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Climate Change Perceptions: A Study With Portuguese University Social Education Students

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Abstract

Climate change (CC) is one of the most urgent problems to solve in this century, the effects of which cover a wide range of disciplines that go beyond the environmental component, becoming a social and economic problem as well. Social educators are professionals who must ensure that the quality of life in socially vulnerable societies is improved. In order to mitigate the problem of climate change, it is necessary for all professionals in the most varied areas to have climate literacy, so that they can adopt behaviors that comply with the objectives of sustainable development. Recognizing the importance of the social educator in the context of contemporary societies, we intended to find out the university students' perceptions on the social education course. With this in mind, we set out to carry out this study, which was based on the application of a questionnaire using a Likert scale. The respondents were 161 social education students at a higher education institution in Portugal. In order to carry out the inferential analysis, we took care to meet the necessary criteria for carrying out parametric tests. The results showed that a majority (72.6 %) of students were concerned about climate change. They (54.7 %) also stated that they would like their course to deal more with climate change, as 74 % acknowledged that they did not have the skills to deal with climate change as a future professional. The results also showed that the students were incapable of correctly listing a consequence of climate change. The data collected and analyzed in this study allowed us to conclude that Environmental Education played a fundamental role in the academic training of social educators, suggesting the need for

its reinforcement and inclusion in their training plans. We also found that greater efforts were needed to improve students' climate literacy.

Keywords: Climate change, climate literacy, environmental literacy, social education.

Introduction

Climate change is an emergency that requires urgent resolution, and this can be achieved by training more critical citizens with more robust climate literacy. Primary and secondary schools, as well as universities, are aware of this problem and have been developing curricula and pedagogical approaches that try to raise awareness of the problem of climate change among everyone and among future professionals in different areas (Leal Filho et al., 2021).

This awareness through education could progressively permeate and influence good environmental practices in the community and local and national governments (Cordero et al., 2020, Gardner et al., 2021, Udas et al., 2018). However, even though climate education has been gaining ground in schools in Portugal, Europe, and other countries around the world, we still seem to be living in a state of "climate ignorance" (Pinillos, 2018). This low climate literacy – or climate illiteracy – leads to confusion, misconceptions, ingenious theories, distorted beliefs, and perceptions that conflict with scientifically accepted explanations. The ignorance and misconceptions that children, young people, and adults possess spread due to the abundance of complex, divergent, inaccurate information or even absurd errors that are propagated in an age of mass information. Climate science includes complex topics (for example, the interaction between weather and climate on regional and global scales, radiative forcing, aerosols, and Milakovitch cycles), which is yet another challenge to overcome when promoting climate literacy (Ramos & Bergano, 2016; Chen, 2011; Cartea, 2015; Lee et al., 2015; Oversby, 2017). The mission of improving climate literacy must embrace the entire society. Authors, such as Shwom et al. (2017), call for climate literacy programs not to be reduced to biophysical science, but to integrate relevant knowledge from the social sciences. The balance between the biophysical dimension and the social dimension in the construction of the scientific representation of climate change is essential. There must be professionals capable of spreading an understanding of the environmental issues facing the world today. This study was carried out with the collaboration of Social Education undergraduate students at a higher education institution in northern Portugal. To verify and understand the presence of environmental curricular units in the initial training of Social Educators, we analyzed the curriculum of the respective three-year degree. After this analysis, we found that the Environmental Education Curricular Unit is included in the Initial Training for Social Educators, more specifically in the 1st semester of the 2nd year. This aspect, which we consider to be very significant and relevant, shows that the higher education institution is concerned about training in this area, formally considering it in the degree's curriculum. Looking specifically at the curriculum unit (academic year 2022/2023), we can see that its learning objectives assume that at the end of the curricular unit students will be able to: "(I) recognize the role of man as a modifier of ecosystems; (II) know the importance of environmental quality for the emotional balance and well-being of the population; (III) understand the implications of the exhaustive exploitation of natural resources; (IV) understand the importance of individual behavior in environmental issues; (V) design and plan environmental education actions with diverse audiences; (VI) promote environmental

sustainability projects in social institutions." We believe that these objectives make clear the concern with training (social) education professionals capable of understanding environmental issues on a global scale, and individual responsibilities, but also developing concrete actions with different audiences. Social educators can play a crucial role in society, many of them end up having to work in schools, so they must have a reasonable base of climate literacy.

