



Evaluating the transition among K-19 students in the context of environmental citizenship

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Received: 21 June 2022 / Accepted: 25 January 2024
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Abstract

This study investigates high school students' environmental thoughts and behaviors. Two hundred and ninety-six students from Istanbul, Turkey's Marmara Region's Hisar School participated in the current study. The higher education institution samples used in this analysis came from earlier studies conducted by the authors. The statistical methods of principal component analysis, independent sample t test, chi-square test, and regression analysis are used to assess the data collected for the present study. The research aims to verify that the given hypothesis holds for every sample. Among the significant findings are high-level environmental attitudes and behaviors together with statistically proven differences between male and female students. Compared to male students, more female students participate in physical and academic environmental consciousness than male students. Students in high school typically focus more on environmental issues. The results showed that environmental concerns have a greater ability to impact behavior connected to the environment than environmental knowledge and attitude and that there is a positive correlation between parents' income levels and their level of environmentalism.

Keywords Environmental sustainability · Regression analysis · Principal component analysis · Environmental citizenship · Environmental thought

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1 Introduction

According to Bell (2005), environmental citizenship (EC) is an ideology that “makes demands on people to act differently for the benefit of the environment.” As a result, environmental consciousness encompasses both a person’s attitude toward the environment and their conduct within it. According to ENEC (2018), ENEC refers to citizens’ responsible pro-environmental activity at the local, national, and international levels, including both individual and group actions aimed at resolving current environmental issues, preventing the emergence of new ones, achieving sustainability, and fostering a healthy community. These information is presented at European Network of Environmental Citizenship, COST Action CA 16229. Hadjichambis et al. (2020) assert that EC is essential to the development of low-carbon societies, sustainable development, green and cycle economies, and the resolution of global environmental problems. The concept of environmental citizenship will undoubtedly help to reduce the hazards associated with climate change and environmental deterioration. To encourage good environmental citizenship, the public must be made aware of the issues pertaining to endangered animals, an increase in natural disasters, forest conservation, and other related subjects. As a result, the term “environmental citizenship” (EC) is broad and encompasses a variety of characteristics, such as the knowledge, skills, attitudes, values, and beliefs needed to address environmental issues (Takahashi et al., 2015). Furthermore, in addition to basic practices like recycling and turning off the lights, EC advocates for new ways of thinking and acting that are pertinent to environmental behavior (EB) and environmental attitudes (EA). Being an involved citizen means recognizing the value of sustainable environments for people and wildlife, supporting biodiversity and environmental protection, and advocating for resource conservation. Being an environmental citizen means having the freedom to influence environmental policy, make sustainable decisions for oneself, uphold the law, and encourage sustainable arrangements (Jorgensen & Jorgensen, 2021). This is only partially true for environmental attitudes, even though attitudes and behavior typically have a minimal association (Bauer et al. 2020). On the other hand, Braito et al. (2017) demonstrated a high correlation between people’s environmental behavior (EB) and decision-making and their connections with nature.

In addition to having a solid political and social framework, EC also has a strong educational foundation, asserts Yu et al. (2019). Convincing and educating people and communities to become environmental citizens is one of our time obligations; the other is to protect our natural environment and achieve sustainable growth. In addition, societal influence, experiences in early life, and voluntary actions all make a big difference. Several studies in the literature (Cheah et al., 2019; Činčera et al., 2020; Hadjichambis et al., 2020, 2022; Hadjichambis & Paraskeva-Hadjichambi, 2020; Kovách et al., 2021; Meerah et al., 2010; Ojedokun, 2018) discuss the connection between citizenship and educational attainment. The literature study also revealed that Turkish researchers have conducted only a restricted amount of studies on the perception of the EC perception in Turkey (Baş, 2010; Çermik & Akçay, 2020; Gunduz et al., 2017, Küçük, 2017, Oral et al., 2020; Özdemir, 2020; Uzun & Sağlam, 2007). For instance, Gunduz et al. (2017) conducted a study to investigate the impacts of constructivist teaching methods on EC. The research’s findings showed a significant difference in the EB and knowledge levels of the students in the experimental group and positive changes in the EB levels of the students in the experimental group where constructivist teaching methods were employed. Sucuoğlu (2017) investigated how applied EC in secondary schools affected

students' understanding of the environment. The findings demonstrated that while students lacked knowledge of environmental awareness issues, they were sensitive to environmental challenges.

