

Article

Comparing the Effect of Scientific Background on University Students' Environmental Views

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Abstract: Creating an environmentally aware society is not an easy task and requires knowledge about what affects the formation of environmental views. At the same time, to contribute to environmental protection, individuals with different educational backgrounds need to have environmental awareness, because their decisions as future professionals may affect the environment. The problem, however, is that there is not adequate research on the association between educational background and environmental views. To address this gap, the aim of this study is to investigate whether scientific background affects environmental views and attitudes. Specific objectives are to examine whether scientific background affects university students' views on environmental issues as well as their attitudes towards the solution to environmental problems. To achieve this aim, a comparative study was performed on two student groups: students attending environmental studies and students attending classical studies. The results showed that non-environmental students were less willing to change their habits to protect the environment and to participate in environmental actions compared to environmental students who expressed a pronounced willingness to do so. However, both student groups did not acknowledge their personal environmental responsibility. Categorical regression revealed that students' certain sociodemographic variables affected their willingness to change habits. However, other additional variables are recommended to be analyzed in future studies. The results from this study provide support for making changes in the curricula of non-environmental departments and for carrying out actions to reinforce the participation of students in initiatives aimed at raising environmental awareness.



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1. Introduction

The survival of the planet is threatened by a plethora of severe problems and most of them are related to the impacts of human activity [1]. At the same time, many environmental problems, such as the depletion of natural resources, air and water pollution and deforestation, are highly interrelated [2]. To address all these problems effectively, it is necessary to take action and leverage strategies that aim at sustainable development, enhanced information provision, higher public environmental awareness and focused interventions in environmental education [3].

The negative effects of human activities pose risks to the sustainability of the planet and humanity has now reached a point where environmental problems exceed geographical limits and are approached as global phenomena. At the same time, environmental quality seems to be inextricably linked to human activities, but also to the economic development of each country [4]. More specifically, the economic prosperity in each country is associated with the increasing energy demand and the level that natural resources are exploited, which, however, results in greater pollution levels [5].

Due to environmental problems, humanity is now faced with the live risk of a climate crisis that will have severe consequences for all countries. These consequences do not

affect only natural ecosystems, but also people's living conditions. In other words, climate change is bound to affect citizens' life [6]. It also calls for changes in consumers' decisions and choices [7].

Solutions are feasible when citizens acquire knowledge about existing and emerging environmental problems and use this knowledge to address them [8]. From this perspective, education at all levels can become a critical tool to address environmental problems and prevent ecological collapse [9]. Yet, potential benefits associated with education for sustainability had not been expressed until the United Nations Conference on Environment and Development, which was held in Rio de Janeiro, and established Agenda 21. This was the first time that the reorientation of education towards sustainability was stated, and in specific, it was stated that the focus of education should also involve sustainable development and topics like increasing the levels of public environmental awareness and promoting educators' environmental training [10]. This was later confirmed in the World Summit on Sustainable Development (WSSD) in Johannesburg, which concluded that "education is recognized as the driving force to promote sustainability" [11]. The influence of education on sustainability is promising for 'decoding' active citizen participation in environmental protection and the solution to environmental problems [12]. Intergovernmental bodies and institutions have been stressing the need that graduates should have the knowledge, values and skills to contribute to the formation of an environmentally sustainable society through their personal and professional actions [13]. At the same time, environmental behavior is closely linked to environmental knowledge and environmental awareness. That is because once individuals become environmentally aware, it is possible to make changes in their behavior for the sake of the environment [11]. From this perspective, the environmental knowledge and the awareness of young individuals may define planet sustainability. The concept of sustainability refers to our ability to preserve or support a process continuously over time. In the settings of business and policy, sustainability tries to help prevent the depletion of natural resources, so that they will be available in the long run [14].

Given that environmental problems are expected to exacerbate in the years to come, universities of today should not be focusing merely on the quality of education they provide, but their focus should include more factors and eventually attain a high level of engagement with social and environmental problems. In other words, universities need to adopt a comprehensive approach to their role and re-evaluate their actions based on the degree to which these actions help students realize the implications of environmental problems [15]. As a response to the pressing impacts of climate change, more and more universities around the globe alter their mission and restate their objectives in order to correspond to the increasing environmental concerns [16].

Environmental topics are mostly regarded as the domain of environmental disciplines because, so far, most of those who advocate for the inclusion of sustainability in higher education come from environmental studies [17]. That being said, each discipline can at least to some level include the environmental training of students by providing knowledge and skills. In this way, students in formal education could be encouraged to develop environmental consciousness along with other skills, as well as to transform knowledge and consciousness into action [18]. Young people are the future of society and their environmental awareness should be strengthened so that they are able to actively participate in decision-making processes [19]. Taking into consideration the evolution of the so-called environmental issue, it is certain that future generations will be required to deal with a considerable number of complex environmental, social and economic challenges [20].

So far, the inclusion of environmental material into higher education curricula has been remarkably slow and a barrier may be that there is not much research evidence supporting the role of environmental knowledge in environmental views and perceptions. The latter are associated with attitudes towards the environment, which along with other factors may lead to behavioral change [21]. Against this background, the aim of this study is to investigate whether scientific background affects environmental views and attitudes. Specific objectives are to examine whether scientific background affects university

students' views on environmental issues as well as their attitudes towards the solution to environmental problems. To achieve this aim and objectives, this study examines the views of two undergraduate student groups; the first group involves students attending the Department of Forestry and Natural Environment (FNR), whereas the second includes students attending the School of Italian Literature (ILL) of the Aristotle University of Thessaloniki. These two departments fully met the criteria for comparison purposes because students in the forestry department attend a high number of environmental courses, whereas the Italian literature students do not attend any environmental courses at all. In practice, forestry students acquire a high level of understanding of natural systems, while literature students cannot attain such a level if they depend on their curriculum alone. From this perspective, comparisons between the two student groups can deepen our knowledge on the effect of environmental knowledge on environmental views and perceptions.

The remainder of this article is organized as follows. In the next section, we present the theoretical framework of environmental education with an emphasis on universities in Section 2. Section 2.1 discusses the development of environmental education and Section 2.2 discusses the role of environmental education. Section 3 describes, in great detail, the methodology followed to perform this study, while the results are reported in Section 4. In Section 5, a detailed discussion on the results and study limitations is provided. The conclusions are drawn in Section 6.