Methodology

This is a quantitative study, which used a questionnaire survey to collect data and the SPSS statistical program version 27.0 to analyze it. In general, the quantitative method aims to quantify a problem and understand its dimension, providing numerical information on the behavior and opinion of the individuals in the sample, presented in exact numbers (Dias, 2009). By understanding the concerns of a sample, we can draw conclusions that can help make political decisions. In this context, a study was carried out to examine the perceptions of students studying for a degree in Social Education at a higher education institution in the north of Portugal regarding climate change. The following tasks emerged from this aim: (i) to find out about students' perceptions of climate change; (ii) to check whether students' perceptions of climate change vary according to the variables "year of study", "secondary school course attended", "age" and "religion".

The data collection instrument used was a questionnaire previously constructed for this study and validated by two professionals in the field. The questionnaire consists of 19 closed-ended items using a Likert scale with five response options (strongly disagree, disagree, indifferent/do not know, agree, strongly agree), and two open-ended questions. Due to the nature of the article format and to respect the page limit, we have only included a few items that we found worth examining.

As far as the participants are concerned, this study used a convenience sample from the population of undergraduate students. The distribution of the sample (161 students) is demonstrated in Table 1.

Table 1
Distribution of the Sample by Degree Years

Year of degree	1st year	2nd year	3rd year
N (%)	57 students (35.4 %)	56 students (34.8 %)	48 students (29.8 %)

As for the characterization of the sample according to age, the participating students were aged between 18 and 63, with an average age of 22.

In terms of gender distribution, 132 (81.4 %) of the students were female, and 29 (18.0 %) – male.

As for their area of study during secondary school, the majority, 105 (65.2 %) came from the area of languages and humanities, 34 (21.1 %) – from areas related to economic sciences, 19 (11.8 %) – from sciences and technologies, and finally 3 students (1.9 %) – from areas related to the arts.

When it came to their religion, 100 (62.1 %) were Christians, 35 (21.7 %) were evangelicals, 4 (2.5 %) professed Islam and 1.2 % said they were Buddhists. There were also 20 (12.4 %) who said they did not identify with any specific religion.

Data Collection and Analysis Procedures

The questionnaire was administered during the months of April and May 2023, with the university's permission. One of the researchers presented the study and its tasks to the students in their classrooms, in the presence of the teachers. A Google Forms link was shared with the students, and they were invited to participate voluntarily and anonymously.

The data obtained from the Google forms was exported to a database using IBM SPSS v27.0 statistical software (SPSS, IBM Corporation, New York, NY, USA), and Jamovi v2.3. The data was then analyzed using descriptive and inferential statistics.

To carry out the inferential analysis, we used parametric tests, the Kolmogorov Smirnov normality test, whose Null Hypothesis (H0) was "the data is normally distributed" and given that the p-value result was ($p< 0.05$) for the variables under study, we rejected the Null Hypothesis (H0) and assumed that the sample did not follow a normal distribution. Non-parametric tests were therefore used. To compare the variables under study according to two groups, the Mann-Whitney test was applied, which is a non-parametric test suitable for comparing the distribution functions of a variable in two independent samples (Marôco, 2014). According to the same author, the Kruskall-Wallis test was used to compare the variables under study according to more than two groups, which is the appropriate non-parametric test for comparing the distributions of two or more at least ordinal variables observed in two or more independent samples.

Spearman's correlation coefficient was used to correlate age and the variables under study, which is a non-parametric measure of association between two variables that are at least ordinal. This coefficient is obtained by replacing the values of the observations with their respective orders. Measures of association quantify the intensity and direction of the association between two variables (Marôco, 2014). The further section focuses on the results taking into account the variables.

Results

The results were analyzed by crossing the following variables:

- The sample's level of concern about climate change as a function of the "religion" variable;
- Perception of climate change according to the variable "year of graduation";
- Perception of climate change according to the variable "secondary school course";
- Perception of climate change according to the "age" variable.