Oral et al. (2020) investigated the attitudes and actions of engineering students toward the European Community at a university located in the Marmara Region, one of Turkey's most industrialized regions. According to the authors, there is a statistically significant difference in some EB between students enrolled in engineering faculties and those studying environmental engineering. It is significant to highlight that no previous study comparing two distinct Turkish educational institutions has been carried out. Consequently, if there is a change in terms of EC from high school, through university students is the study's research issue. "Transition" is defined as "the process of changing, or a change from one form or condition to another" in this study (Cambridge, 2021), and many scholars (Loorbach, 2017; Mazmanian & Karft, 2009; Vanal Bergh et al., 2011) have studied this phrase and portrayed a change in society in many ways in the literature on environmental sciences. Consequently, the purpose of the study is to evaluate the EC attitudes of high school students and their behavior by investigating the transition from high school to higher education institutions such as universities.

The study's title, "K-19," designates children who have finished their formal education after falling into a certain age range. When looking through the education literature, it is relatively rare to find studies that use the term K-19. In this research, the phrase K-12 is frequently utilized. Under the American educational system, "districts" are local school units that are specifically assigned to a town, county, or multiple regions based on their demographics and proximity. This is referred to as K-12 education (Glavin, 2014). Another goal of this research is to bridge the knowledge gap in the field of K-19 studies.

2 Materials and methods

This section comprises the following stages: information about the samples; the questionnaire; data collection; and analysis.

2.1 Information about the samples

The current study included 296 middle and high school students from Hisar School in Turkey's Marmara region. Hisar School (HS) is a private school located in Istanbul, Marmara Region (Fig. 1), with a present enrollment of approximately 1,400 students giving quality education of the highest academic standards in Istanbul (NEASC, 2021). Table 1 provides basic information regarding descriptive statistics of demographic questions. According to Table 1, among the sample, 53.9% of the participants were female, while 46.1% were male.

2.2 The questionnaire

This section contains 37 questions, is divided into three sections, and is based on a study by Uzun and Sağlam (2007). The questionnaire is validated in terms of accuracy and validity by contacting Uzun and Sağlam (2007).



Fig. 1 Study area

Table 1 Descriptive statistics of demographic questions

Variable/statistic	Categories	Rel. frequency per category (%)
Gender	Male	46.1
	Female	53.9
Mother's Level of Education	Middle School–High School	6.8
	Master's or PhD	31.4
	University	61.8
Father's Level of Education	Middle School–High School	7.8
	Master's or PhD	40.5
	University	51.4
	Primary School	0.3
Are there any foundations you work with as a volunteer?	Yes	33.1
	No	66.9
Are there any other environmental volunteers in your family?	Yes	53.7
	No	46.3

1. Demographic information: The purpose of this section was to compile broad details regarding the age, gender identity, financial status, and interest in meaningful natural associations of the understudies.
2. The Environmental Thought (ET) scale: This part of the survey was made to elicit data from students on their awareness of and sensitivity to the environment with 13 questions. The 14-item, 5-point Likert-type environmental thought subscale has five points.

The third element is the Environmental Behavior (EB) scale, which was created to evaluate how the children behaved in response to 13 questions about environmental concerns. The 13-item, 5-point Likert-type environmental behavior subscale has five points. Based on the responses and environmental factors, values ranging from 5 (strongly agree/always) to 1 (strongly disagree/never) were assigned when computing the EB and ET scale scores.