2. Theoretical Background

Humans comprise a fundamental part of the natural environment and, in contrast to other living organisms, humans can affect the environment in various and lasting ways [1]. Human communities and civilizations were eventually differentiated from the natural environment by creating technical systems that were often not in harmony with natural laws. At the same time, humans and the environment have a relationship that is characterized by constant interactions and dependence. Disruptions in this relationship negatively affect not only the environment but also humans. The harmonious co-existence of humans and nature ceased when humans developed their ability to leverage natural resources. This is when humans started to trust their own power and defied nature, neglecting their utter reliance on nature. This was a turning point in human history, and it marked the era in which humans disengaged themselves from nature and pursued growth. Driven by their selfish motives, humans became volatile towards nature even though the adverse impacts of these actions were suffered by humans themselves. Today, humans are required to reverse environmental problems through addressing complex environmental problems and promoting environmental awareness. Environmental problems result from human-driven disruptions to nature; environmental problems, however, trigger the emergence or the exacerbation of social problems leading to an overall deterioration in human life. Examples of problems inextricably linked to social ones involve air pollution, soil erosion, overconsumption, climate change and climate migration [22–24]. These problems are closely linked to the influences occurring in the relationship between humans and nature, as well as humans' decisions and choices. In this regard, the investigation of environmental problems requires more attention on the society–environment nexus.

As environmental problems deteriorate over the course of time, they become multidimensional and require an immediate yet spherical solution. Many scientists propose that solutions should not be limited to scientific applications but should involve knowledge diffusion with the purpose of raising awareness about environmental problems. Awareness is a highly challenging target especially if one considers that humans lose their contact with nature the more they develop technology [25]. Environmental issues cannot find sustainable solutions only within scientific progress or the establishment of stricter legislation. It is equally necessary to dedicate efforts to the creation of environmentally responsible citizens and societies. To that end, citizens need to acquire environmental knowledge and skills while shaping positive environmental attitudes and behaviors. In such a process, the role

of education is crucial in the effort to inform social groups about environmental issues and to shape pro-environmental attitudes and behaviors among them [22].

Pro-environmental attitudes involve various components such as cooperation, the critical study of environmental issues, participation, self-knowledge and the ability to express ideals. Critical thinking guides individuals to reach reasonable assumptions, form 'proper' judgments and make correct choices [26]. The objective of modern environmental education is to cultivate critical thinking among members of society and particularly among younger ones as their attitudes will define the future [27]. According to the results of a considerable number of studies, environmental awareness begins in childhood. It can be first shaped through the close family circle and then in school, while later, it manifests through young individuals' participation in activities in nature [9]. In each stage, the shaping of environmental attitudes is subject to individuals' interaction with their peers and their exposure to media content [9,28]. According to Ostman [29], the media's strong influence should be leveraged to help society attain sustainability because the media play a primary role in informing the public about environmental issues. At the same time, it appears that young citizens exhibit a pronounced concern and interest in environmental rather than social and political topics. It has been observed, however, that when not interested in political topics, individuals are also not interested in environmental topics because pro-environmental behaviors stem from political ideals.

2.1. The Development of Environmental Education

It is often argued that the solution to environmental problems depends on individuals' knowledge, interest, skills, attitudes and motives regarding environmental problems. Moreover, it is necessary to fully understand the interdependence between nature and humans and to predict the impact of every action, attitude and choice.

Environmental education seeks to shape citizens that are characterized by knowing and predicting the effects of choices as well as understanding the need for compassion among humans. Since 1970, the establishment of environmental education aims to shape citizens that are active in terms of environmental issues. In the following decade, the theoretical principles of environmental education were applied, and the ideals of environmentally aware citizens developed. According to Hungerford et al. [30], environmental education at its core tries to help individuals acquire knowledge about the environment so that they can work towards maintaining balance between living standards and environmental quality. In the 1990s, environmental problems were perceived as a 'side effect' of economic prosperity and the developmental choices of human societies. In this regard, environmental education is also related to the notions of development and evolution, society and economy [31]. The solution to environmental problems requires a profound understanding of the complex relationship that exists between the natural and social spheres, as well as the dynamics of factors that affect environmental quality. Although such understandings are critically important, they do not suffice, as individual and collective efforts are also required. In this sense, it is necessary to acknowledge that social problems are part of environmental problems.

Over the next few decades of its evolution, environmental education approached the environment as a whole and environmental problems as part of the total environment [32]. The environment is defined by various developmental factors and its study puts emphasis on the management of natural resources and, when this management is proper, future sustainability can be ensured [33]. Citizen participation in environmental issues is described as a priority in most conventions of education [10], because environmental and social sustainability result from collective efforts, attitudes and choices.

2.2. The Role of Environmental Education

It is often argued that environmental problems could be tackled if people became aware of them. For children and adolescents, environmental awareness could be raised through environmental education programs, and, for this reason, many scholars stress

the need to place them at the core of curricula. If such programs are combined with environmental courses and information campaigns, students can learn about pressing environmental problems and shape pro-environmental attitudes [34]. Learning about these problems enables young individuals to shape pro-environmental attitudes [34,35]. In such processes, students should not have a passive role, but they should actively participate in the process. Active participation methods consist of forms of interaction between teachers and students where both parties interact during lessons [36]. From this perspective, schools can act as the main means to promote environmental education especially when experiential learning techniques are utilized [9].

Throughout the implementation of environmental education programs, students assume an active role in the learning process and are trained in different ways, so that they are able to set targets, take decisions and initiatives, make arguments and develop productive criticism [37]. Studies on the subject have indicated that students' participation in environmental education programs has increased their environmental knowledge significantly [38], has helped them adopt pro-environmental practices [39] and shaped pro-environmental attitudes. It is also necessary to mention that the design of environmental education programs should take into account the perceptions of individuals, because attitudes are affected by perceptions, thereby changing behaviors [40]. Environmental education, therefore, provides valuable opportunities for social change while shaping attitudes in line with a more sustainable way of living [41]. Environmental awareness lies in the understanding of the environment, the effects of human activities on it and the importance of protecting it [42]. In this regard, environmental awareness is a concept that should concern all people that wish to live in a healthy environment. Television shows with discussions about the environment, the analysis of environmental events and the wide array of media that people use these days can play a major role in raising environmental awareness among citizens [8].