The participants' responses regarding the consequences of climate change were analyzed.

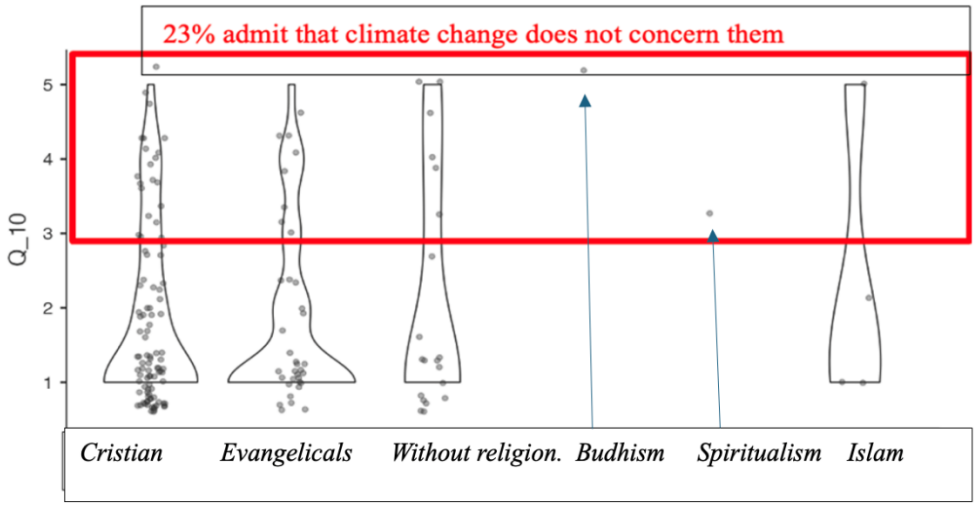
The Sample's Level of Concern About Climate Change as a Function of the "Religion" Variable

Figure 1 shows the results of question 10, which deserved some attention, where an attempt was made to verify the students' concern and correlate it with their religion: "Climate change is something that doesn't worry me". We can see that the majority of respondents are Christians (n=100), followed by evangelicals (n=35), no religion (n=20), Islam (n=4), Buddhism (n=1) and spiritualism (n=1). Because the discrepancy between the number of students of different religions is so large, there are no

statistically significant differences in this question, but even so, we cannot help but notice that of the entire sample (n=161 student respondents) there is a percentage of 23.8 % who are indifferent to the problem or who are not concerned about the problem of climate change.

Figure 1

Box Plot of the Distribution of Answers to Question No. 10 (Q_10) and the Religion Variable



Perception of Climate Change Taking Into Account the "Year of Graduation"

Comparing the degree of agreement with the statements on climate issues according to the year of graduation variable (Table 4), there are statistically significant differences, namely in "Q8 – When I buy something, I always take into account the ecological footprint of the product I'm going to buy" (p=0.002) whose average was higher in the group of 2nd year graduates, followed by the group of 3rd year students; as well as "Q11 – I'd like to learn/know more about climate change" (p=0.012) whose mean was higher in the 2nd year undergraduate group, followed by the 3rd and 1st year undergraduate student groups. We can see the average in more detail in Table 2 and Figure 2 below.