2.3 Data collection

To illustrate the similarities and differences among students at Hisar Schools, a standardized questionnaire was utilized to ascertain children's environmental thought and behavior profiles (to represent middle and high schools). Convenience sampling tools were utilized to select the random sample, including a middle school with 441 students and a high school with 467 students (Levy & Lemeshow, 2013). The opportunity to freely engage in online surveys using Google Forms was made available to all students. The survey was subsequently made available online via Google Forms by the school administration (Nunes et al., 2020; Srivastav et al., 2021). The questionnaires were completed by 186 out of 467 high school students and 110 out of 441 middle school students. The data collected from middle and high schools are compared with that from higher education institutions in Turkey, represented by Oral et al. (2020).

2.4 Data analysis

The environmental sciences have long made extensive use of statistical studies. In his discussion of the origins and evolution of environmental statistics, Guttorm (2000), for instance, noted that environmental statistics emerged in the early 1960s. In this study, the subgroups of ET and EB were identified using principal component analysis (PCA), the first phase. Since PCA does not assume any distribution, a functional exploratory tool can be used as a descriptive method on a wide range of numerical data. The Kaiser–Meyer–Olkin (KMO) (conducted with the coefficient of 0.869) and the Bartlett sphericity test were also employed to determine whether the data fit factor analysis (Ene et al., 2021; Uzun & Sağlam, 2007). For factor analysis, the Kaiser–Meyer–Olkin (KMO) test evaluates the quality of your data analysis. The test ascertains whether there is sufficient sampling for both the overall model and each of the model's variables. If *k* samples have equivalent variances, Bartlett's test (Snedecor & Cochran, 1982; Shrestha, 2021) is employed to find out. Once significant factors were determined, the independent sample *t* test was employed, respectively. The most common type of *t* test, commonly referred to as the unpaired samples *t* test, is used to compare the means of two sets of data. Last but not least, the chi-square independence test establishes if categorical variables are related (Zibran, 2007). Finally, regression analysis has been used to examine the relationships between environmental thought and behavior aspects. The collected data from Hisar Schools (HS) were statistically analyzed by employing the SPSS 21 program. Environmental attitude and behavior (EB) scales were used to determine each student's EB and ET ratings (Uzun & Sağlam, 2006). Values ranging from 5 (agree/always) to 1 (never agree/always) were assigned to the responses to calculate the attitude scale scores. Additionally, each student's EB and ET attitude scores were calculated, respectively. The ET scale has scores between 14 and 70, whereas the EB scale has scores between 13 and 65. After dividing the values by the total number of variables, the averages from the descriptive statistical

analyses were obtained. These values, which ranged from 1 to 5, were then interpreted by determining which scale response they corresponded to.

3 Results and discussion

The purpose of this research is to monitor the transition from university to high school in Turkey within the same geographic area as the literature. Accordingly, this section presents the results and makes a comparison with the findings of a prior study (Oral et al., 2020) that examined university students aged 18 to 25's understanding and activity levels related to environmental citizenship.

3.1 Descriptive statistics evaluation

Tables 1 and 2 show descriptive statistics for samples and environmental thought and behavior, respectively. In this study, the gender ratio was equal, and the education level of the families was primarily a university degree (Table 1); however, in the prior study (Oral et al., 2020), the gender ratio was also equal but the education level of the families was primarily high school. When compared by Oral et al. (2020) the proportions of both questions, such as “Are there any organizations that work voluntarily?” and “Are there any other environmental volunteers in your family?” are notably different. The provided responses to these questions revealed that volunteers' family members make up 53% of high school students and 22% of university students. The reason for this answer can be explained by the fact that the children of high-income families are enrolled in high school as students. This outcome can be noticed when compared with the outcomes published by Oral et al. (2020).