The coverage of environmental issues in Internet-based applications, platforms and campaigns that aim to draw attention to environmental problems is able to exert great influence and shape perceptions that are positive towards the environment [43]. One can conclude that the media are important in 'awakening' the public about the environment. In particular, the media have remarkable potential in disseminating environmental knowledge and raising environmental awareness. Due to technological progress, media that disseminate information to a wider audience instantaneously have emerged. Meanwhile, the printed media, which are still favored by people of somewhat older ages, contain extensive articles about various environmental topics. In addition, national and international conferences organized or co-financed by international organizations are very appealing to the public and can contribute to raising environmental awareness. Environmental magazines that cover a wide spectrum of environmental topics and include scientific studies also seem to be favored by readerships. Despite being affordable and accessible to citizen majorities, radio programs do not cover environmental problems to an adequate level. On the other hand, television is not only the most widely used medium, but it also includes environmental shows and documentaries that can make a notable impact on citizens' environmental knowledge [44]. Finally, social media can become a useful resource by providing their users with necessary environmental information. At the same time, social media present a notable potential for environmental awareness because they are used regularly by younger individuals and, therefore, they could be leveraged in the effort to raise awareness [45]. This could be achieved by using social media as a platform to exchange ideas about environmental issues, including the adoption of recycling, energy saving and sustainable daily practices [46].

According to Skanavis [47], the media, with their immense influence, are able to raise environmental awareness through environmental programs, materials and discussions about concerning environmental problems. If such information is covered properly and is focused on the true significance and effects of environmental problems, then citizens can be expected to be affected and even take action. The fundamental target of these programs should be to educate and raise awareness among citizens. Interestingly, many television

shows have been using popular celebrities as these can draw the attention of the audience and often act as role models.

Future leaders and decision-makers are shaped at a notable level during their academic years, and it is thus highly meaningful to examine university students' environmental views, attitudes and behaviors. A considerable volume of research has focused on students' environmental views and interest. For example, Rosentrater and Burke [48] examined students' environmental attitudes, perceptions and habits at the Iowa State University and observed that students demonstrated adequate levels of interest in environmental topics such as ways to reduce their own footprint and contribute to environmental improvement in general. This pronounced environmental interest, however, was not correlated with students' demographic characteristics. It is also interesting to discuss the findings of Liu and Lin [49], who conducted interviews with university students to examine their views on nature and nature–human relationships, indicating that pro-environmental students held a mixture of worldviews. On the one hand, they perceived humans as part of nature and thus subject to natural laws, while, on the other hand, they thought that humans play a dominant role in nature but may be replaced and that humans should feel responsible for nature and try to preserve natural resources. Erdogan [50] also examined university students' views and found that over half of respondents held pro-environmental views. When examining the effect of attending one environmental course, the same author found only a minimal influence on students' environmental views.

Prabawa-Sear and Baudains [51] performed focus groups in order to investigate the relationships between university students' environmental attitudes and behaviors and indicated a strong relationship between attitudes and behaviors. The relationship between attitude and behavior was further corroborated by Boca and Saracli [52], whose study indicated a positive correlation and also noticed that students engaged often in environmental protection activities such as volunteering and recycling.

In relation to the environmental behavior of university students, Kayawa (2007) used an online questionnaire to examine university students' views on sustainability and indicated that students tend to associate sustainability with their environment while they were positive towards altering their personal habits including purchase habits, recycling and energy/water saving. He et al. [53] compared the environmental knowledge, attitudes and behaviors between two university student samples in developed and less-developed urban regions in China. It was concluded that backgrounds were related to students' levels of environmental knowledge, attitudes and behaviors. The influence of worldviews on environmentally responsible behaviors was confirmed by Inkpen and Bailey [54]. That being said, their study showed that even students classified as 'environmentally aware' were willing to adopt only a few environmentally friendly behaviors and only if such behaviors were considered convenient. Using the Value–Belief–Norm theory, which is based on value frameworks and can account for decision-making processes, Whitley et al. [55] examined the socio-psychological factors that affect university students' environmental behaviors. Their analysis showed that, interestingly, students with biospheric and altruistic values had a greater likelihood to adopt sustainable behaviors, whereas those exhibiting selfish values were less likely to engage in such behaviors.

Acknowledging that environmental knowledge may have a positive effect on environmental attitudes and perhaps behavior, it has been proposed to include environmental courses in the study programs of departments that are not related to environmental disciplines. To examine the potential outcomes of including environmental courses in non-environmental departments, McMillan et al. [56] assessed the impact of an introductory environmental university-level course on the environmental values of students and observed that the course helped students deepen their environmental values and become more eco-centric and less homo-centric. In the context of this course, students participated in various activities but the activities that were the most influential involved exercises whose aim was to become aware of the footprint of personal habits and attended some educational documentaries. The effect of such courses was also indicated by the study of

Jurgi-Hage et al. [57], where university students' cognitive and behavioral environmental concern was positively affected by the inclusion of formal instruction on the environment. Ayeni [58] conducted a study on first-year students at the Cape Peninsula University of Technology in South Africa to investigate how students defined their environment. It was shown that there is considerable differentiation in students' environmental awareness, which was ascribed to gender, age, place of residence, family income and parental education level. If the effects of information provision (such as time spent on social media) are taken into account, however, this differentiation is not that significant. It was concluded that awareness through environmental education should be based on specific objectives and requires a conscious interchange of interests and value systems. Li and Chen [59] examined Chinese university students' participation in actions and concluded that college education, environmental organizations and experiences are the most important factors affecting environmental action. In the study of Limo [60], 15 public and private universities in Latin America participated. The main conclusion from this study was that there is an important relationship between education for sustainability and students' environmental attitudes. In addition, it was inferred that universities should intervene in campus spaces using sustainable approaches, while students should understand that they are the ones that should take care of the environment. At the same time, students attending the University of Presov in Slovakia were examined in terms of their environmental awareness. In specific, students scored highly especially regarding the cognitive and emotional factors but did not achieve high scores in the behavioral factor. The same study did not detect any strong differences in terms of students' gender. Gur et al. [61] investigated the social and academic skills among students attending law and journalism studies in Quetta in Pakistan and indicated that students from both disciplines had about the same skills, while social skills had a positive impact on their academic skills. This study recommended the provision of professional development for faculty members in order to ensure the integrated training of undergraduates. The same study also recommended that educational institutions should place timely and adequate attention so that students' social skills are improved. This could be achieved through the continuous provision of seminars, lectures, sport infrastructures and outdoor spaces.