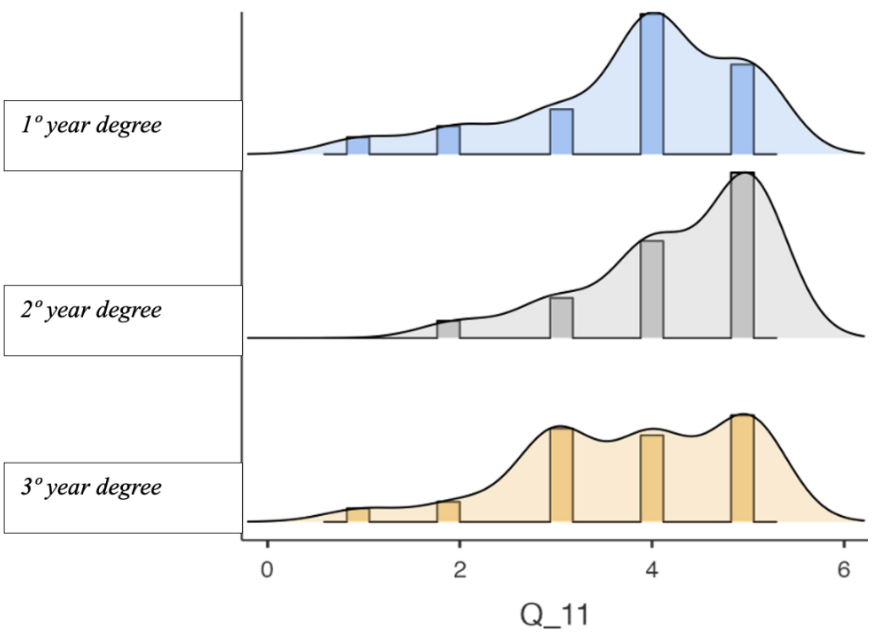
Table 2

Comparison of the Degree of Agreement With the Statements on Climate Issues According to Year of Degree

	1st year degree n=57		2nd year degree n=56		3rd year degree n=48		
8 – When I buy something, I always take into account the ecological footprint of the product I'm going to buy	average	Dp	average	Dp	average	Dp	*p*
	2.4	1.0	**3.1**	1.2	**2.8**	1.2	**0.002**
11 – I'd like to learn more about climate change	**3.8**	1.1	**4.3**	0.9	**3.8**	1.1	**0.012**

Figure 2

Histogram of the Degree of Agreement With Question 11: I would like to learn/know more about climate change according to the year of graduation. Likert Scale: 0 – completely disagree and 5 – completely agree



Perception of Climate Change Using the "Secondary School Course" Variable

About "Q 5 – Climate change is just an excuse to exploit taxpayers with new taxes", there are statistically significant differences (p=0.036) whose mean was higher in the group of students who studied Economics at secondary school. There are statistically significant differences, namely in "Q 9 – As human beings, we are above other living beings" (p=0.013) whose mean was higher in the group of students who studied

Languages and Humanities at secondary school, followed by the group of students who studied Economics.

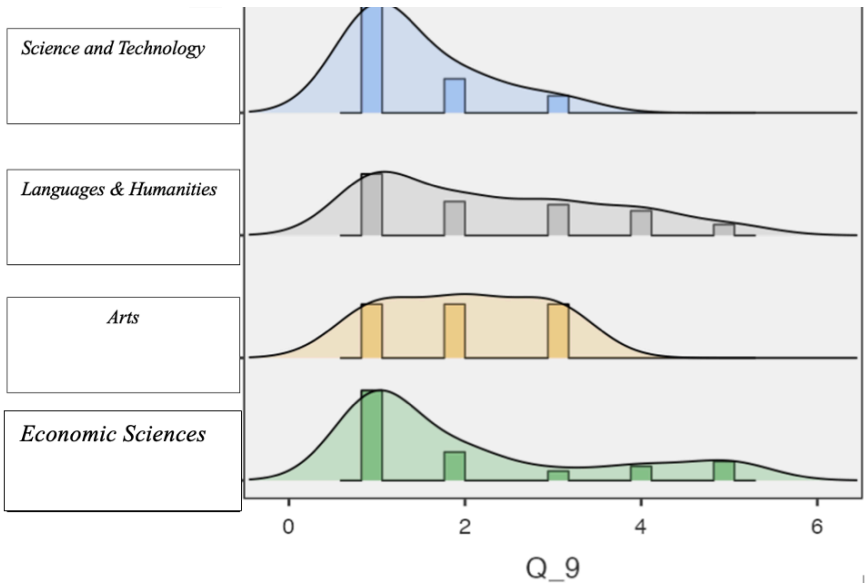
Table 3

Comparison With Climate Change Statements According to Secondary School Course

5 – Climate change is just an excuse to exploit taxpayers with new taxes	Science and Technology n=19		Languages & Humanities n=105		Economic Sciences n=34		
	average	Dp	average	Dp	average	Dp	*p*
	1.6	1.0	**2.4**	1.5	**2.5**	1.4	**0.036**
9 – As human beings, we are above other living beings	**1.4**	0.7	**2.3**	1.3	**2.0**	1.4	**0.013**

Figure 3

Histogram of the Degree of Agreement With Question 9: "As human beings, we are above other living beings" as a function of the secondary education field of study variable. Likert Scale: 0 – completely disagree and 5 – completely agree



Perception of Climate Change Taking Into Account the "Age" Variable

From the analysis between students' age and the degree of agreement with statement 8 "Q8 – When buying something, I always take into account the ecological footprint of the product I'm going to buy" (r=0.170*), there is a weak positive correlation between age and the degree of agreement with the statement, which suggests that older students tend to agree more with this statement.

