

CONTRIBUTIONS OF CLIMATE CHANGE RESEARCH TO THE IMPLEMENTATION OF THE 2030 AGENDA

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Abstract

The adoption by the United Nations of the 2030 Agenda for Sustainable Development raises new challenges in the field of educational research and its importance as a priority area for action. Climate change is one of these priorities, however, to solve or minimize the problems that arise from it, public policies are needed, but also new scientific, technological and educational solutions. In this sense, we proposed to do a quantitative research to find out the perception that children in the 1st and 2nd cycle of basic education in Portugal have about climate change. We used a Likert scale questionnaire adapted to children from these study cycles, validated by the Portuguese Directorate General of Education. This study was based on the application of 136 surveys, and the results obtained so far are in line with what other studies, present in our literature review. In which a lack of knowledge on this subject is evident. There seems to be a deficit in the school's ability to raise awareness about climate change, as warned by a project carried out by the School Education Gateway, which showed that teachers in countries such as Spain, Turkey, Romania and Canada do not have adequate skills to educate students about climate change, and this is reflected in the students' perception. In view of the above, the school has a share of responsibility in which it should contribute to promote values, attitudes and pro-environmental behaviors. If we do nothing, our lives will be significantly affected by climate change and, therefore, society, schools, governments should prepare us to adapt to the climate crisis and should also enable us to contribute to solutions that allow us to achieve climate justice and mitigate the problem. As there are no studies of this nature done in Portugal with children of this age group. We believe that this study can be an added value, because it meets the goal number 13, of sustainable development, which refers to the mitigation of climate change issues and goal number 4, which refers to Quality Education. This theme is also addressed in the referential of education for sustainable development and in the national strategy of education for citizenship. The results of this type of research may suggest the need for greater responsibility of governments and schools towards the sustainable development goals of the 2030 agenda. In this context, it is essential to know the perceptions and literacy level of the population and then propose changes or educational reforms that meet the UNESCO commitments, in the need to find solutions that help mitigate the climate crisis.

Keywords: climate change, education, climate literacy, sustainable development.

1 INTRODUCTION

The topic of climate change is part of the Portuguese national curriculum mandatory schooling, and should be addressed from early childhood education to the end of secondary education. Throughout their schooling, the students should come into contact with the complexity of the subject in multiple and diverse moments of the teaching and learning process. Schools should, therefore, be one of the responsible for climate change education, however, the existing literature [1][2] [3] refers that teachers do not address the subject effectively. Also, UNESCO has analyzed the school programs of more than 100 countries, including Portugal, and 47% did not make reference to climate change. The ones that did address the subject were countries more vulnerable to the consequences of climate change and approached it in a very superficial, almost insignificant way. Of the teachers included in this study, 95% said it was urgent to talk about this issue in the classroom, but only 40% were able to teach about it. Some countries that stand out with good educational policies are Italy, which has created a discipline on climate change that accompanies students from pre-school to high school; Indonesia and South Korea have added climate change to their school curriculum since 2013, with the purpose of enriching the literacy of their citizens. Indonesia organizes every year, the Climate Change - Education Forum, which aims to exchange ideas and knowledge about climate; Colombia, which has adopted Environmental Education in schools at both formal and informal levels, on a large scale, also addressing issues related to climate change [4]. In the case of Portugal, the most motivated teachers have no support from the curriculum or textbooks, in which cutting-edge topics such as biodiversity or climate

change go almost unnoticed. The subject is addressed in some subjects, but without ever presenting the true scope of this problem. [5] As far as textbooks are concerned, they have a very precarious approach to the topics and are also outdated, these have a six-year shelf life when, in the case of climate change, there are new facts almost every day [6]. In basic education, environmental issues such as climate change are cross-cutting, and are part of the national curriculum where they are addressed by various subjects [7]. As we can see in table nº1.

Table 1: Cycle of study and areas that address Climate Change topics in Portuguese Education.