Furthermore, it has been frequently observed that higher economic levels are linked to higher levels of environmentalism (Arcury & Christianson, 1990; Arcury et al., 1986; Herrera, 1992; Leppänen et al., 2012; URFU, 2021). Strieder et al. (2017), for instance, looked into the connection between environmental awareness and several sociodemographic traits in the Brazilian cities of Maringá and Sarandí. They discovered a positive correlation between environmental awareness and education and income levels. Except for question 3, questions 1 through 11 in Table 2 present the opinions between never disagreeing (1) and disagreeing (2). The mean response to question 3 (our planet no longer experiences degradation) is 2.25, indicating that they are only somewhat in agreement (Supplementary Material 1). The survey results of Hisar Schools are comparable to those of college students (Oral et al., 2020). According to the study findings, Hisar School students are not sure how to respond to questions about biodiversity (1.49), ozone layer depletion (1.49), and natural resources (4.46), among other topics. Environmental education appears to be important to the younger generation, although students at higher education institutions are already informed about the environment. Students at Hisar schools, however, demonstrated a high degree of environmental awareness and motivation to safeguard the environment when asked environmental behavior questions. Students in Hisar School primarily respond (4.02) to question 7 (I do not hesitate to warn someone who eliminates the environment), much like students at higher education institutions (Oral et al., 2020). Because these young people grew up in the digital era, visual media has a stronger influence than print media, according to an analysis of the scale's questions. There is a significant and moderate association between environmental knowledge and attitude levels, as well as between

Table 2 Descriptive statistics of environmental thoughts and behaviors questions

ITEMS	Mean	SD	ITEMS	Mean	SD
ET 1. Endangered organisms are exaggerated, and there are already enough species in nature	1.49	0.901	EB1. I watch and listen to environmental programs on TV and the radio	3.20	1.03
ET 2. Unnecessary expenses are made for the restoration of historical sites	1.93	1.07	EB2. I follow environmental developments from daily newspapers	2.66	1.09
ET 3. Erosion is no longer seen in our country	2.25	1.11	EB3. I watch documentaries covering environmental issues	3.20	1.10
ET 4. Pesticides used in agriculture are beneficial for the environment	1.76	1.05	EB4. I read books about the environment except for textbooks	2.62	1.19
ET 5. There is no harm in selling the lands that have lost their forest quality to bring income to the country	1.84	1.1	EB5. I follow popular environmental magazines	2.39	1.17
ET 6. The government should allow the construction of buildings intended for tourism in national parks and forests	1.91	1.15	EB6. I follow scientific articles about the environment	2.38	1.15
ET 7. To the tent-test build a house, wetlands should be dried and houses should be made in those areas	1.46	0.948	EB7. I do not hesitate to warn someone who harms the environment	4.02	0.99
ET 8. Since the environment is self-cleaning, the wastes of people do not cause problems	1.29	0.736	EB8. I would like to participate voluntarily if an environmental cleaning activity is organized in our school	3.59	1.21
ET 9. The ozone layer has thinned over the USA especially, there is not any danger for Turkey	1.49	0.867	EB9. My friends know me as an environmentally conscious person	3.89	1.08
ET 10. Turning off the light when leaving the room does not save much energy	1.53	0.889	EB10. I would work for a long time free of charge for a livable environment	3.14	1.24
ET 11. There is so much water in the world that people can never pollute	1.52	0.930	EB11. I share my environmental knowledge with my friends	3.70	1.19
ET 12. Rapid consumption of natural resources is an important problem for our future	4.46	1.16	EB12. When buying a product I make sure that the waste is recyclable	3.40	1.24
ET 13. One of the major problems in Turkey is unplanned urbanization	4.29	1.14	EB13. I prefer products that do not harm the environment even more expensive	3.58	1.22
ET 14. Global warming can cause irreparable disasters in the future	4.36	1.13			

Table 3 Bartlett's sphericity test result of environmental thought

Chi-square (Observed Value)	1910,04
Chi-square (Critical value)	99,617
df	78
p-value (Two-tailed)	<0.0001
Alpha	0.05

Table 4 Total variability of the thought

	F1	F2
Eigenvalue	6032	1509
Variability (%)	46,397	11,604
Cumulative %	46,397	58,002

environmental knowledge and levels of environmentally responsible citizens, according to Ozdemir (2020) and Smederevac-Lali et al. (2020).