The above review shows that even though there has been substantial research on university students' environmental views and attitudes, there is a scarcity of studies attempting comparisons between students' environmental views and their scientific background. The present study proposes that individuals with different educational backgrounds need to have environmental awareness in order to contribute to efforts aimed at preventing global ecological collapse. In this respect and in order to make recommendations for changes in the curricula of higher education, it is necessary to compare the effect of scientific background on university students' environmental views.

3. Materials and Methods

To gather the required data for this study, the chosen research instrument was the structured questionnaire. Taking into account previous relevant studies and the objectives of this study, a structured questionnaire with closed-ended and open-ended questions was constructed. The questionnaire contained 19 questions and examined respondents' views and awareness about the environment and environmental protection. To enable respondents to express their views as precisely as possible, most questions employed five-point Likert scales ranging from 'Strongly disagree' to 'Strongly agree', 'Not at all' to 'Very Much', while one question was answered on a scale from 'Very difficult' to 'Very comfortable' [62]. According to the legislation in place, this study had to be issued approval by the Research Ethics Committee of the Democritus University of Thrace (DUTH/CER/26322/160-21/12/2020).

As the intention was to examine the effect of discipline on environmental views, it was considered appropriate to recruit two respondent groups that attend environmental and non-environmental studies. Therefore, the population under study comprised

undergraduate students attending the Department of Forestry and Natural Resources (FNR) as well as the School of Italian Language and Literature (ILL). Both departments belong to the Aristotle University of Thessaloniki and are located in Thessaloniki, the second-most populated Greek city. It should be noted that the forestry department offers a high number of explicit environmental courses that help students attain a high level of scientific knowledge about the environment, whereas the Italian literature department does not offer any environmental courses at all. To recruit respondents, a two-stage sampling approach was used. According to this technique, the first stage was the academic year while the second stage was the courses in each department. In relation to the latter, students attending each course in each department were censused. This study was carried out from January 2021 to the end of July 2021. At that time, the total number of undergraduates in the forestry department was 1555 and in the Italian literature department 1109. In total, 433 students participated in this study, but eight questionnaires had to be removed because respondents had not marked which of the two departments they attended. Hence, the total number of questionnaires included in the analysis was 425 questionnaires. More specifically, 234 undergraduate forestry students and 191 undergraduate Italian literature students participated in this study. The collected data were coded and inserted into the Statistical Package for the Social Sciences (IBM SPSS v.25) for statistical analysis.

In this study, the variables that were examined involved students' 'sociodemographic characteristics', 'evaluation of environmental issues in the city of Thessaloniki', 'the contribution of various factors to the exacerbation of environmental problems', 'stakeholders that can contribute to the solution of environmental problems', 'information sources about environmental topics', 'actions to raise student environmental awareness', 'frequency of participation in environmental actions' and 'willingness to protect the environment'. For the analysis, descriptive statistics, Cronbach's α coefficient, the non-parametric Friedman test, the non-parametric Mann–Whitney test and categorical regression were performed. Descriptive statistics were applied to provide a picture of the basic features of the data and Cronbach's α coefficient identified the internal consistency of the questionnaire. The reliability of measurement has to do with the degree to which it is consistent, and Cronbach's alpha can measure the strength of this consistency. It expresses the squared correlation between the score (observed) that a person is assigned on the given scale and the score that they would have obtained (true) if they had been asked about all issues. Cronbach's alpha is a quantification of the level of agreement on a standardized 0 to 1 scale. In addition, the non-parametric Friedman test was used, which compares the values of three or more correlated groups of a variable. The Mann–Whitney test was also applied to compare differences between two independent groups in cases where the dependent variable is ordinal or continuous, but not normally distributed. Categorical regression scales the nominal, ordinal and numerical variables in an optimum manner [63].

Regarding the tests that were performed on the study variables, respondents' sociodemographic variables were analyzed with descriptive statistics, 'evaluation of environmental issues in the city of Thessaloniki', 'the contribution of various factors to the exacerbation of environmental problems', 'stakeholders that can contribute to the solution of environmental problems', 'information sources about environmental topics' and 'actions to raise student environmental awareness' were analyzed with Cronbach's α coefficient, Friedman's non-parametric test, the non-parametric Mann–Whitney test and categorical regression. Finally, 'frequency of participation in environmental actions' and 'willingness to protect the environment' were scrutinized with descriptive statistics, the non-parametric Mann–Whitney test and categorical regression.

4. Results

4.1. Respondents' Sociodemographic Characteristics

Respondents' sociodemographic information was first collected. Female students (71.6%) significantly outnumbered their male peers, and most were fifth-year students (by 44.3%) followed by fourth- (by 37.4%) and first-year students (by 30%). The majority

reported cities (rather than rural places) as their place of permanent residence (75.9%). In terms of their economic status, considerable shares described it as moderate (by 44.5%) and comfortable (by 28.8%). Regarding students' background, substantial shares of students' fathers were public servants (by 21.9%), freelancers (by 25.7%) and pensioners (by 25.7%), whereas considerable shares of students' mothers were not engaged in paid work (27.2%) or were private employees (17.4%). In terms of students' parents' educational level, appreciable shares of fathers were reported to be university (27.5%) and upper secondary school graduates (23.5%), while a high share of mothers were upper secondary school graduates (39%) and university graduates (28.8%).

4.2. Respondents' Evaluation of Environmental Issues in the Area of Thessaloniki

Respondents from both disciplines were asked to evaluate the importance of various environmental issues in the city where they study. Cronbach's α coefficient scored 0.777 in the case of Forestry and Natural Resources students and 0.86 in the case of Italian Language and Literature students. According to the results of the non-parametric Friedman test (Table 1), forestry students gave the highest ranking to traffic congestion (mean rank 6.26), and this was followed by sea pollution (mean rank 6.11) and waste (mean rank 5.37). Floods received the lowest ranking. For Italian literature students, waste (mean rank 6.96) was the highest-ranked environmental issue, followed by sea pollution (mean rank 6.88) and lack of green spaces (mean rank 5.56). Much like their peers from the forestry department, floods were the lowest-ranked issue (mean rank 2.28).

