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Knowledge in Regard to Environmental Problems among University Students in Cali, Colombia

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Abstract: The purpose of this research was to understand the level of environmental knowledge among students at Santiago de Cali University (USC) and to evaluate the differences found based on school, gender, and age groups. To gather data, a survey that included sociodemographic information, aspects of environmental knowledge, actions aimed at mitigating environmental problems, and environmental awareness was administered to 268 students at USC in the year 2017. We conducted an online survey of 268 students in the year 2017 by means of a questionnaire that included 18 questions with sociodemographic information, aspects of environmental knowledge, actions aimed at mitigating environmental problems, and environmental awareness campaigns conducted at USC. Additionally, we conducted an analysis to assess how gender, age groups, and academic training influence the scores of the constructed indicators: General Index of Environmental Knowledge (GI), Identification of Environmental Problems (EP), Solutions to Environmental Problems (SP), and Knowledge of Environmental Campaigns (EC). Statistical tests (i.e., Mann–Whitney U test, Chi-square test of independence, Pearson's coefficients correlation) were used to analyze the data. Through this study, we concluded that although no significant differences were found in environmental knowledge and actions to mitigate environmental problems between genders, age groups, and schools, there were important implications observed in these categories concerning the variables analyzed. In addition, positive correlations were found between the indicators GI and SP, both globally and at the level of each gender, age group, and in some schools, which shows that with greater knowledge of environmental problems, there is greater recognition of solutions.

Keywords: environmental education; environmental knowledge; environmental problems; literacy environmental; university students Principio del formulario; Final del formulario

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1. Introduction

Education is a human process that enables the active transformation of social and environmental conditions [1]. Specifically, environmental education aims to strengthen fundamental environmental knowledge at all educative levels and must be subject to a continuously updating process in accordance with the sociocultural context [2]. Both individuals and communities need to acquire reasoning skills in relation to their environment. Understanding environmental issues among individuals from non-environmental science backgrounds heavily relies on their academic training [3]. However, the treatment of environmental topics in these cases is sporadic and insufficient [4]. For this reason, authors such as Jordan et al. [5] argue that integrating different knowledge domains is essential for comprehending environmental problems.

The prevailing traditional and reductionist approach to environmental education fails to acknowledge the intricate social context in which humans are immersed [6–8]. However, there is evidence of growing environmental awareness in the population, especially among young people. According to various studies, they are individuals who exhibit heightened sensitivity to environmental issues and are actively engaged in caring for the natural world and helping to preserve conditions for future generations [9–12].

In the context of the global environmental crisis, it is crucial to strengthen environmental knowledge and promote pro-environmental behavior [12,13]. Humanity faces the challenge of transforming its relationship with nature [6]. It is imperative that humans achieve a balance between economic development and planetary ecological capacity to ensure sustainability [6].

Several authors have proposed planetary boundaries on which the stability of ecological systems in the biosphere depends [14–17]. These boundaries determine how much disturbance caused by society can be absorbed up to a certain threshold [15]. Over the past 200 years, humans have exceeded several ecological limits, resulting in critical issues such as inadequate waste management, atmospheric pollution, biodiversity loss, and global warming [14,15,18].

Therefore, mitigating the negative effects of surpassing these boundaries must begin with understanding the socio-environmental problems and implementing social and political actions to enhance environmental education at all levels of society [19]. Environmental education processes significantly contribute to developing strategies for minimizing environmental problems and re-evaluating behaviors, attitudes, and actions that harm nature [20].

It is crucial, particularly within educational contexts and universities, to create spaces for reflecting on the relationship between humans and nature. Additionally, fostering discussion and social action can shed light on recognizing the Earth's biophysical limits and our connection with them [21,22]. Forming new connections between science, society, and environmental culture could be the formula for instilling social values with regard to the environment and its preservation [5].

The literature on environmental education in Colombia highlights a series of guidelines, orientations, and national policies that have been promoted by educational institutions [21,23]. However, these processes have proven insufficient in terms of instilling attitudes, values, and actions geared toward fostering an environmental culture [24]. Various authors [25–27] have posited that the country has endeavored to cultivate a culture of environmental responsibility through both formal and non-formal educational settings. These educative processes integrate governmental and non-governmental institutions, environmental groups, and society [27]. Therefore, it is crucial to incorporate an interdisciplinary approach into the traditional teaching of environmental sciences, integrating them with various knowledge domains. In consequence, universities can serve as platforms for analyzing and developing solutions to diverse environmental issues while nurturing ecological awareness and respect for nature among their students [26].

In Colombia, several studies have acknowledged the relationship and importance of enhancing environmental education within university contexts [19,28]. Some of these studies conducted various research projects to understand human thinking and its connection with the environment [19]. These works demonstrated changes in human decisions and attitudes that positively impacted the environment [20]. In this regard, universities provide valuable skills to strengthen scientific knowledge, aiming to enhance decision-making processes [22]. Throughout the educational journey, it is fundamental for universities to cultivate a professional perspective where students can identify themselves as environmentally responsible agents in both society and the productive sector [29].

In this context, concepts such as the "sustainable university" and the "green campus" have emerged due to the increasing significance of universities as agents of sustainable development [27]. Consequently, universities are regarded as microcosms where infrastructure aligns with participatory and democratic processes [23]. Thus, both governments

and universities have recognized the importance of integrating environmental education and sustainability into curricula as fundamental elements for social development, thereby contributing to the holistic and comprehensive education of students [25,26,30].

Santiago de Cali University (USC) has seven faculties (Basic Sciences, Economics and Business Sciences, Humanities and Art, Law, Education, Engineering, and Health). USC has a student population of approximately 19,482 [31]. Since 2018, after adopting an educative competency-based model, the university has established the integration of environmental competency into all academic programs [31]. As a result, all students from different academic programs are currently required to take the course "Ecosystems, Environment, and Sustainable Development". The purpose of this course is to improve knowledge and raise environmental awareness.

In compliance with the new USC curricular guidelines [30], this study presents the historical diagnostic results for the environmental knowledge of the first group of students who took the course "Ecosystems, Environment, and Sustainable Development" in the second semester of 2017. This is to report evaluating the environmental knowledge and skills developed throughout this course and its initial impact on implementing the curricular policy of strengthening environmental education in all academic plans. We analyzed different factors associated with environmental knowledge to strengthen educational strategies focused on sustainability. Furthermore, the study evaluated these factors of environmental knowledge in students assigned to different university careers and considered the possible influence of sociodemographic aspects. Finally, this study reports significant evidence of a pedagogical experience that contributes to improving educational quality and strengthening environmental training in different professionals.

2. Materials and Methods

2.1. Place of Study

This research was carried out at the campus of the Universidad Santiago de Cali (3°24′12.28″ N, 76°32′51.79″ W), located south of Santiago de Cali (Colombia). The area of vegetation coverage is estimated to be approximately 23,400 m^2, 35% of the total area. In the same way, its infrastructure has preserved some arboreal species typical of the tropical deciduous woodland. The university campus has implemented eco-friendly infrastructure such as solar panels, a reserve water tank for the reuse of water for different necessities, grease traps in all the restaurants, and water saving in taps and toilets in all buildings. Finally, USC has a waste-management plan [30].