3.2 Factor analysis results of environmental thought and behavior

As was already discussed in Sect. 2.4, PCA is a technique used in exploratory data analysis to identify significant variables in data sets (Gorsuch, 1983; Jolliffe & Cadima, 2016; Nunnally, 1978; Ogwueleka, 2014; Tabachnick & Fidell, 1996). The major objective is to condense a large number of factors into a limited number of important summary ratings. The KMO and Bartlett's tests were initially used to evaluate the hypotheses in this study, and then PCA was utilized to assess both environmental thoughts and environmental behaviors.

To determine if the variables were independent, Bartlett's test of sphericity (Table 3) was also used. It was not appropriate for the factor analysis if the correlation coefficient matrix was not a unit matrix. Consequently, the following is the alignment of the study's hypothesis:

H₀ There is no correlation significantly different from 0 between the variables.

H_a Between the variables (ET and EB), at least one of their correlations is substantially different from 0.

Table 4 indicates total variability (with % 58), and at the end of the scree plot analysis results, Table 5 shows two meaningful factors, orderly F1 and F2.

For to evaluate environmental security and comprehension, ETFac1 applies to questions 1, 3, (because erosion is no longer observed on Earth), 4, 5, 7, 8, 9, 10, and 11. Questions 12, 13, and 14 on the ETFac2 evaluate participants considering environmental considerations. The first eleven questions assessed the participants' knowledge of the environment, and the final two questions probed their comprehension of environmental issues.

Along with environmental awareness, questions 2 and 5 addressed the convergence of the economy and the environment. The factor analysis results showed that ET1, ET3, ET4, ET6, ET7, ET8, ET9, ET10, and ET11 were substantially connected, whereas ET2 and ET5 were not. Important results have been obtained from ET12 and ET13, with multiple participants exhibiting an awareness of environmental concerns and the negative implications of

Table 5 Factor loadings of environmental thought

	F1	F2
ET1	0.727	0.047
ET2	0.569	0.055
ET3	0.692	0.067
ET4	0.690	0.001
ET5	0.566	0.108
ET6	0.727	0.012
ET7	0.841	0.002
ET8	0.886	0.038
ET9	0.828	0.045
ET10	0.749	0.022
ET11	0.753	0.062
ET12	- 0.205	0.847
ET13	- 0.165	0.873

climate change. These findings are consistent with those of a study involving university students (Oral et al., 2020). Conversely, the ET3 yielded inconsistent findings when administered to college students; nonetheless, secondary school study participants had a similar perspective. This is because the previous sample of university students represented a diverse range of backgrounds. On the other hand, most of the participants in the study are from Istanbul. Secondary school students may have the same perspective due to their similar ages, educational levels, and socioeconomic backgrounds. Despite their diverse backgrounds in terms of education, employment, and culture, university students have similar opinions about environmental challenges and concerns. Some Turkish primary and high school curricula cover environmental issues, leading to a common understanding of these subjects. According to a survey of Chinese college students on local and global environmental issues, regional environmental issues are more significant and tangible than global ones. Furthermore, according to Duan et al. (2005), Chinese respondents showed worry about environmental issues that have an impact on their daily lives.

Our results demonstrate that in comparison with domestic concerns, global challenges have become exceedingly worrying (ET12, ET14). The same consideration was given to the EB Scale questions. Table 6 demonstrates that the KMO values and Bartlett's test are statistically significant, enabling their inclusion in the investigation. Table 7 shows that the overall variability of our components, or % 63 (explained variance), is a suitable percentage to use them in the data analysis. According to Tables 2 and 8, EB1, EB2, EB3, EB4, EB5, and EB6 assess how the participants engage with media and literature about the environment and climate change. The social dimensions of environmental citizenship are measured using the EB7, EB8, EB9, EB10, and EB11 scales. The EB12 and EB13 ratings are used to assess conscientious and sustainable consumption. According to factor analysis, there is a significant