Table 1. Rankings of the non-parametric Friedman test regarding respondents' views on the importance of various environmental issues.

	Forestry and Natural Resources	Italian Language and Literature
Air pollution	5.14	4.97
Water pollution	5.24	4.31
Sea pollution	6.11	6.88
Soil pollution	4.26	4.05
Traffic congestion	6.26	5.47
Lack of green spaces	4.86	5.56
Stray animals	4.83	4.54
Waste	5.37	6.96
Floods	2.93	2.28
	χ^2 (df = 8, N = 229) = 321.579, $p < 0.001$	χ^2 (df = 8, N = 189) = 571.205, $p < 0.001$

According to Table 2, there are significant statistical differences in how students from the two disciplines evaluate environmental issues. Forestry students held stronger views on the significance of air pollution, water pollution, soil pollution, traffic congestion, stray animals and floods compared to their literature peers, who assigned greater importance to sea pollution and waste.

4.3. Students' Views on What Contributes to the Exacerbation of Environmental Problems

Next, respondents' views on what or who bears responsibility for environmental problems were examined. Cronbach's α coefficient scored 0.716 in the case of Forestry and Natural Resources students and 0.749 in the case of Italian Language and Literature students. In Table 3, it can be seen that both forestry and literature students gave the highest rankings to industries' improper function and rule violation (mean ranks 5.63 and 6.06, respectively). Forestry students also assigned great significance to the insufficient protection of resources (mean rank 5.32) and inadequate citizen information (mean rank 5.21). For Italian literature students, the government (mean rank 5.75) and the insufficient protection of resources (mean rank 5.72) were highly responsible for the environmental problems.

Table 2. Results of the Mann–Whitney test regarding the differences in views on the importance of various environmental issues between the two student groups.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
Air pollution	229.34 *	192.00	0.001
Water pollution	237.14 *	180.19	0.000
Sea pollution	196.81	231.64 *	0.001
Soil pollution	228.52 *	191.74	0.001
Traffic congestion	240.70 *	177.14	0.000
Lack of green spaces	211.93	212.08	0.090
Stray animals	225.00 *	195.17	0.009
Waste	179.54	252.70 *	0.000
Floods	236.11 *	182.43	0.000

* Student group that has higher mean.

Table 3. Rankings of the non-parametric Friedman test regarding respondents' views on what contributes to the exacerbation of environmental problems.

	Forestry and Natural Resources	Italian Language and Literature
Ourselves	1.96	1.90
The government	4.74	5.75
Local authorities	4.69	5.70
Citizens	4.61	3.54
Educational system	3.84	3.34
Industries' improper operation and rule violations	5.63	6.06
The insufficient protection of resources	5.32	5.72
Inadequate citizen information	5.21	4.00

χ^2 (df = 7, N = 232) = 521.363, $p < 0.001$ χ^2 (df = 7, N = 189) = 728.047, $p < 0.001$

According to the results of the Mann–Whitney test, respondents attending forestry studies believed more strongly that 'ourselves', citizens, the educational system and inadequate citizen information are responsible for environmental problems. On the other hand, respondents attending Italian literature studies strongly perceived that the government, the local authorities, industries (due to improper operation and violations) and insufficient resource protection bear responsibility for the existing environmental problems (Table 4).

Table 4. Results of the Mann–Whitney test regarding the differences in what contributes to the exacerbation of environmental problems between the two student groups.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
Ourselves	225.46 *	196.54	0.012
The government	182.32	248.39 *	0.000
Local authorities	181.22	248.47 *	0.000
Citizens	248.98 *	166.65	0.000
Educational system	239.70 *	176.74	0.000
Industries' improper operation and rule violations	195.12	232.71 *	0.000
The insufficient protection of resources	197.78	229.44 *	0.001
Inadequate citizen information	249.61 *	165.88	0.000

* Student group that has higher mean.

4.4. Respondents' Views on Stakeholders That Can Contribute to the Solution to Environmental Problems

Next, students' opinion on the stakeholder groups that can contribute to the solution to environmental problems was investigated (Table 5). Before the performance of the non-parametric Friedman test, Cronbach's α coefficient scored 0.813 in the case of Forestry and Natural Resources students and 0.903 in the case of Italian literature students. According to the results of the Friedman test, for the forestry group, the government (mean rank 5.23) followed by local authorities were the most important stakeholders, whereas for the literature group, the local authorities followed by the government were the most important stakeholders that can contribute to the solution to environmental problems. For foresters, the other most important stakeholders involved the educational system and citizens, while for literature students, other significant stakeholders were the European Union and international organizations.

Table 5. Rankings of the non-parametric Friedman test regarding respondents' views on the evaluation of stakeholders that can contribute to the solution to environmental problems.

	Forestry and Natural Resources	Italian Language and Literature
Ourselves	3.38	2.38
The government	5.23	5.63
Local authorities	5.05	5.70
Citizens	4.78	3.35
Educational system	4.84	3.65
European Union	4.65	5.55
International organizations (e.g., United Nations, etc.)	4.15	5.20
Non-governmental organizations (e.g., WWF, etc.)	3.94	4.54
χ^2 (df = 7, N = 230) = 191.147, $p < 0.001$		χ^2 (df = 7, N = 186) = 518.895, $p < 0.001$

The Mann–Whitney test was next applied in order to assess the differences between the two student groups with regard to their opinion on the stakeholders that can contribute to the solution to environmental problems (Table 6). According to the results of this test, forestry students strongly perceived that 'ourselves' followed by citizens and the educational system are the stakeholders that can solve environmental problems. Meanwhile, Italian literature students perceived that the government, local authorities and non-governmental organizations can contribute to the solution to environmental problems.

Table 6. Results of the Mann–Whitney test regarding the differences in stakeholders that can contribute to the solution to environmental problems between the two student groups.

	Mean		p
	Forestry and Natural Resources	Italian Language and Literature	
Ourselves	247.71 *	168.21	0.000
The government	194.59	229.12 *	0.000
Local authorities	189.99	239.96 *	0.000
Citizens	252.15 *	161.87	0.000
Educational system	250.06 *	166.69	0.000
European Union	188.30	242.02 *	0.000
International organizations (e.g., United Nations, etc.)	188.69	241.55 *	0.000
Non-governmental organizations (e.g., WWF, etc.)	196.81	231.64 *	0.002

* Student group that has higher mean.