Level of Education	Curriculum Area/Discipline
Preschool Education	World Knowledge Area
1º Cicle	Citizenship and Development; Environmental Studies
2º Cicle	Natural Sciences; History and Geography of Portugal; Citizenship and Development;

Nowadays the concept of literacy is widespread in several areas, such as computer literacy or political literacy. We now need to implement climate literacy for all. Not only to create more environmentally critical and empowered citizens, but also to sometimes force politicians to implement new laws in favor of the environment. We need not only a better climate policy, but also a change in the lifestyle of every individual, but for that we need a good understanding of the climate crisis. For this to be effective, schools need to be able to contribute to the implementation of climate education. [8] Although climate education has gained some expression in schools, in Portugal and in Europe and the rest of the world, it seems that we still live a state of "climate ignorance". Teachers have a crucial role in training children and young people to develop their understanding and attitudes towards climate education. To this end, it is essential that there are professionals capable of promoting an understanding of the environmental issues facing the world today. The education system has a share of responsibility for a more responsible global citizenship. It is also important to remember that children already live and will have to live in the hostile situations of the future, and that only through changes in behavior and lifestyles globally will the impacts of climate change be mitigated. Climate change education is essential for a world transformed by a changing climate [9].

2 METODOLOGY

When we constructed our research questions, we saw, the questions and objectives, which would have been addressed in other studies, such as that of School Education Gateway [1]. In this way we obtained a basis for comparison with others. We chose the quantitative methodology because this method is effective in that it is conclusive and aims to quantify a problem and understand its dimension, providing numerical information about the behavior of the individuals in the sample [10].

We believe that it is imperative to know the perceptions that primary and secondary school students have about climate change. In this context, we designed a questionnaire that could meet our research questions and objectives, which are expressed in table 2 below:

Table 2: Research Questions and Research Objectives.

Research Issues	Objectives
1 - What perceptions about climate change do primary and second cycle school students have?	-Evaluate the perceptions of 1º. and 2º. cycles students about climate change. -Identify the causes and consequences of climate change and verify whether the associated ideas are anthropocentric or ecocentric.
2 - Are these perceptions the same according to the variables - age, gender, residence, year of schooling, geographic contexts, parents profession?	- To see if perceptions of climate change differ by age, gender, residence, year of schooling.

2.1 Characterization of the Sample

In order to understand all aspects to solve the main questions of this research and to meet the proposed objectives, this work will rely on the voluntary participation of 1st and 2nd cycle students from three school schools of Bragança. The research problem that we propose to develop and that will guide our research focuses on the perceptions of climate change and how these are seen by students. Since the region of northeastern Transmontano is a region likely to face some of the consequences of climate change, we include schools inserted in a microclimate of the cold Transmontano land, and others in the warm land. The collaborating schools are of a more rural character, two of them (Carrazeda de Ansiães and Vila Flor) are more designated from the microclimate of terra quente Transmontana, with a milder climate, marked by the Douro river valley and the valleys of its affluents. The other school, in Vinhais, is part of the D. Afonso III group of schools, is further north, is part of the higher altitude regions and constitutes the cold land Transmontana, where the landscape is dominated by the low hills of the Transmontano plateau.

In what concerns the sample, the participating students are between 9 and 14 years old, with an average age of 10, being 58 in the 4th grade and 78 in the 6th grade. As for the gender distribution, 77 students are female and 59 are male. The educational level of the parents is sometimes lower than the surveyed population, where about 22% of the parents have the 4th year of schooling. Another 22% have completed high school and approximately 12% have a college degree. In fact, the answers obtained to the questions in Group I of the survey reveal that these students come from diverse socio-cultural backgrounds. It is worth mentioning that all the students in the sample reside in the Bragança district area.

2.2 Instrument Description

In the construction phase of the questionnaire, the different questions were written in an objective and simple way, to be clear and precise as there could be difficulties of understanding on the part of the children. We avoided ambiguous questions, determined by the use of colloquial expressions or difficult terms for understanding. The questionnaire consisted of 24 closed response items, one open response item, and a final multiple choice question. It was first submitted to a pilot study class to see if there were any difficulties or doubts on the part of the children in answering the questionnaire. We focused on questions that could measure: (i) scientific understanding of the phenomenon (ii) causes of climate change, (iii) consequences for humans and other forms of life, (iv) solutions to mitigate climate change and (v) anthropocentric ecocentric posture. This instrument was validated by experts in the field to verify and give their opinions on the relevance and clarity of the questions. Before being submitted to the students, the survey had to be approved by the ethics committee of UTAD (University of Trás-os-Montes e Alto Douro), by the school board of each grouping, and by the General Direction of Education. The survey was applied, always in similar places and conditions to all the elements that participated in the study. The locations chosen were the classrooms, ensuring adequate conditions so that students did not feel awkward with the situation and, at the same time, could be concentrated while filling out the questionnaires.