Table 6 Bartlett's test for the environmental behavior

Chi-square (Observed value)	1706,989
Chi-square (Critical value)	99,617
df	78
p-value (Two-tailed)	< 0.0001
alpha	0.05

Table 7 Total variability of the environmental behavior

	F1	F2	F3
Eigenvalue	5773	1648	0.852
Variability (%)	44,409	12,679	6.55
Cumulative %	44,409	57,088	63,638

Table 8 Factor loadings of environmental behavior

	F1	F2	F3
EB1	0.676	0.248	0.14
EB2	0.747	0.11	0.154
EB3	0.785	0.242	0.106
EB4	0.788	0.193	0.194
EB5	0.75	0.206	0.122
EB6	0.771	0.054	0.246
EB7	0.173	0.348	0.540
EB8	0.248	0.817	0.093
EB9	0.085	0.663	0.414
EB10	0.299	0.740	0.224
EB11	0.191	0.439	0.476
EB12	0.381	0.112	0.762
EB13	0.11	0.234	0.799

association between EB1 and EB6 under Factor D1. These findings, which include data from a study involving college students, suggest that rather than reading scholarly articles and textbooks, individuals prefer to watch and listen to films and television shows while learning about environmental issues.

The strong correlation among EB8 and EB11 under Factor D2 suggests that participants have a propensity for environmental activism. EB12 and EB13 are significantly correlated under Factor D3. Responses to these inquiries demonstrate a general comprehension of the significance of sustainability. The preference of participants to spend a substantial amount of money on things manufactured more sustainably may stem from their better socioeconomic standing. Although EB7 produces a range of results, they are more linked when Factor D3 is included. The participants' reluctance to warn others about environmental damage explains this. At a given significance level, the independent sample t test is used to test the key hypothesis of equivalent population means. (For this study, it is determined % 95). Table 9 reveals that there is a significant gender difference in the meaning of ET1 between boys and girls. According to the study's findings, high school students' ET 1, EB 2, and EB 3 scores varied statistically significantly. One of the most significant conclusions is the difference between conduct and perception. The literature indicates that while some studies (Eroğlu and Okur, 2021; Görümlü, 2003) show that gender does not affect students' opinions, other studies (Kibert, 2000) show a significant difference in favor of women. Table 10 shows that gender matters when it comes to volunteering, with women making up 68% and men 32% of the total. Furthermore, the gender effect reported by Attari et al. (2009), which showed that women were more likely to favor voluntary actions, may support our results. The rest of the indicators, such as the educational level of the mother and father, have no bearing on both questions. Are there any foundations for which you volunteer?

Table 9 Independent samples t test

	<i>t</i>	<i>df</i>	<i>p</i>
<i>Gender</i>			
ET1	1.827	294	0.069
ET2	- 1.901	294	0.058
EB Fac1	- 0.723	294	0.470
EBFac2	- 5.218	294	0.001
EBFac3	- 2.005	294	0.046
<i>Are there any foundations you work with as a volunteer?</i>			
ET1	- 0.044	294	0.965
ET2	0.213	294	0.832
EB Fac1	1.449	294	0.148
EBFac2	3.362	294	< .001
EBFac3	2.959	294	0.003

