-adolescent concern for the natural environment according to gender. *Indoor and Built Environment*, 25(1), 262-268. <https://doi.org/10.1177/1420326X14537282>
- Stern, M. J., Powell, R. B., & Hill, D. (2014). Environmental education program evaluation in the new millennium: What do we measure and what have we learned? *Environmental Education Research*, 20, 581-611. <http://dx.doi.org/10.1080/13504622.2013.838749>
- Strong, C. (1998). The impact of environmental education on children's knowledge and awareness of environmental concerns. *Marketing Intelligence & Planning*, 16(6), 349-355. <https://doi.org/10.1108/02634509810237523>
- Sutton, S. G., & Gyuris, E. (2015). Optimizing the environmental attitudes inventory. *International Journal of Sustainability in Higher Education*, 16(1), 16-33. <https://doi.org/10.1108/IJSHE-03-2013-0027>
- Thomas, R. E. W., Teel, T., Bruyere, B., & Laurence, S. (2019). Metrics and outcomes of conservation education: A quarter century of lessons learned. *Environmental Education Research*, 25(2), 172-192. <https://doi.org/10.1080/13504622.2018.1450849>
- Thompson, C. W., Aspinall, P., & Montarzino, A. (2007). The childhood factor: Adult visits to green places and the significance of childhood experience. *Environment and Behavior*, 40(1), 111-143. <https://doi.org/10.1177/0013916507300119>
- Toomey, A. H., Knight, A. T., & Barlow, J. (2017). Navigating the space between research and implementation in conservation. *Conservation Letters*, 10(5), 619-625. <https://doi.org/10.1111/conl.12315>
- Ugulu, I., Sahin, M., & Baslar, S. (2013). High school students' environmental attitude: Scale development and validation. *International Journal of Engineering Science*, 5(4), 415-424. <https://doi.org/10.1080/09751122.2013.11890103>
- Unesco. (1978). *The Tbilisi declaration: Final report*. Paper presented at the Intergovernmental Conference on Environmental Education. USSR, Tbilisi 14-26 October 1977.
- White, R., & Stoecklin, V. (2008). *Nurturing children's biophilia—developmentally appropriate environmental education for young children*. Retrieved from <http://www.whitehutchinson.com/children/articles/nurturing.shtml>
- Yilmaz, O., Boone, W. J., & Andersen, H. O. (2004). Views of elementary and middle school Turkish students toward environmental issues. *International Journal of Science Education*, 26(12), 1527-1546. <https://doi.org/10.1080/0950069042000177280>
- Yu, X. (2014). Is environment 'a city thing' in China? rural-urban differences in environmental attitudes. *Journal of Environmental Psychology*, 38, 39-48. <https://doi.org/10.1016/j.jenvp.2013.12.009>