Table 4

Correlation Coefficient Between the Age of the Students and the Degree of Agreement With the Statements on Climate Issues

Age	
8 – When I buy something, I always take into account the ecological footprint of the product I'm going to buy	0.170

The value in Table 4 indicates that climate change and the age of the students indicate a weak positive correlation between the two variables (concern about climate change and age of the students). There is a slight tendency for older students to be more concerned about climate change than younger students.

List of Consequences of Climate Change

Although the majority of participants are concerned about climate change, we believe that the number of those who are not concerned or are indifferent to the problem deserves attention. About understanding the phenomenon, when it comes to mentioning a consequence of climate change, the answers shown in Figure 4 below emerge.

Figure 4

List of answers, where they are asked to list the consequences of climate change that they know about, the figure shows that n=57, corresponding to 35.4 % do not know or prefer not to answer, the second most mentioned consequence is rising sea levels (13.6 %), the greenhouse effect (9.9 %), pollution (9.9 %), factories (8.6 %), loss of biodiversity (5.5 %), drought (5.5 %), forest fires (4.3 %), ozone (4.3 %) and garbage (2.4 %)

Discussion

We should start by saying that this study may have some aspects that should be analyzed with caution: (i) the results should not be generalized, as we must remember that it was a convenience study; (ii) Age variance of the sample: The participating students were aged between 18 and 63. High variability means that the values are less consistent, so it is harder to make predictions.

At the beginning of the research, we were willing to understand whether concern about climate change varied according to religion. Several studies have shown that religion can influence the way we look at climate change (Carr et al., 2012; Sachdeva, 2016; Skirbekk et al., 2020). According to Alper (2022), evangelicals tend to express skeptical views, while people with no religion consistently express higher levels of concern. In our study, in particular, there were no statistically significant differences when comparing concerns according to religion, which may be due to the size of the sample or the lack of heterogeneity in its distribution by religion.

About perceptions of climate change based on the year of graduation, 2nd year students seem to be more sensitive to the problem. They are more concerned about the ecological footprint when buying a particular product, which may be because it is precisely in the 2nd year that they have the environmental education curricular unit in their degree, which may influence their perception and sensitivity to the problem in question. Authors such as Kuruppuarachchi et al. (2021) and Ramos et al. (2023) state that courses that address environmental topics improve students' environmental literacy. These types of curricular units or courses build technical knowledge about the subjects (from an information point of view), and then end up having a stronger influence on the construction of their opinions, laying solid foundations in awareness, changing behavior, and developing skills in their students so that they better understand the environment (Jacobi, 2003). It should be noted that it was also the 2nd year students who showed the most interest in learning/knowing more about climate change, which reinforced the importance of this curricular unit in raising awareness of the problem. Many universities do not include development education, and this is something that will have to change in the future if we are willing to mitigate climate change (Kitagawa, 2023).

When we take into account the high school course the students came from, we see that there are differences between students who studied Science and Technology at high school and those who studied Economics, for example. The latter are the ones who most agree that climate change is just an excuse to exploit taxpayers with new taxes. The study by Kuruppuarachchi et al. (2021) also found that there was a more anthropocentric attitude in courses less related to the environment, such as management or accounting. The same authors stressed that environmental education should be reinforced in formal education. Similarly, Lutar Skerbinjek et al. (2017) also found that administration, management, or accounting students score lower on environmental perceptions. Students in areas related to economics and business seem to have more individualistic, materialistic, and competitive values (Vansteenkiste et al., 2006). A possible explanation for this result may be related to the fact that people trust in the ability of technology to tackle environmental challenges and are reluctant to make personal sacrifices for the sake of the environment (Pan & Hsu, 2022).