Also, do you have any family members who volunteer? Finally, regression analysis was used to analyze the correlations between the variables. Some studies' findings indicate that students are more inclined to take environmental action if they have a better understanding of environmental issues (Kousar et al., 2022; Meinhold & Markus, 2005; Le Hebel et al., 2014). This result indicates that the same elements (ET1 and ET2) that explain environmental behaviors (EB1, EB2, and EB3) also explain environmental thoughts. To do this, regression analysis was applied separately to each component of environmental behavior. The strength of the relationship between the dependent variable and the independent variables (ET1 and ET2) (EB1, EB2, and EB3) is shown in Table 11 of the model's table of contents. The "R square value" (*s*) is the percentage of the dependent variable's variance that can be predicted based on the independent variable. In this investigation, the R square values are 0.048; 0.125; and 0.049. In terms of percentage, EB2 has the highest percentage at 12.5%. This result suggests that the highest level of explanation for the EB Fac 2 is provided by ET1 and ET2. ANOVA tables give the basis for significance tests and offer details on the degrees of variability inside a regression model. The model is meaningful for all dependent variables for EB1, EB2, and EB3, and this statistical test has a 95% significance level (Table 12). Table 13 displays the standardized and unstandardized coefficient B values along with their significance levels. EB Fac 1, ET1, and ET2 show a significant *p*-value ($p < 0.05$) for the model. For the model, EB Fac 2, ET has no importance ($p = 0.099$; $p = 0.000$), while ET2 does ($p = 0.005$; $p = 0.000$). This is an important discovery since, out of the three models, the regression model for EB Fac 2 has the highest R square value; nevertheless, this model only includes one relevant factor, ET 2. We verified each regression assumption twice (Supplementary Material 1).

Changing people's perceptions and behaviors to become more environmentally conscious is the most efficient way to combat the global environmental pollution problem. The body of research indicates that people's environmental views influence their environmental behavior. This association might be strong (Grob, 1995; Gholamzadehmir et al., 2019), medium (Axelrod & Lehman, 1993; Smith et al., 1994), or low (Makki et al., 2003). Grade level, gender disparity, and parental education level were shown to have an impact on students' attitudes toward the environment in primary school, according to Baş (2010)'s investigation of the attitudes of students toward the environment based on gender, class, occupation, and family educational status. Using a valid instrument designed to measure these

Table 10 Chi-square independence test

	χ^2 Value	df	<i>p</i>
Gender/ Are there any foundations you work with as a volunteer?	10.424	1	0.001
Mother's education level/ Are there any foundations you work with as a volunteer?	0.435	2	0.805
Father's education level/ Are there any foundations you work with as a volunteer?	0.878	3	0.831
Mother's education level/ Do you have any family members who provide volunteer services?	0.653	2	0.721
Educational background of your father—Are there any institutions (organizations, associations, etc.) that you provide voluntary service to?	0.878	3	0.831

Table 11 Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
EBFac1	0.220 ^a	0.048	0.042	0.978
EBFac2	0.353 ^a	0.125	0.119	0.938
EBFac3	0.221 ^a	0.049	0.042	0.978

Superscripts a and b present the significances

Table 12 ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig
1	Regression EBFac1	14,258	2	7129	7440	0.001 ^b
	Residual	280,742	293	0.958		
2	Regression on EBFac2	36,806	2	18,403	20,884	0.000 ^b
	Residual	258,194	293	0.881		
3	Regression on EBFac3	14,441	2	7221	7541	0.001 ^b
	Residual	280,559	293	0.958		

Superscripts a and b present the significances

Table 13 Coefficient table

Model		Unstandardized coefficients		Standardized coefficients	t	Sig
		B	Std. Error			
EBFac1	(Constant)	3.190E-17	0.057		0.000	1.000
	ETFac1	0.161	0.057	0.161	2.820	0.005
	ETFac2	0.158	0.057	0.158	2.768	0.006
EBFac2	(Constant)	5.814E-17	0.055		0.000	1.000
	ETFac1	0.091	0.055	0.091	1.656	0.099
	ETFac2	0.346	0.055	0.346	6.321	0.000
EBFac3	(Constant)	1.288E-16	0.057		0.000	1.000
	ETFac1	0.058	0.057	0.058	1.021	0.308
	ETFac2	0.216	0.057	0.216	3.793	0.000

constructs in young children, Evans et al. (2007) found no significant relationship between environmental attitudes (EA) and environmental behavior (EB) in children aged 6–8 years in the USA, Austria, Mexico, and Spain. This research was part of a larger study on children's EB. The non-significant EB results were explained by the possibility that measuring environmental behaviors was difficult, and the authors speculated that older kids would have a stronger relationship between EA and EB. Although secondary school students' views about the environment were almost solely unfavorable, Uzun and Saglam's (2007) research indicates that environmental thought and knowledge levels were typically favorable, and there was a meaningful correlation between the two factors. The author also came

to the conclusion that girls outperformed boys in terms of environmental behavior, knowledge, and reasoning. When it came to thought and knowledge exams, the 17-year-old age group did better. On the other hand, there was little variation in the way each environment behaved. Comparing “middle” and “lower-class” families, those from “upper-class” households generally scored higher in the areas of environmental thought and understanding. In terms of environmental behavior, “lower-class” participants scored higher than “upper-class” ones.