2.2. Participants and Instruments

This study implemented a transversal descriptive design and included a sample of 268 students of a total of 880 belonging to different academic programs. They were registered in the course "Ecosystems, Environment, and Sustainable Development" in 2017. The sample was selected randomly; the confidence level was 95%, with a 5% error.

The design of the instrument focused on obtaining useful information to understand environmental knowledge and perceptions at the regional and local levels. The questionnaire (Appendix A) was designed using Google Forms in 2017 and distributed to the entire student population via email. The survey consisted of 18 questions organized in four parts: 1. Sociodemographic data as follows: age, gender, socioeconomic level according to the social classification in Colombia (1 to 6, representing low to high income, respectively) and type of high school of origin (public or private) (Question 1). 2. Analysis of the knowledge and importance of environmental problems (Questions 2–6). 3. Questions related to the mitigation of the different environmental problems (Questions 7–9). 4. Evaluation of the knowledge of the activities carried out at the university focused on environmental sustainability (Questions 10–18). In this paper, environmental knowledge is related to what respondents have learned about the environment (Questions 2–9), and environmental awareness is related to performing actions or activities to care for the environment (Questions 10–18).

All the questions in the form were closed-ended, and eligible response options were provided for the respondent to select from a predetermined list. Each question in each section required respondents to either tick one appropriate response or tick more than one appropriate response. Within the questionnaire, certain questions required the respondent to provide binary responses of "yes" or "no" (Questions 2, 5, 7, 10, 13, and 15). Others presented a spectrum of options, where participants were tasked with selecting multiple responses they concurred with (Questions 3, 6, 8, 11, 14, 16, and 18). Furthermore, the questionnaire incorporated two Likert-type scale questions (Questions 4 and 9). Data gathered from questionnaires were tabulated in an MS Excel spreadsheet. Pivot tables were constructed, and frequency analyses were performed.

In the questionnaire, each one of the proposed problems (Question 3 in Appendix A) was selected based on theoretical models, including sustainable ONU development goals [32], the planetary limits proposed by Steffen [15], the National Policy for the Environmental Comprehensive Soil Management [33], the Fifth National Report on Biodiversity [34], among other authors referenced (Table 1). Thus, 12 environmental problems were established.

Table 1. Environmental problems and definitions and their relation to questionnaire questions.

Environmental Problem	Definition	Questions Related	References
Mismanagement of solid waste (MSW)	Inadequate management of collection, source separation, storage, transportation, transfer (including recycling), treatment, and disposal of solid waste.	3c, 8c, 11c,12a,17,18	[35–38]
Water pollution (WP)	Water pollution is a physical, chemical, or biological factor causing aesthetic or detrimental effects on aquatic life and on those who consume the water.	3e, 8b, 11b, 13, 14	[11,36,39,40]
Air pollution (AP)	Is determined as the presence of pollutants in the air in large quantities for long periods. Air pollutants are dispersed particles, hydrocarbons, CO, CO_2, NO, NO_2, SO_3, etc.	3b	[11,37,40,41]
Soil pollution (SP)	Soil pollution occurs through the release of chemicals or the disposal of wastes, such as heavy metals, hydrocarbons, and pesticides.	3k	[11,33,37,40,42]
Noise pollution (NP)	Noise pollution is produced by machines, vehicles, traffic noises, and musical installations that are harmful to our hearing.	3f	[11,40,43]
Visual pollution (VP)	Visual pollution is a type of pollution that has negative effects on human vision, spatial orientation, and both physical and mental health. It also has psychological and economic impacts on a community. This is characterized by "unrestrained and uncoordinated diversity" of shapes, colors, light, materials, and clusters of disparate visual elements.	3l	[37,42,44,45]
Low implementation of renewable energy (LRE)	The limited use of energy from natural resources such as sunlight, wind, rain, tides, plants, and animals.	3i, 8d,11b,15,16	[39,46,47]
Global Warming (GW)	The rise in global temperature, attributed to an increase in greenhouse gases, stems primarily from industrialization, deforestation, fuel combustion, and unsuitable agricultural practices.	3d	[14,15,48,49]
Biodiversity loss (BL)	Disappearance of the variety of different forms of life on Earth, including different plants, animals, micro-organisms, the genes they contain, and the ecosystem they form. Loss of genetic variation; ecosystem variation; species variation (number of species) within an area, biome, or planet.	3a	[34,39,50–53]
Lack of environmental knowledge (LEK)	Lack of information used to develop one's own environmental attitudes and behaviors.	3g	[5,33,39,54–56]
Inefficient public transport system (IPT)	Inefficient public transport is disorganized and operates in the midst of different flows of vehicles, leading to congested roads, delayed arrivals, increased pollution, and more road accidents. These systems prove to be inefficient in the absence of proper planning and government regulation.	3j, 8f	[37,57,58]
Lack of further research into environmental topics (LRI)	Lack of research in resource and environmental sciences hinders understanding of economic and environmental change, hindering sustainable development. Lack of research limits the development of related disciplines and technologies and hinders the implementation of science and technology policies at regional, national, and global levels.	3h, 8h	[33,59,60]

2.3. Data Analysis Procedures

2.3.1. Characterization of Individuals

Descriptive data were presented for sociodemographic variables. Respondents were classified into three age groups as follows: adolescents (between 16 and 17 years), young adults (between 18 and 24 years), and adults (between 25 and 58 years). These categories were chosen according to the Ministry of Health and Social Protection [61]. Subsequently,

the answers with regard to the identification of environmental problems, the actions to mitigate environmental problems, and the knowledge of environmental campaigns were presented.

2.3.2. Factor Assessment (Gender, Age Group, and Schools) Regarding Environmental Knowledge at Universidad Santiago de Cali

To assess the environmental problems, a global index and three indicators were constructed. The General Index of Environmental Knowledge (GI) corresponds to the average value of the three indicators identified, such as Identification of Environmental Problems (EP), Solutions to Environmental Problems (SP), and Knowledge of Environmental Campaigns (EC). Each indicator was created by dividing the value corresponding to each answer from the survey respondents by the maximum value reported in all answers (Table 2). The scores of the previous variables were represented with percentage values.

Table 2. Description of the general indicators of environmental problems (EP), solutions to environmental problems (SP), and knowledge of environmental campaigns (EC).

Mathematical Expression of the Indicator	Description
Environmental Problems (EP) $PA_i = \frac{x_i}{c} * 100 = \frac{x_i}{8} * 100$	- x_i : Number of environmental problems identified by student i. - c : Maximum number of problems identified.
Solutions for Environmental Problems (SP) $SP_i = \frac{x_i}{c} * 100 = \frac{x_i}{6} * 100$	- x_i : Number of solutions that can reduce the environmental problems identified by student i. - c : Maximum number of solutions identified.
Knowledge of Environmental Campaigns (EC). $CA_i = \frac{x_i}{c} * 100 = \frac{x_i}{4} * 100$	- x_i : Number of environmental campaigns in the university identified by student i. - c : Maximum number of environmental campaigns identified.
General Index of Environmental Knowledge (GI) $GI_i = \frac{EP_i + SP_i + EC_i}{3}$	

For further clarification of the variables used in the study, Table 3 shows the variables, variable categories, and their labels.