4.5. Information Sources about Environmental Topics

Afterwards, the information sources from which students have obtained information about environmental topics were examined (Table 7). Cronbach's α coefficient scored 0.698 for forestry students and 0.875 for Italian literature students. The performance of the non-parametric Friedman test showed that the Internet was the most important information source for both student groups, while the two groups' mean ranks were very close (5.18 and 5.02, respectively). Respondents' family and friends were also ranked highly and, interestingly, printed media were ranked in the last position by both forestry students (mean rank 2.64) and literature students (mean rank 2.74).

Table 7. Rankings of the non-parametric Friedman test regarding respondents' use of information sources.

	Forestry and Natural Resources	Italian Language and Literature
School	3.10	3.03
Family environment	3.55	3.56
Friend circle	3.67	3.16
Television–Radio	2.88	3.48
Internet	5.18	5.02
Magazines–Newspapers	2.64	2.74
χ^2 (df = 5, N = 226) = 320.640, $p < 0.001$		χ^2 (df = 5, N = 178) = 227.970, $p < 0.001$

The Mann–Whitney test was next performed to further examine the differences between the two respondent groups. When Table 8 is examined, it can be seen that there is a significant difference in students' evaluation of information sources. More specifically, forestry students perceived the Internet, family and friends as the most important information sources, whereas Italian literature students regarded television and radio as the most important sources that helped them learn about environmental topics.

Table 8. Results of the Mann–Whitney test regarding the differences in information sources between the two student groups.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
School	231.60 *	177.37	0.000
Family environment	226.79 *	189.17	0.000
Friend circle	236.49 *	175.84	0.000
Television–Radio	210.09	206.55	0.756
Internet	243.53 *	171.06	0.000
Magazines–Newspapers	231.60 *	177.37	0.000

* Student group that has higher mean.

4.6. Environmental Awareness

4.6.1. Actions to Raise Undergraduate Students' Environmental Awareness

Students' opinion on the degree to which various factors can raise environmental awareness was next explored. Before the application of the non-parametric Friedman test, Cronbach's α coefficient scored 0.747 for forestry students and 0.713 for Italian literature students. In Table 9, it is seen that there are major differences between the two student groups. That is, forestry students gave the highest ranking to the study program (mean rank 3.29), whereas Italian literature students gave it to professors (mean rank 3.51). For forestry students, actions implemented within the context of the study program was ranked in the second position (mean rank 3.29), while for Italian literature students, actions implemented by the university at a central level was ranked in the second position (mean rank 3.35). Conversely, forestry students gave actions implemented by the university at a central level

the lowest ranking (mean rank 2.63), whereas Italian literature students gave it to actions implemented in the context of the study program (mean rank 2.38).

Table 9. Rankings of the non-parametric Friedman test regarding respondents' views on the ability of various factors to raise environmental awareness.

	Forestry and Natural Resources	Italian Language and Literature
Study program (curriculum)	3.29	2.68
Actions implemented in the context of the study program	3.25	2.38
Professors as a source of inspiration	3.03	3.51
Interactions with other fellow students	2.79	3.07
Actions implemented by the university at a central level	2.63	3.35
χ^2 (df = 4, N = 232) = 43.686, $p < 0.001$		χ^2 (df = 4, N = 190) = 111.379, $p < 0.001$

The Mann–Whitney test was next performed to further examine how the views of the two student groups differentiate. According to Table 10, forestry students perceived the study program (curriculum), the actions implemented in the context of the study program, the professors as a source of inspiration, the interactions with other fellow students and the actions implemented by the university at a central level as the most important actions to raise undergraduate students' environmental awareness.

Table 10. Results of the Mann–Whitney test regarding the differences in actions to raise undergraduate students' environmental awareness.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
Study program (curriculum)	284.18 *	125.05	0.000
Actions implemented in the context of the study program	282.84 *	125.96	0.000
Professors as a source of inspiration	264.20 *	148.83	0.000
Interactions with other fellow students	262.72 *	150.39	0.000
Actions implemented by the university at a central level	248.97 *	167.09	0.000

* Student group that has higher mean.

4.6.2. Participation in Environmental Actions

Students were asked to report the level at which they participate in environmental actions (Table 11). More than half of Italian literature students reported not participating at all in environmental actions, whereas as few as 11.5% of forestry students reported not doing so. In addition, a considerable share of Italian literature students reported participating slightly (26.7%) with the corresponding share of forestry students being significantly higher (30.3%). Moreover, an appreciable share of forestry students reported a moderate participation (35.9%), while the corresponding share of literature students was much lower (17.3%).

Then, the Mann–Whitney test was performed to further analyze participation in environmental actions between the two respondent groups (Table 12). It was confirmed that forestry students participate more often.

Then, categorical regression was performed in order to detect the factors that affect students' participation in environmental actions. For the forestry student sample, the analysis gave a coefficient value of multiple determination $R^2 = 0.228$, while for the literature student sample, the analysis gave $R^2 = 0.284$. For both samples, the values were statistically important (Table 13).

Table 11. Percentage units regarding students' participation in environmental actions.

	Forestry and Natural Resources	Italian Language and Literature
Not at all	11.5	50.3
Slightly	30.3	26.7
Moderately	35.9	17.3
Much	21.4	5.2
Very much	0.9	0.5
Total	100.0	100.0

Table 12. Results of the Mann–Whitney test for the differences between the two student groups in terms of their participation in environmental actions.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
Participation in environmental actions	259.75 *	155.72	0.000

* Student group that has higher mean.

Table 13. Factors affecting students' participation in environmental actions.