The purpose of Bilir’s (2012) research is to ascertain the attitudes and behaviors of high school students in Cyprus about environmental education and water conservation. The investigation revealed that although students have an understanding of environmental education and water conservation, their behavior was considered insufficient. Students’ environmental thinking and understanding often grew as their grade level climbed, but their scores on environmental behavior did not. Given students’ increased understanding, it is projected that environmental understanding as well as opinion averages will rise as grade levels rise. However, the problem of students’ inability to transform their knowledge into behavior is thought-provoking. All university engineering students, according to a prior study by Oral et al. (2020), have positive thoughts and behaviors, but there is a statistically significant difference in some EB between students enrolled in engineering faculties and environmental engineering students. One of this study’s notable discoveries is the fact that the environmental behavior scale identifies three components. In contrast, a study that involved college students only offered two variables (Oral et al., 2020). The age factor can also be connected to this conclusion. Furthermore, high school students can focus more on the details provided by the questions. Zachariou et al. (2019) studied the attitudes of secondary school students in Greece regarding environmental issues and environmental education with 1059 students. Additionally, these findings demonstrate that students were more inclined to participate in environmental education programs if they were more aware of environmental problems. Ballantyne and Packer (2002) conducted a study on the preferences of 580 students, ages 8 to 17, regarding their experiences with environmental education. Based on their findings, the authors concluded that integrating observation with instruction is an effective teaching strategy, especially when it encourages students to think about how human activity affects wildlife and natural ecosystems. Iwasaki (2022) conducted a study on Japan’s Eco Experience Education Program for Early Childhood (EEEPEC), an educational program that includes lectures on energy and water conservation as well as global warming. According to certain findings, early childhood environmental education initiatives may help young children develop long-term environmental behaviors.

4 Limitations of the study

The data collection session at Hisar School occurred during the Sars-CoV-2 (COVID-19) pandemic. As a result, the majority of students at the two educational institutions participating in the study can access Google Forms via computers or cell phones. Due to issues with the internet infrastructure, some students’ online access was limited. Finally, because the high school students were unfamiliar with the definitions of some of the specific environmental vocabulary used in the surveys, the course instructors took the time to explain them in the questionnaires. To avoid further confusion, exact information was provided before they were granted access to the online survey forms hosted on Google servers.

5 Recommendations and conclusion

This study's research question is formulated as to whether there is a transition in EC attitudes and behaviors between high school and university students. Because it addresses the concept of environmental citizenship throughout the transition from high school to university, the study can be regarded as a pioneer in the field of environmental sciences, according to the research question.

The study establishes two hypotheses, respectively. The findings showed that there is a significant shift in EC attitudes and actions between high school and university students. For example, family members of volunteers make up 53% of high school students and 22% of university students. This study also found that gender makes a difference when it comes to volunteering, with women accounting for 67% and men accounting for 32%. It was also discovered that the higher a family's income, the more environmental challenges high school students are exposed to. According to recent research, high school students are not sure how to respond to several issues about biodiversity (1.49), ozone layer depletion (1.49), and natural resources (4.46). Nevertheless, compared to college students, high school students are more likely to be concerned about environmental issues. This explains both how the younger generation learns through media such as TV shows, cartoons, and ads, and how the globalizing world employs written, spoken, and visual media to influence public opinion on global warming.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10668-024-04570-0>.

Funding Open access funding provided by the Scientific and Technological Research Council of Türkiye (TÜBİTAK).

Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors declare no conflict of interest.

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