Additionally, we assessed the effect of the gender, age group, and different schools in the scores of the indicators created (GI, EP, SP, and EC); the Mann–Whitney U test, proposed by Knowledge Frank Wilcoxon, was used to compare more than two groups. Furthermore, the Chi-square test of independence was used to evaluate the relationship between particular categorical variables related to the knowledge of environmental problems and actions to mitigate them with the variables of age group and gender. Finally, we assessed if there is an association between the scores of the EP and SP or EC indicators using Pearson's coefficient correlation (r closer to 1 or -1 indicates a strong positive or negative linear correlation among the variables, and the values of r closer to 0 indicate that there is no linear correlation). All tests were performed at a 5% significance level ($\alpha = 0.05$). The tests were carried out using R-3.6.1 statistical software [62].

Table 3. List of the variables used in the study.

Variable	Variable Categories
Environmental Problem (EP)	Mismanagement of solid waste (MSW) Water pollution (WP) Air pollution (AP) Soil pollution (SP) Noise pollution (NP) Visual pollution (VP) Low implementation of renewable energy (LRE) Global warming (GW) Biodiversity loss (BL) Lack of environmental knowledge (LEK) Inefficient public transport system (IPT) Lack of further research into environmental topics (LRI)
Environmental Problems (EP)	Number of environmental problems identified by student i (*Xi*) Maximum number of problems identified (*c*)
Solutions for Environmental Problems (SP)	Number of solutions that can reduce the environmental problems identified by student i. (Xi) Maximum number of solutions identified (*c*)
Knowledge of Environmental Campaigns (EC)	Number of environmental campaigns in the university identified by student i. (Xi) Maximum number of environmental campaigns identified (*c*)
General Index of Environmental Knowledge (GI)	Combination of EP, SP, and EC variables
Gender (GE)	Women (WO) Men (ME)
Age group (AG)	Adolescent (ADO) Young (YO) Adult (ADU)
School (SC)	Health (HE) Economic Sciences (ES) Law (LA) Engineering (EN) Communication and Advertising (CA) Education (ED) Basic Sciences (BS)

3. Results

3.1. Student Characterization

The sample of participating students was from 15 different municipalities in the Valle del Cauca department, mainly represented by people living in Santiago de Cali (87.7%), and nearly 5% of the students were residents in Palmira and Yumbo (the two closest cities from the capital). Table 4 shows the primary demographic factors for the 268 participants. The mean age was 22.6 $\pm$ 6.2 years, with women comprising 57.8% of the sample. Additionally, notable percentages were observed for the following factors: youth (68.7%), middle-income social class (51.4%), and the School of Health (39.6%).

Table 4. Participant characteristics.

Factors	N (%)
Gender (GE)	
Women (WO)	155 (57.8)
Men (ME)	113 (42.2)
Age group (AG)	
Adolescent (between 12 and 17 years old) (ADO)	24 (9.0)
Young (between 18 and 24 years old) (YO)	184 (68.7)
Adult (older than 25 years) (ADU)	60 (22.4)
Socioeconomic Level	
Low (0–2) (LO)	91 (34.0)
Middle (3–4) (MI)	138 (51.4)
High (5–6) (HI)	39 (14.9)
School (SC)	
Health (HE)	106 (39.6)
Economic Sciences (ES)	43 (16.0)
Law (LA)	40 (14.9)
Engineering (EN)	32 (11.9)
Communication and Advertising (CA)	20 (7.5)
Education (ED)	18 (6.7)
Basic Sciences (BS)	9 (3.4)

3.2. Identification of Environmental Problems

A total of 94.4% of the students identified the existence of significant environmental issues. The results show that biodiversity loss (34.4%) is a problem with higher identification scores. Other environmental problems showed results as follows: air pollution (32.4%), solid waste mismanagement (30.0%), climate change (28.5%), and water pollution (26.1%) (Table 5).

Table 5. Environmental problems identified by the students at Universidad Santiago de Cali.

Environmental Problems	Yes	No
a. Biodiversity loss (BL)	34.4	65.6
b. Air pollution (AP)	32.4	67.6
c. Mismanagement of solid waste (MSW)	30.0	70.0
d. Global Warming (GW)	28.5	71.5
e. Water pollution (WP)	26.1	73.9
f. Noise pollution (NP)	21.7	78.3
g. Lack of environmental knowledge (LEK)	12.7	87.4
h. Lack of further research on environmental topics (LRI)	11.5	88.5
i. Low implementation of renewable energy (LRE)	11.1	88.9
j. Inefficient public transport system (IPT)	10.3	89.7
k. Soil pollution (SP)	9.5	90.5
l. Visual pollution (VP)	4.4	95.7

Considering the students who identified environmental problems, 70% indicated that they are highly important, 27.3% indicated that they have a medium level of importance, and 2.8% indicated that they have a low importance. The same trend was found when analyzed by age and gender, providing evidence that adolescents, young adults, and adults perceive environmental problems to be highly important at rates of 59.1%, 69.2%, and 63.2%, respectively. Regarding gender, men and women perceive environmental problems to be highly important at rates of 72.9% and 67.8%, respectively (Figure 1).

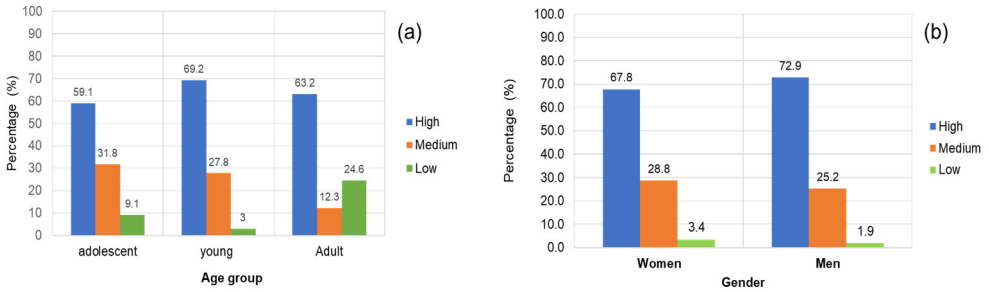

Figure 1. Level of importance of environmental problems identified by age (**a**) and gender (**b**).

Also, 94.2% of people indicated that they had been or would be affected by an environmental problem. In this context, 47.2% of students mentioned current importance, while 37% indicated they will be affected in the near future (about 5 years) and 12% said that they will be affected in the future (over 10 years). On the other hand, 3.7% of respondents answered that they had been affected in the past. The mentioned rates were higher for men (97.1%) in comparison to women (92.0%). For age groups, adults (95.8%) and young people (95.7%) indicated being more affected than adolescents (78.9%).

Our findings show higher scores in women than men with respect to the general index of environmental knowledge (GI) and the environmental problems indicator (EP). No significant differences were observed among genders, neither for the general index of environmental knowledge (GI) (Wilcoxon = 9612, $p = 0.178$) nor for the environmental problems indicator (EP) (Wilcoxon = 9575, $p = 0.180$) (Table 6).

Table 6. Comparison of means of the GI, EP, SP, and EC indices according to factor (gender, age group, school).