Independent Variables	Forestry and Natural Resources				Italian Language and Literature			
	Beta	F	<i>p</i>	Importance (Pratt)	Beta	F	<i>p</i>	Importance (Pratt)
Gender	0.017	0.062	0.804	−0.002	0.206	4.586	0.034	0.200
Father's occupation	0.318	10.087	0.000	0.458	0.288	12.478	0.000	0.259
Mother's occupation	0.200	5.771	0.000	0.208	0.206	6.248	0.000	0.114
Education level	−0.148	0.936	0.445	0.078	−0.102	0.163	0.921	0.061
Mother's education level	0.086	0.172	0.915	0.065	−0.149	0.204	0.893	0.134
Economic status	−0.146	0.672	0.414	0.066	−0.272	2.115	0.124	0.227
Year of study	−0.156	2.481	0.087	0.127	−0.060	0.141	0.708	0.007
	R ² = 22.8%; <i>p</i> < 0.05				R ² = 28.4%; <i>p</i> < 0.001			

According to the analysis, forestry students' participation in environmental actions is mostly affected by their parents' occupation, while literature students' participation is mostly influenced by their gender. Pratt's relative importance measures for each independent variable showed that the independent variables of 'Father's occupation' (45.8%) and 'Mother's occupation' (20.8%) made the greatest contribution to the dependent variable in the case of forestry students. In the case of Italian literature students, however, father's occupation (25.9%), mother's occupation (11.4%) and gender (20%) made the greatest contribution to the dependent variable. It is worth noting that father's education level along with economic status and the year of study had a negative effect on the dependent variable in both cases.

4.6.3. Students' Willingness to Change Habits to Protect the Environment

Students' willingness to change their habits to protect the environment was next examined (Table 14). Although both student groups expressed willingness to change habits, forestry students were considerably more willing to change their daily habits for the sake of the environment. In specific, the strong majority of forestry students (by 82.9%) were 'much' and 'very much' willing to change habits, whereas less than half of literature students (by 47.2%) expressed the same level of willingness. In addition, a significant share of literature students (39.8%) were moderately willing and 13.1% were unwilling to change habits. The corresponding rate for forestry students was as low as 1.3%.

Table 14. Percentage units regarding students' willingness to change their daily habits to protect the environment.

	Forestry and Natural Resources	Italian Language and Literature
Not at all	0.0	0.5
Slightly	1.3	12.6
Moderately	15.8	39.8
Much	55.1	32.5
Very much	27.8	14.7
Total	100.0	100.0

The above observations were confirmed by the Mann–Whitney test, which detected a significant difference between the two student groups (Table 15).

Table 15. Results of the Mann–Whitney test regarding the differences in students' willingness to change habits to protect the environment.

	Mean		<i>p</i>
	Forestry and Natural Resources	Italian Language and Literature	
Willingness to change daily habits to protect the environment	249.56 *	168.20	0.000

* Student group that has higher mean.

Categorical regression was next performed in order to detect the factors affecting students' willingness to change habits for the sake of environmental protection. The analysis gave a coefficient value of multiple determination $R^2 = 0.176$ for forestry students and $R^2 = 0.486$ for literature cases. The values were statistically important for both student groups (Table 16).

Table 16. Factors affecting students' willingness to change habits to protect the environment.

Independent Variables	Forestry and Natural Resources				Italian Language and Literature			
	Beta	F	<i>p</i>	Importance (Pratt)	Beta	F	<i>p</i>	Importance (Pratt)
Gender	0.154	2.479	0.117	0.166	0.347	20.524	0.000	0.336
Father's occupation	0.198	2.559	0.021	0.135	0.275	7.160	0.000	0.181
Mother's occupation	0.247	9.672	0.000	0.273	0.227	8.366	0.000	0.056
Father's education level	−0.039	0.051	0.985	0.015	0.217	4.101	0.018	0.086
Mother's education level	−0.202	0.512	0.475	0.156	−0.195	3.026	0.031	0.068
Economic status	−0.215	2.020	0.113	0.255	−0.228	4.091	0.019	0.100
Year of study	−0.002	0.000	0.991	0.000	0.255	4.300	0.006	0.172
		$R^2 = 17.6\%; p < 0.05$				$R^2 = 48.6\%; p < 0.001$		

Forestry students' willingness is mostly affected by their parents' occupation, while literature students' willingness is mostly influenced by their gender, parents' educational level, economic status and year of study. Pratt's relative importance measures showed the independent variables' contribution to the dependent variable. For forestry students, father's occupation (13.5%) and mother's occupation (27.3%) made the greatest contribution, whereas for literature students, gender (33.6%), father's occupation (18.1%) and year of study (17.2%) made the greatest contribution.

Finally, it should be noted that father's education level, economic status and the year of study have a negative impact on the dependent variable in the case of forestry students. For literature students, however, mother's education level and the economic status have a negative effect on the dependent variable.

5. Discussion

University education not only trains young individuals before they assume their roles in society, but it also shapes future leaders, decision-makers, professionals and consumers whose decisions and actions will affect the environment in different ways [15]. In this regard, it is often argued that universities have the moral obligation to prepare students and ensure that they have the skills and knowledge to contribute to efforts aimed at preventing global ecological collapse [64]. In other words, universities' role should not be evaluated based solely on quality education criteria, but any evaluation should also include their commitment to educating students on sustainability and ecology values. For this reason, some universities are redefining their mission and objectives while seeking ways to cope better with concerns about the environment [16]. It is in this context that disciplines are now required to set sustainability objectives and incorporate them into lesson plans and curriculum units.

However, the percentage of universities that have proceeded to such changes remains very low and the reason for this may be that there is not much evidence supporting that the provision of environmental knowledge can shape positive environmental views and attitudes among students. More specifically, the European University Association conducted a study on 166 higher education institutions in 28 European countries and made two somewhat conflicting observations. Firstly, the gap between the development of new technologies through research (88%) and the contribution of universities to consumer behavior (46%) showed an imbalance between the way in which technological innovation and social interventions are pursued. Secondly, there is a discernible gap between universities' contribution to the mitigation of infrastructures' environmental effects (70%) and the improvement in their resilience to climate change impacts (50%). This suggests an opposition between the way that universities contribute to climate change mitigation and climate change adaptation, even though both consist of the pillars of sustainable transition [65]. To provide evidence that environmental knowledge can contribute to the formation of pro-environmental attitudes, this study has compared the environmental views between students attending forestry studies and students attending Italian literature studies. In other words, the environmental views of students with different scientific backgrounds were examined because this investigation is able to point to the effect of environmental knowledge on environmental views and attitudes. Students' views on various issues differed; for instance, forestry students assigned greater importance to problems like traffic congestion compared to Italian literature students. In addition, although both student groups perceived that the government and local authorities are the stakeholders that should contribute to the solution to environmental problems, forestry students assigned significantly higher importance to the educational system and citizens, whereas Italian literature students assigned importance to the European Union and international organizations. It is possible that this difference in opinion between the two student samples is due to their perceptions on the scale that environmental problems can be addressed. That is, forestry students place more importance on the solution to environmental problems at the local level, whereas literature students seem to focus more on the EU level. It is also interesting to discuss students' views on the factors that can raise environmental awareness. Forestry students seemed to acknowledge that environmental actions within the study program and the inclusion of environmental topics in the study program can raise students' environmental awareness. Conversely, Italian literature students thought that professors can do so and assigned the lowest importance to actions within the study program. Another similarity between our two student samples was that the Internet was reported as the most-preferred information source. The same preference for the Internet has been recorded among citizen groups over the last few years. As the most-used information source, therefore, the Internet should be leveraged by policymakers and universities in order to communicate important messages more effectively and with higher precision. While it is a valuable source of information, the Internet can also be filled with propaganda [66]. Our student samples were similar in the factors affecting their participation in actions. It was observed that students' parents'