To understand the extent of their understanding of the phenomenon of climate change, we challenged the students to identify the consequences of climate change. In general, there was a worrying percentage of wrong answers. Almost 10 % mentioned pollution as a consequence, and 8.6 % mentioned factories, which are a cause and not a

consequence. Another 4.3 % mentioned ozone and, finally, 2.4 % pointed to garbage, giving a total of 25.2 % wrong answers in the sample. Given that this is a problem that needs to be solved urgently, and that everyone knows about it, these figures seem to us to be worth reflecting on, not least because these students will be education professionals. However, these figures reflect what other previous studies have already mentioned, which is that there is a "gap" in the population's literacy or knowledge of the problem, and this climate illiteracy often does not distinguish between age or social class (Sharma, 2012; Lee et al., 2015; Corner et., 2015; Azevedo & Marques, 2017).

Conclusions

There is a common consensus that education is a driving force in addressing the challenges of CC and in promoting the social change required to achieve a more sustainable world (Corrochano et al., 2023). It is necessary to recognize unsustainability as a trend in global development known as the Anthropocene. We must also consider that there is a lack of understanding and skills in environmental education and consequently in climate literacy (Wanchana et al., 2020). Despite environmental education being present in the missions of modern universities, we live in a state of climate illiteracy (Blanco et al., 2017; McCaffrey & Buhr, 2008). Climate is changing faster than attitudes and behaviors about human-environment interactions, and knowledge does not advance fast enough to make people adapt or mitigate (Reimers, 2021). It is urgent to improve curriculums with climate education as soon as possible, as the rapidly changing and uncertain world is faced with sustainability-oriented challenges. Higher education needs to play an increasingly significant role in helping students become active and responsible citizens (Zsóka et al., 2013).

Social educators as professionals who will work with various spheres of society, from children to elderly people, rich and poor, must have the mission of raising awareness and educating about one of the biggest challenges of the century. In this study, we found no differences in the level of concern about climate change according to religion. However, differences were found when considering the year of the degree attended, with 2nd year students showing greater sensitivity to the problem, given our data, we cannot say for sure that this is because they have attended an environmental education class, but it could be a good indicator, although other studies would be necessary to confirm this.

Differences were also found according to the secondary school course attended, with students from the economic sciences tending to show a more anthropocentric attitude. This leads us to believe that sustainability lessons during the school/academic career make a difference in understanding students' perceptions and level of literacy about CC. On the other hand, some students who have taken natural sciences classes, with an environmental component in the past have reasonable levels of correct answers and, a more "ecocentric" posture. This study adds to something that has been known for some time: there is a lack of climate literacy, and this is not an isolated case, other studies find the same in different countries (Rasis et al., 2023).

If we are willing to mitigate the problem, we must reinforce the school curriculum so that students and teachers can have tools to understand and teach about climate. The school (from early years to university) has a fundamental role in promoting sustainability (McKeown-Ice, 2010) and preparing new generations to face the challenges of climate change. Climate education must make sure that students understand concepts about the climate, but that this is reflected in actions.

We must highlight the study by Poza-Vilches et al. (2023) when they state that universities prioritize the "Personal" dimension, leaving sometimes the "Environmental" dimension in the background. Universities should embrace climate change education to equip their students with the knowledge, critical thinking skills, and understanding of science and ethical frameworks, which help them in mitigating, adapting to, and reversing climate change (Haas, 2021). We believe that this work could lead to a closer look at the higher education courses in the field of education and related courses, highlighting the added value of including curricular units/disciplines that contribute to the development of responsible attitudes and skills that enrich climate literacy.

When it comes to climate change literacy, the literature is unanimous in stating that there is a long way to go. We share the idea of the United Nations Development Program (UNDP, 2021) and suggest that climate literacy should go beyond the natural sciences and be integrated into the various subject areas. This means that climate change education must go beyond equipping people with the skills to understand CC. It must equip them to understand the trade-offs, make choices, and invent solutions that can help us integrate choices that are environmentally sustainable within a larger framework of how we live.

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