Factor	EP		SP		EC		GI	
	Mean	***p*-Value**	**Mean**	***p*-Value**	**Mean**	***p*-Value**	**Mean**	***p*-Value**
Sample (N = 268)	26.9		17.5		18.8		21.1	
Gender (GE)								
Women (WO)	29.2	0.180	18.8	0.319	18.7	0.796	22.2	0.178
Men (ME)	23.8		15.8		18.8		19.5	
Age group (AG)								
Adolescent (ADO)	30.4		17.4		21.7		23.2	
Young (YO)	26.6	0.972	17.2	0.907	18.4	0.803	20.7	0.977
Adult (ADU)	26.5		18.7		18.9		21.4	
School (SC)								
Basic Sciences (BS)	23.6		11.1		11.1		15.3	
Economic Sciences (ES)	35.4		25.2		17.7		26.1	
Communication and Advertising (CA)	23.0	0.130	17.5	0.364	17.1	0.331	19.2	0.352
Law (LA)	23.7		18.9		21.7		21.4	
Education (ED)	37.5		32.4		20.6		30.2	
Engineering (EN)	32.3		14.0		25.0		23.8	
Health (HE)	23.4		14.1		16.4		18.0	

Minor variations were found with regard to the knowledge of problems between genders. The differences were not statistically significant (X2 = 0.03, $p = 1.0$). Women affirmed that air pollution (37.7%) was the most important problem to solve. For men, the main environmental problem to solve was biodiversity loss (33.6%). According to GI and EP, there were no significant differences (GI, Kruskal–Wallis = 0.046, $p = 0.977$) (EP, Kruskal–Wallis = 0.057, $p = 0.972$) among age groups. However, women and adolescents showed higher values for both scores (Table 6). Also, the scores for knowledge of environmental problems were not statistically significant between age groups (X2 = 0.07, $p = 1.0$). For

adolescents, young people, and adults, the priority main problems were climate change (45.6%), biodiversity loss (35.5%), and solid waste mismanagement (36%), respectively. Finally, considering schools, Economic Sciences and Education were correlated with the highest values. However, no significant statistical differences were found between schools for GI (Kruskal–Wallis = 6.672, $p = 0.352$) and EP (Kruskal–Wallis = 6.868, $p = 0.130$) (Table 6).

3.3. Solutions to Environmental Problems

The results showed that 94% of students indicated the importance of actions to reduce, mitigate, or solve environmental problems. Of the eight main activities recommended for reducing or mitigating environmental issues, the three most significant were managing solid waste (36.6%), planting trees (27.4%), and saving water (22%) (Question 8 in Appendix A, Figure 2).

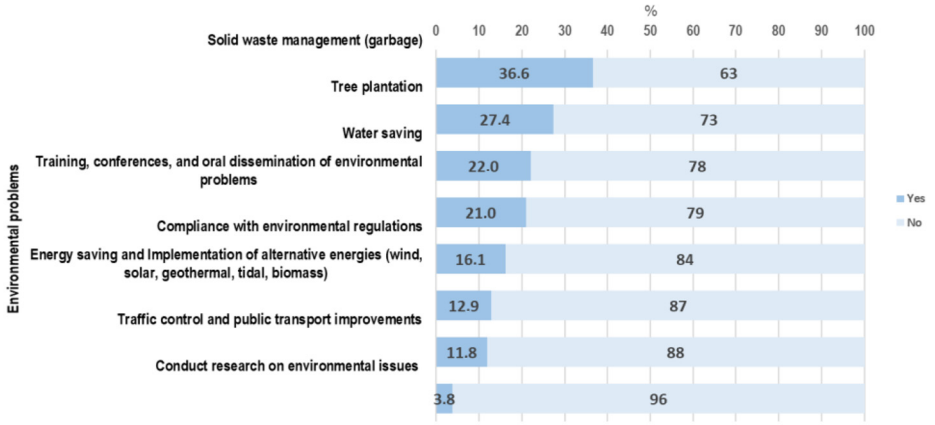

Figure 2. Actions known to students for the reduction or mitigation of environmental problems.

Thus, the main actions were focused on water use efficiency (82.4%), electrical energy use (72.3%), and solid waste management (62.4%) (Questions 13, 15, and 17, respectively, in Appendix A). These actions were carried out frequently (44.1%) and occasionally (27.3%), and only 13.1% of the students indicated that they always performed eco-friendly actions. With regard to gender, there were no differences between women (69%) and men (69.9%) with respect to performing eco-friendly actions, while for age groups, a higher percentage of young people (50.3%) carried out eco-friendly actions frequently. Conversely, 40% and 38% of adolescents and adults, respectively, carried out eco-friendly actions occasionally.

Women and men showed higher values for solutions to environmental problems (SP). However, these differences were not significant (Wilcoxon = 9314, $p = 0.319$) (Table 6). Considering knowledge about actions to reduce environmental problems, these do not vary significantly between genders (X2 = 0.07, $p = 0.883$). Thus, women indicated that the main actions to solve environmental problems were solid waste management (44.9%), tree plantation (28%), and water saving (23.4%). Men indicated that tree plantation was the main action to solve environmental problems (26.6%), while 25.3% and 20.3%, respectively, indicated solid waste management and water saving (Appendix B).

The scores for SP tend to be higher among adult students (18.7), followed by adolescents (17.4) and young people (17.2). However, there are no significant statistical differences between them (Kruskal–Wallis = 0.057, $p = 0.907$). The knowledge about actions to reduce environmental problems did not vary significantly among age groups (X2 = 0.03, $p = 1.0$). The main action recognized for all age groups was solid waste management. This proportion is higher in adults (100%) than in young people (35.2%) and adolescents (22.9%). Adults perceive water saving as a second relevant action (56.3%), while tree plantation was the second option for young people (26.6%) and adolescents (14.3%).

In general, women showed a higher trend to realize actions than men. According to age groups, adolescents performed actions for efficient water use (87%) and solid waste management (73.9%). Young people showed higher values in actions associated with

efficient use of energy (77.3%). In terms of performing actions, our results showed the lowest performed actions values among students, who acquired devices, tools, or changes in home infrastructure.

Students indicated that efficient water use (82.4%) was the main action they took to mitigate environmental problems. A total of 86% of women had an affirmative answer versus 76% of men in performing actions to save water. Also, these outcomes were significantly different between genders (X2 = 0.53; $p = 0.05$). Specifically, the main actions related to water use efficiency were as follows: closing the faucet while taking a shower (44.5%), saving water while brushing teeth (38.2%), and cleaning the dishes (27.3%).

Participants' main energy-saving actions were as follows: unplugging electronic devices (50.3%), turning off lights (43%), and using LED light bulbs (37.3%). Significant differences were found in actions supporting efficient energy use between genders (X2 = 6.16, $p = 0.019$). The main action for women (47.1%) and men (55.6%) was unplugging electronic devices, while the second action for women was turning off lights (46.3%). Conversely, for men, the use of household gas was second (41.7%). In terms of age groups, young people (52.2%) and adults' (50%) first option for energy-saving was unplugging electronic devices. At the same time, the main action performed by adolescents was turning off lights (52.9%).