occupation was a highly influential variable in that respect [67,68]. A notable difference between our student groups was that forestry students reported higher participation in environmental actions compared to their counterparts in the Italian literature department. It thus seems that non-environmental students in this study may be ignoring the impact of participation in environmental actions. Much to our surprise, although forestry students' willingness to change their habits for the sake of the environment was higher than that of their peers, this difference was not as pronounced as expected. This raises concerns about whether students realize that each choice of habit has a certain environmental impact. At the same time, it seems that a possible lack of such realizations is irrespective of students' area of study and, thus, explanations should be sought in other non-educational factors.

Higher education should put more emphasis on environmental education for graduates because student attitudes such as the ones recorded in this study are not encouraging. Our results corroborate those of Abubakar et al. [69], who noticed that while students had increased interest in acquiring knowledge on environmental sustainability, they lacked the willingness to participate in such activities. According to Thapa [70], environmental education results in increased student participation in pro-environmental actions and improves their attitudes towards the environment and, therefore, it could strengthen student participation. However, a later study indicated that students attending the highest number of environmental courses compared to students of other faculties showed less participation in pro-environmental actions [71]. This finding was further confirmed by other studies where students' daily habits and attitudes were not environmentally friendly despite their adequate level of environmental knowledge and information; the conclusion was that the discipline, and consequently the curriculum, did not seem to affect students' interest and knowledge about the environment [72,73]. Other studies, however, have highlighted the positive role of participating in campus activities in the formation of attitudes. In specific, students who engaged in activities implemented within campus green programs showed more interest and had generally more favorable attitudes towards the issue of sustainable development compared to their peers who did not participate in such activities. It can thus be seen that knowledge and interest in the environment do not always influence the attitudes and behaviors towards environmental problems nor do they drive changes in daily habits [73]. This, however, should not be confused with the effective role of environmental education in shaping environmentally responsible citizens. It has been shown that for shaping proper recycling habits, individuals' attitudes, emotions, personal identity and participation are also important factors [74]. In general, in the effort to solve environmental issues, relevant education should consist not only of knowledge provision, but it should also include participation in relevant actions in order to be effective. Also, students' willingness to take part in pro-environmental and ecological activities on campus according to the students themselves is influenced by their attitude about how responsible and capable they believe the university itself is to maintain a sustainable environment [75]. Meanwhile, other studies have observed that financial incentives can encourage students to participate in pro-environmental activities more than anything else [76].

In order to motivate students to engage responsibly, the subject of sustainable development needs to be integrated and linked into their own field of study so that they will be able to provide effective sustainable solutions to environmental issues through their future professional capacity [77]. For example, a survey on engineering students that attended an introductory electronic engineering course found that most respondents attributed responsibility for the e-waste problem to the engineers themselves. The provision of certain courses may not be feasible for certain disciplines such as those in classical studies. Solutions can be found to some extent in interdisciplinary education as well as in non-formal education and lifelong learning.

Finally, some limitations of this study should be mentioned. More specifically, the Department of Forestry and Natural Resources is not the only environmental department in Greece that offers such a high number of courses specialized in environmental issues, while the School of Italian Language and Literature is also not the only non-environmental

department that lacks courses related to the environment. Therefore, this study concerns the students of two departments and cannot be generalized to all environmental and non-environmental students. It should also be noted that external factors have a notable structural effect on the process of shaping environmental attitudes and views, as previous studies have shown. These external factors, however, have not been considered here. A recommendation for future research would be to investigate the environmental attitudes of students from both environmental and non-environmental departments of the same university such as the Departments of Biological Sciences or Environmental Engineering of other universities and preferably regional, i.e., not in major urban centers, as such research could strengthen the observations made in this study. Another recommendation is to also examine the effect of non-environmental variables on the formation of students' environmental views. It would be very interesting to investigate the effect of political beliefs as well as participation in public organizations unrelated to environmental issues.

6. Conclusions

The aim of this study was to investigate whether scientific background affects environmental views and attitudes. Specific objectives were to examine whether scientific background affects university students' views on environmental issues as well as their attitudes towards the solution to environmental problems. The aim and objectives were achieved as the present study has detected certain remarkable similarities and differences between two student groups that come from different scientific backgrounds: an environmental and a non-environmental one. The most noteworthy difference was that non-environmental students were less willing to change their habits to protect the environment and to participate in environmental actions compared to environmental students who expressed a pronounced willingness to do so. In other words, it seems that scientific background has an effect on the formation of individuals' environmental behavior and as such its effect should be examined more. This brings forward the need to re-evaluate the role of higher education in the effort in shaping environmentally responsible citizens who will take pro-environmental decisions both as consumers and professionals. Another unexpected similarity was that both student groups did not acknowledge their personal environmental responsibility, which calls for future research. Further statistical analysis revealed that some of the students' sociodemographic characteristics affected their willingness to change habits. Students also expressed a tendency to transfer responsibility to environmental policies or other actors and this may be attributed to the complexity of environmental problems. A striking difference was that non-environmental students were less willing to participate in environmental actions compared to environmental students who expressed a pronounced willingness to do so. Hence, it can be seen that environmental curricula may have an effect on student participation in environmental actions and may also prompt students to change their habits for the sake of the environment. In other words, the acquisition of scientific environmental knowledge may have a positive effect on some students' environmental views. In addition, both student groups did not use printed media for their information on environmental topics and preferred to use Internet-based sources. The frequent use of social media recorded in this study gives prominence to their potential role as valuable tools to emphasize the benefits of low-cost pro-environmental habits and to promote the adoption of pro-environmental behaviors.

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