The general patterns in relation to solid waste management were: 1. People classified organic and inorganic food at all the places they went (44%). 2. They carried the waste until they found a waste can (32.5%); and 3. People did not throw their waste in unauthorized places (28.9%). It was shown that the actions to reduce consumerist habits were less frequent; for instance, people used a thermos to carry liquids and avoided buying plastic bottles (18.1%), avoided the use of straws (17.5%), and bought strictly what they needed (10.2%). Furthermore, activities such as washing yogurt containers and food tins were less frequent habits (1.8%). Significant differences between genders were found with respect to the actions performed for appropriate solid waste management (X2 = 6.44, $p = 0.016$). Although men and women carry out the three main actions mentioned before in similar frequencies, men (46%) have fewer consumerist habits than women (43%). Women wash food containers at a low frequency (2.8%), while men do not. In general, the three age groups adopted the same three actions mentioned above. However, actions to reduce consumption habits were more common among adults (62.1%) than among young people (50.5%) and adolescents (29.4%). The reason why students did not perform waste management was due to waste cans not being nearby. They thought that the cleaning staff did not recycle waste properly. In some cases, the staff were not interested in performing this activity.

Among schools, no statistically significant differences were observed in the scores of the indicator of solutions for environmental problems (PS) (Kruskal–Wallis = 6.551, $p = 0.364$). It is just like in the case of GI; that is, values are higher for the schools of Economic Sciences and Education than others (Table 6). Variations were observed for the solutions to environmental problems (SP) among seven different schools at USC.

3.4. Knowledge of Environmental Campaigns

Half of the population (53%) had not seen environmental campaigns at USC. The campaigns most frequently identified were those associated with recycling, such as the distribution of ecologic points; collection of bottle caps, plastic bottles, and batteries (66.7%); training workshops; and teaching environmental topics inside The Environment Week event (28.6%), which includes conferences and cultural activities. The campaigns least identified by the students were environmental regulations (6.3%), water and energy saving (17.5%), and those related to Earth Day (18.3%). Students suggested that USC should conduct environmental activities like seminars and lectures about environmental problems (39.5%), recycling education campaigns (34.5%), and innovative initiatives to generate an impact beyond the university scope (27.3%). Also, it should include environmental material in all academic courses from the first year of study, with environmental experiences and ecological field trips, to raise people's awareness (23.6%).

There were no statistically significant differences for EC between men and women (Wilcoxon = 8906, $p = 0.796$) (Table 6). No significant differences between genders were observed with regard to the identification of environmental campaigns (X2 = 0.28, $p = 0.609$). Women noted environmental campaigns more frequently (48.4%) than men (45.1%). Both women (65.3%) and men (68.6%) mainly identified recycling campaigns. In the second place, men recognized campaigns such as the Environment Week event or Earth Day with the same frequency (25.5%), while women identified training workshops and the teaching of environmental topics in the second place (34.7%).

The scores of the environmental campaigns indicator (EC) tend to be higher in adult students, followed by adolescents and young people. However, no statistically significant differences between age groups were noted (Kruskal–Wallis = 0.438, $p = 0.803$) (Table 6). The identification of environmental campaigns did not vary significantly between age groups (X2 = 0.02, $p = 1.0$). The groups recognize recycling campaigns most often, followed by training workshops and the teaching of environmental topics and the Environment Week event.

Variations in the scores of the environmental campaigns indicator (EC) were observed among seven schools. The values were higher in the case of Engineering School, followed by Law School and Education School. However, there were no statistically significant differences between schools (Kruskal–Wallis = 6.887, $p = 0.331$) (Table 6).

3.5. Relationship between Environmental Knowledge Indicators

In general, a moderate correlation was observed between the identification of problems and their solutions (r = 0.55; $p = 0.000$), as well as a weak correlation between the identification of problems and campaigns (r = 0.44; $p = 0.000$) (Table 7). The assessment by gender showed moderate correlations between EP and PS and weak correlations between EP and EC, both among men and women. Moderate correlations were observed between EP and SP for adolescents and young people, while adults showed a strong correlation (r = 0.70; $p = 0.000$). Furthermore, moderate correlations were identified between EP and EC for the group of adolescents, while these were weak for young people and adults. In the analysis of faculties, strong correlations between EP and SP were found in the faculties of Economic Sciences (r = 0.74; $p = 0.000$), Communication (r = 0.77; $p = 0.000$), and Education (r = 0.60; $p = 0.000$), while for other schools studied, the correlation were weak. Moderate correlations were identified between EP and EC for all schools.

Table 7. Pearson correlation (r) analysis of environmental problems (EP), solutions for environmental problem (SP) indicators, and campaign indicators (EC).

Factor	EP vs. SP		EP vs. EC	
	Correlation (r)	***p*-Valor**	**Correlation (r)**	***p*-Valor**
Global	0.55	0.000 **	0.44	0.000 **
Gender (GE)				
Women (WO)	0.53	0.000 **	0.40	0.000 **
Men (ME)	0.57	0.000 **	0.50	0.000 **
Age group (AG)				
Adolescent (ADO)	0.53	0.009 **	0.56	0.005 **
Young (YO)	0.51	0.000 **	0.39	0.000 **
Adult (ADU)	0.70	0.000 **	0.28	0.000 **
School (SC)				
Health (HE)	0.33	0.000 **	0.36	0.000 **
Economic Sciences (ES)	0.74	0.000 **	0.45	0.002 **
Law (LA)	0.52	0.000 **	0.54	0.000 **
Engineering (EN)	0.44	0.014 *	0.51	0.003 **
Communication and Advertising (CA)	0.77	0.000 **	0.45	0.051
Education (ED)	0.71	0.001 **	0.52	0.032 *
Basic Sciences (BS)	0.60	0.088	0.04	0.972

** $p < 0.01$, * $p < 0.05$.

4. Discussion

4.1. Identification of Environmental Problems

Changes in attitudes and aptitudes of the population with respect to environmental issues will change with the acquisition of constant and progressive knowledge about the actual socio-environmental problem [63–65]. Moreover, this education must be given to all socioeconomic classes. The dominant socioeconomic class in the USC is the middle class. The university focuses on middle- and lower-middle-class students who pay low tuition fees compared to the average of other private universities in the region, which demonstrates its goal of being an inclusive university for the entire vulnerable population.

This study showed that biodiversity loss (34.4%) was the most relevant environmental problem, followed by air pollution (32.4%). In Colombia, there are few studies that have been conducted to analyze the knowledge or perception of environmental problems. A study carried out among students of a public university in 26 states of the country, analyzing 9 environmental problems, showed that water pollution was the most relevant problem (79.3%), followed by solid waste management (65%) and air pollution (57.3%) [65]. Another study showed that the inclusion of different topics, such as the state, policies, issues, and lessons regarding the perception of nature in university students from business programs, can change their vision of nature [66]. Likewise, in a Chilean university, students affirmed that water and air pollution are also important topics to analyze because they are related to people's health [67]. These studies show that variations in the most important problems in people's environment may be related to the environmental approach included in the courses and the influence of social media and environmental campaigns [68].

Moreover, Table 8 provides a comparative evaluation of environmental problems amongst university students belonging to different academic disciplines across nine research studies carried out in seven countries covering various regions of the world. The three key concerns outlined by students in our survey, namely biodiversity loss, atmospheric pollution, and inadequate solid waste management, have also been identified as important within global university contexts. It is worth emphasizing that air pollution is a predominant issue across most of the studies examined. Conversely, the issue of biodiversity loss appears as a significant topic in six of the research studies. Simultaneously, the problem of mismanagement of solid waste is identified as a major concern in four of the examined papers.

Colombia, as a megadiversity country, has a tendency to protect its flora and fauna. As a result, it is clear that pollution, together with other different environmental impacts, affects biodiversity, water, and air [34,69]. Similarly, at both regional and national levels, the efforts to discuss issues related to biodiversity loss have been increased [70]. Some examples of this are the citizen science activities performed by the Alexander von Humboldt Institute and different territorial environmental entities [71]. Furthermore, similar trends are reported by other authors regarding climate change, land use change, and pollution as problems that negatively affect biodiversity and ecosystem services [50,72,73]. On the other hand, the importance given to air pollution in this study is due to the poor air quality in the two main cities of Colombia, Bogotá and Medellin [74,75].

EP's high percentage of students consider these problems to be extremely important (70%), especially in the case of adolescents, as they are more inclined towards environmental issues than older people [76]. Older adults did not want to get involved in environmental actions [77]. Apparently, religious affiliation had a strong relationship with measures of attitudes and concerns and willingness to support the environment [77]. In fact, adolescents consider that natural problems will affect them at some point in their lives, even in less than 5 years. This proves that they are aware of the adverse environmental effects which are real, and they consider that the problems are caused by human behavior [20].

The general index of knowledge (GI) provides a relevant differentiation when making comparisons between gender and age variables. It was found that scores on the general knowledge index and the environmental problems indicator tended to be higher for adolescent students. The youngest age group was shown to be more inclined to take decisive

action to solve environmental problems [66]. Although the knowledge of the problems according to gender was not statistically significant (X2 = 0.03, p = 1.0), women are more aware of the problem than men because the former has become a force that not only supports proper environmental management but also demands a better quality of life and greater social equality [78].

Comparing the answers of students from different programmes, higher scores in the Environmental Problems (EP) and Solutions to Environmental Problems (SP) indicators were found for the schools of Education and Economic Sciences and Engineering and Economic Sciences, respectively. In the case of the curricular content, the School of Education has an undergraduate program in natural sciences. In addition, students enrolled in other courses must take subjects related to ecology and environmental impact. Students in the School of Economic Sciences acquire knowledge about environmental problems in their courses, especially in economics, which includes courses on environmental economy and business environmental management. Moreover, Engineering School programs adopt an environmental approach through courses such as bioengineering and sustainable energy, which enable students to seek, question, and propose solutions to environmental problems. According to some authors [79,80], engineering courses, and more specifically civil engineering courses, need to include the environmental challenges facing their immediate surroundings and the world. Engineers' vision is crucial for designing and building an innovative, sustainable future; therefore, they must have the necessary knowledge and be committed to sustainable development, always including environmental issues. Moreover, it is evident that the different research groups and the research seedbeds of each program also contribute to improving attitudes toward the environment.

Table 8. Comparison of the studies investigating environmental knowledge.

Country	University	Student	Knowledge about Environmental Impact	Value or Percentaje (%)	Reference
China	University students from the municipality of Shanghai (MS) and Gansu Province (GP)	Different university careers	a. Water scarcity and pollution, b. global warming, c. stratospheric ozone depletion, d. air pollution, ozone depletion	Most important: a. (MS and GP); second most important: b. (MS and GP); third most important: c. in MS, d. in GP; fourth most important: d. in MS, c. in GP	[81]
Finland	University of Eastern Finland	Arts, social sciences, education, mathematics	a. Climate change, b. lack of clean water, c. decrease in biodiversity	a. 45, b. 34, c. 15	[82]
Turkey	Istanbul University in Istanbul	Faculty of Engineering, Faculty of Business Administration, Veterinary School, School of Physical Education and Sports, and Vocational School of Technical Sciences	a. Air pollution, b. noise pollution, c. water pollution, d lack of infrastructure 13.7, e. solid wastes and f. soil pollution	a. 37, b. 20.9, c. 16.1, d. 13.7, e. 10.1, and f. 1.3	[83]
Sri Lanka (Ceylon)	The Open University of Sri Lanka (OUSL) and University of Peradeniya (UP)	Engineering, science, management, law, arts, and social sciences	a. Global warming b. Ozone layer depletion c. Loss of biodiversity/natural forests d. Acid rains e. Agricultural pollutants f. Depletion of fossil fuel	a. 52.2% of UP and 41.2 of OUSL, b. 19 both UP and OUSL, c. UP 15.2 and 16.5 OUSL d. UP 2.7 and 7.2 OUSL, e. UP 9.5, OUSL 10.2, and f. 1.2 UP and 4.2 OUSL	[84]
Mexico	Universidad Autónoma de Chiapas	Civil Engineer	Environmental conditions are bad	Strongly agree (66.4), agree (14.4), disagree (14.4), strongly disagree (4.8)	[78].
Mexico	Universidad Autónoma de Nuevo León	Chemist Bacteriologist Parasitologist	*a*. serious environmental problems (industries and quarries, traffic, noise, water quality, little interest in conservation, the increase in urbanization, the destruction of nature, the lack of green areas and wastewater) *b*. little serious environmental problems: environmental pollution, forest fires, industrial waste, waste of energy, urban waste, the contamination of the rivers and, the increase of the population	a. 56.3 and b. 43.8.	[85].

Table 8. *Cont.*

Country	University	Student	Knowledge about Environmental Impact	Value or Percentaje (%)	Reference
Chile	4 elite and 7 non-elite universities	Agronomy, architecture, sciences, political sciences, accounting and administration, law, design and marketing, education, engineering, literature, public relations, health and social work	a. Climate change, b. water pollution, c. atmospheric pollution, d. overexploitation, e. desertification, f.invasive species.	a. 72, b. 76, c. 76, d. 60, e. 39, f. 33	[86]
Peru	Universidad Nacional del Altiplano	Biology, physics, chemistry and laboratory, mathematics, computing and informatics	Degree of Environmental pollution	Very high (11), high (28), regular (43), low (13), very low (5)	[87]
Peru	Universidad Científica del Sur	Careers in the areas of health, engineering, basic sciences, law, economics, arts, and administration.	a. Deforestation b. global warming c. deglaciation of snow-capped mountains d. acidification of the oceans, e. desertification f. contamination, g. Waste management, h. species extinction, i. lack of alternative energies, j. water shortages	National impact: a. 78.9 b. 53.2, c. 31, d. 19, e. 15.1 Local impact: f. 92.4, g. 37.4, h. 25.8, i. 29.7, j. 9.7	[88]
Colombia	Students of a public university in 26 states of the country	Environmental engineering and technology in environmental Sanitation	a. Illegal trade in plants and animals, b. food contamination (agrochemicals), c. others, d. loss of biodiversity, e. deforestation, f. soil degradation, g. air pollution, h. mismanagement of solid waste, and i. water pollution.	a. 3, b. 7.9, c. 8.6, d. 12.4, e. 32.6, f. 32.6, g. 57.3, h. 65, and i. 79.3	[36]
Colombia	Universidad Santiago de cali	Basic Sciences Economic Sciences Communication and Advertising Law Education Engineering Health	a. biodiversity loss, b. air pollution, c. mismanagement of solid waste, d. global warming, e. water pollution, f. noise pollution, g. lack of environmental knowledge, h. lack of further research into environmental topics, i. low implementation of renewable energy, j. inefficient public transport system k. soil pollution l. visual pollution	a. 34.4, b. 32,4, c. 30, d. 28.5, e. 26.1, f. 21.7, g. 12.7, h. 11.5, i. 11, j. 10.3, k. 9.5, l. 4.4	This study

4.2. Solutions to Environmental Problems

The indicator for solving environmental problems (PS) tends to be higher for adult students, followed by adolescents and then young people. This is due to cumulative knowledge throughout life and acquired maturity compared to other age groups [6,89]. In this study, the age factor showed a trend with regard to environmental knowledge. As can be seen, knowledge is built up across educational processes, with the aim of consolidating perception of different issues. Environmental awareness and ethical–moral behavior are influenced by the level of knowledge acquired from childhood up till the moment that people finish their learning process [5,89]. The relationship between informal and formal education, as well as the general behavior of the community, is important for changing skills and attitudes toward nature. Similarly, in terms of the indicator of Solutions to Environmental Problems (SP), women were more aware at the moment of taking environmental actions (actions were between 10 and 14% more frequent than men's), although there were no significant differences [90–92]. However, research carried out in an elementary school [93] found that boys obtained high scores in variables such as knowledge, attitudes, behavior, and comfort levels with environmental education activities. This demonstrated that gender is not an important factor influencing positive attitudes, knowledge, and environmental behavior [91,92,94].

On the other hand, the students showed that they know of actions to reduce environmental problems, but these actions are carried out infrequently. Overall, adults in this study did not have a previous and adequate environmental education on environmental problems. In the Colombian case, the analysis of environmental education is recent [19,36]. Today, the environmental knowledge of the adult population is influenced by commercial campaigns, TV shows, and debate panels or newspapers. This is a new topic to discuss because, in the last year, there has been little information about environmental education or the importance of protecting and caring for nature. Likewise, in Colombia, the access to education programs and the difference in the home economies make it difficult for adults to obtain know-how on environmental issues. People's knowledge is also limited to issues and actions such as solid waste management (36.6%), tree planting (27.4%), and water conservation (22%). Solutions are necessary for the long term, although they may not be sufficient to mitigate the effects of environmental problems [95–97]. Our findings are consistent with the main environmental issues reported in the media in Colombia [36].

4.3. Knowledge of Environmental Campaigns

Every year, the USC environmental department develops playful and pedagogical campaigns as part of a program of extra-curricular activities. Despite this, 53% of the students declared that they did not know about environmental campaigns carried out at USC. Therefore, it is necessary to continue developing and reinforcing educational actions focused on different environmental issues. Also, educational workshops should be developed by researchers in different fields of environmental science, especially on topics identified by students, such as waste management, water, energy-efficient use, biodiversity, ecology, socio-environmental aspects, air, and noise pollution, among others [98,99]. Although students in a university in Turkey take many courses on environmental issues, their environmental awareness and environmentally responsible behavior are lower than expected, and the same is true for their grades. In this study, courses influenced students' attitudes and aptitudes throughout their university careers [98,100]. These authors also concluded that environmental knowledge does not always influence awareness and behavioral intentions [100], but other studies carried out in different universities showed contrary results [68,101]. As a consequence, environmental education processes can be influenced by cultural and habitual behaviors, which are important to change.

Environmental education and its influence on the community through environmental awareness campaigns have been widely discussed [69,96]. The development of an individual's mental and cognitive potential of an individual is an important factor in mitigating environmental problems and contributing to solving their negative impacts. Increasing

people's knowledge about human activities that affect the environment has an impact on changing their behavior and attitudes [5,21,102]. It is essential that individuals understand, reflect on, and evaluate their impacts on the environment and society [49]. Likewise, it is necessary to strengthen the scientific and environmental culture with ethics and moral values, where it is possible to distinguish the correct behavior of citizens [5].

Social class (stratification in Colombia) and education influence behavior and environmental knowledge [64]. Prior knowledge of basic natural science subjects from high school and the subsequent reinforcement and deepening of this knowledge during university has a positive effect, as the acquisition of new knowledge leads to the adoption of good environmental practices [5,99]. According to some authors [21,64], the lack of education largely determines the behavior of citizens with regard to relevant issues such as current environmental problems.

In general, scores related to environmental problems (EP) were higher than those related to identifying solutions to such problems (SP) and those related to environmental campaigns identified in the USC (EC). Similarly, the significantly positive correlations between EP and EC showed a greater identification of solutions, where environmental knowledge implies changes in people's attitudes. This can be explained by the learning of the surveyed students in the course "Ecosystems, Environment and Sustainable Development". Nevertheless, the environmental campaigns depend more on the dissemination of these campaigns through communication media such as email messages, the university's website, and social media. Our results are in line with research conducted by Freije [49], which indicates that the main factor influencing environmental awareness among students is an educational system that includes environmental issues in the study programs.

Finally, the university should make a political commitment to the environment in order to create a basis for the implementation of environmental policy through university work, education, extra-curricular activities, and research so that people can work in environmental coordination or a department in business environmental management. The university must consider its training role in environmental responsibility issues [103,104] and, thus, become certified as a sustainability university [105]. Universities of the future will influence the education of the leaders, policymakers, scientists, consumers, researchers, and entrepreneurs of the future and, thus, the future decision makers in different areas. Consequently, environmental knowledge and the role of environmental education in transforming lifestyles and attitudes could play a crucial role in shaping individual behavior [91,92,95].

5. Conclusions

Students at the Universidad Santiago de Cali were aware of environmental problems. Even so, their knowledge was limited, although they had information pertaining to different media coverage, including social networks and television, among others. This has an impact on the teaching of environmental issues, resulting in inefficient actions to solve these problems.

Adolescents and young people are more sensitive and committed to environmental issues. Conversely, adults did not have an environmental component in their educational curricula. In addition, the loss of biodiversity, air pollution, and mismanagement of solid waste were the main environmental problems identified by students. These topics are included in the compulsory course "Ecosystems, Environment and Sustainable Development".

Environmental education should not be taught in the traditional way, which primarily involves recycling campaigns, training workshops, and outreach to environmental issues. The new generations require a restructuring of their relationship with these issues through interactive, practical, and virtual approaches. Consequently, the challenge integrates education with social networks and technology, an area where environmentalists and scientists need to keep up to date. Finally, it is necessary to analyze university students' perceptions, behaviors, and attitudes to determine the effectiveness of implemented measures and activities.

The elements considered in this research are aspects of great value at the educational level because the understanding of environmental perceptions can enable the strengthening of educational programs in the context of environmental education; perceptions can promote actions to be more conscientious of nature and can be promoted by institutional projects in order cultivate a generation of collective actions that create a culture of environmental sustainability.

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Appendix A

Environmental knowledge of the students from Santiago de Cali University (the survey was conducted in Spanish).
1. Sociodemographic data
1.1 Email address:
1.2 Academic program and Faculty:
1.3 Semester:
1.4 Gender:
1.5 Age:
1.6 Neighborhood, City:
1.7 Socioeconomic level: 1__, 2__, 3___, 4__, 5___, 6____
Questions:
2. ¿Do you consider that there is a current environmental problem?
Yes_____ Not_____
3. ¿Which one or which ones?
a. ___Biodiversity loss
b.___Air pollution
c. ___Mismanagement of solid waste
d. ___Global Warming
e. ___Water pollution
f. ___Noise pollution
g. ___Lack of environmental knowledge
h. ___Lack of further research into environmental topics
i. ___Low implementation of renewable energy
j. ___Inefficient public transport system
k. ___Soil pollution
l. ___Visual pollution
4. ¿How important are these environmental issues to you?

High _____ Medium_____ Low_____ Does not care
5. ¿ Do you think that you have been or will be affected by an environmental problem?
Yes_____ Not_____
6. ¿ When?
Before (past) _____ Now (Present) _____ In the near future (5 years) _____ Further future (More than 10 years) _____
7. Do you know actions that can reduce or mitigate these environmental problems?
Yes_____ Not_____
8. ¿What actions do you consider could reduce or mitigate environmental problems?

a. ____Tree plantation
b. ___ Water saving
c. ____Solid waste management (garbage)
d. ____Energy saving and Implementation of alternative energies (wind, solar, geothermal, tidal, biomass)
e. ____Training, conferences, and oral dissemination of environmental problems
f. ____Traffic control and public transport improvements
g. ____Compliance with environmental regulations
h. ____Conduct research on environmental issues

9. How often do you take at least one of the next actions to reduce or mitigate environmental aspects?
Always _____ Frequently_____ Occasionally_____ Rarely_____ Never_____
10. Have you seen an environmental campaign at USC?
Yes_____ Not_____
11. ¿What kind of campaigns?

a. ____Training, seminars, and dissemination
b. ____Water and energy campaign
c. ____Waste campaign
d. ____Regulatory campaigns
e. ____Research disclosure
f. ____No campaign

12. ¿What environmental activity should USC do?

a. ____Campaigns for recycling education
b. ____Seminars with guests for talks on environmental problems
c. ____None other, as are the ones that are done, is enough
d. ____Other

13. ¿Do you carry out actions for the efficient use of water?
Yes_____ Not_____
14. ¿What kind of actions?

a. ____Turn off the faucet while brushing your teeth
b. ____Turn off the faucet while taking a shower
c. ____Turn off the faucet while soaping the kitchen utensils
d. ____Take the vehicle (car, motorcycle, bus, etc.) to authorized laundries so as not to do it at home
e. ____Use the water from the washing machine that comes out in washing clothes to do chores at home
f. ____The washing machine uses it maximum of twice a week
g. ____Has and uses water-saving toilets
h. ____All of the above
i. ____Other

15. ¿Do you perform any actions for the efficient use of energy?
Yes_____ Not_____
16. ¿What kind of actions?

a. ____Unplug electronics when you leave the house.
b. ____Use led bulbs
c. ____Has some renewable energy infrastructure (panels, wind, biomass, etc.) Uses household gas
d. ____Turn the lights off when you leave a room or other place
e. ____Use the washing machine once or twice a week
f. ____it ironing clothes once a week
g. ____Does not use an electric shower
h. ____The air conditioning is programmed between 24–26 °C for one or two hours maximum
i. ____Buy electronic equipment with energy-saving capacity
j. ____All of the above
k. ____Other

17. ¿Do you take some actions for the proper management of solid waste (garbage)?
Yes_____ Not_____
18. ¿What actions?

a. ____ Separates organic from inorganic waste everywhere you go (home, university, mall, restaurants)
b. ____ It takes your waste with you when you are out at home if you cannot find a disposal waste place (trash can)
c. ____ Do not throw garbage anywhere where there is an unauthorized disposal place on the street
d. ____ Buy strictly what is necessary
e. ____ Use a thermos to carry liquids. Don't buy plastic bottles
f. ____ Does not ask for a drinking straw in the places where it is offered
g. ____ Wash the containers and the canned, among others, before putting it in the trash can.
h. ____ All of the above
i. ____ Other

Appendix B Supplementary Survey Questions about Actions Actions to Mitigate Environmental Problems

Table A1. Knowledge of actions to mitigate problems by gender (N = 245).

Question	Women (WO)	%	Men (ME)	%	Total	%
Q8 ¿Do you know of actions that could reduce or mitigate these environmental problems?						
No	48	31.0	34	30.1	59	24.1
Yes	107	69.0	79	69.9	186	75.9
Q8. ¿How often do you carry out at least one of the above actions to reduce or mitigate environmental aspects?						
1.Never	15	10.7	6	5.7	21	8.6
2.Rarely	6	4.3	11	10.5	17	6.9
3.Occasionally	43	30.7	24	22.9	67	27.3
4.Frequently	59	42.1	49	46.7	108	44.1
5.Always	17	12.1	15	14.3	32	13.1

Table A2. Knowledge of actions to mitigate problems by age group.

Question	Adolescent (ADO)	%	Young (YO)	%	Adult (ADU)	%
Q8. ¿Do you know of actions that could reduce or mitigate these environmental problems??						
No	7	30.4	48	27.3	22	38.6
Yes	16	69.6	128	72.7	35	61.4
Q9. ¿How often do you carry out at least one of the above actions to reduce or mitigate environmental aspects?						
1.Never	3	15.0	14	8.6	2	4.0
2.Rarely	0	0.0	9	5.5	8	16.0
3.Occasionally	8	40.0	39	23.9	19	38.0
4.Frequently	7	35.0	82	50.3	17	34.0
5.Always	2	10.0	19	11.7	4	8.0

Table A3. Actions identified by gender (Question 8).

Action	Woman (WO)	Men (ME)	Total
c. Solid waste management (garbage)	44.9	25.3	36.6
a. Tree plantation	28.0	26.6	27.4
b. Water saving	23.4	20.3	22.0
e. Training, conferences, and oral dissemination of environmental problems	20.6	21.5	21.0
d. Energy saving and Implementation of alternative energies (wind, solar, geothermal, tidal, biomass)	17.8	13.9	16.1
Energy saving and Implementation of alternative energies (wind, solar, geothermal, tidal, biomass)	13.1	12.7	12.9
f. Traffic control and public transport improvements	12.1	11.4	11.8
h. Conduct research on environmental issues	3.7	3.8	3.8

Table A4. Actions identified by age group (Question 8).

Action	Adolescent (ADO)	Young (YO)	Adult (ADU)
c. Solid waste management (garbage)	22.9	35.2	100.0
a. Tree plantation	14.3	26.6	56.3
b. Water saving	8.6	21.1	62.5
e. Training, conferences, and oral dissemination of environmental problems	5.7	19.5	37.5
g. Compliance with environmental regulations	5.7	15.6	37.5
d. Energy saving and Implementation of alternative energies (wind, solar, geothermal, tidal, biomass)	8.6	14.1	25.0
f. Traffic control and public transport improvements	2.9	12.5	25.0
h. Conduct research on environmental issues	0.0	4.7	6.3

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