With regard to data processing, we had prepared a database, using the SPSS statistical software and descriptive statistics, in which we performed some statistical tests, selected according to the nature of the variables.

3 RESULTS

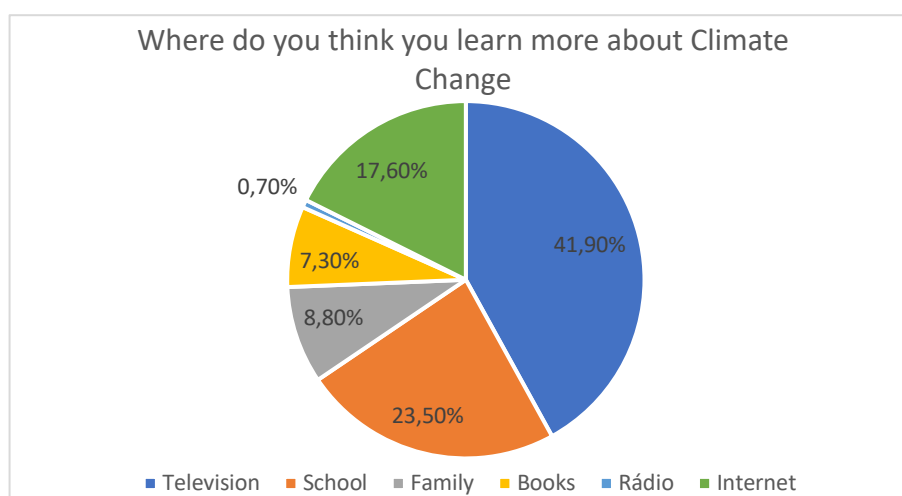
In this section, we will emphasize some results that we think are relevant. In question #25 about the consequence of climate change. In the total sample, almost half of the students (45%) of the students could not list just one consequence of climate change. As well as 8 of these students seem to confuse natural phenomena such as earthquakes and volcanism as a consequence of climate change and 12 students mention pollution as a consequence, as the following table number 3 shows.

Table 3: Results of the sample on perceptions towards question #25 where they were asked to list the consequences of climate change. N=126.

Answer	Frequency	Percentage %
I dont know	62	45,6
Lack of water	12	8,1
Intense Heat	1	0,7
Ice Defrost	1	0,7
Diseases	1	0,7
Biodiversity Extinction	12	8,8
Forest Fires	2	1,5
Sea level rise	9	6,6
Ozone	3	2,2
Polution	12	8,8
Drought	3	2,2
Earthquakes	1	0,7
Volcanoes	7	5,1

Other relevant data on the results shows that 60% of respondents do not associate the greenhouse effect with climate change. As well as 75% of the students, did not know the concept of ecological footprint, which is a basic notion of ecology. However, the students are very interested in learning more about climate change, and agree (76%) that the school should teach more about this topic. On balance, however, it must be acknowledged that most of these students (74%) are sensitive to climate change and show moderate levels of concern for the issue. However, the fact that they are aware or have a positive attitude towards the issue does not imply that they have an adequate ecological awareness, nor even that they adequately value global environmental problems [11]. Sometimes there is a certain social tendency to censure behaviors or practices that are not "environmentally friendly", that is, the environmental crisis has become socially accepted, and respondents tend to respond to what is socially accepted, so we should take these responses with caution, not falling into the naivety of believing that respondents are very concerned about climate change or that they talk a lot about it at home, if this were true, we could expect a more accurate environmental perception. [12] This fact is easily verified, because although some students mention that they discuss the subject at home in a family context, they seem to be completely unaware of the consequences and causes of climate change. This leads us to believe that their behavior or the behavior of the people they live with is not at all pro-environmental.

Since this is such an urgent issue to solve, it was hoped that schools would be able to inspire and transmit the basics about this problem to these students. In fact, even 23% of the students say that they do not learn more about climate change at school, but on TV (41.9%), followed only by school, then the Internet, family, books and finally the radio:



Graph 1: Distribution of the mean of respondents' answers to the question "Where do you think you learn the most about Climate Change?"

The media, such as television, are important when it comes to disseminating content on climate change, although this information is not always reliable or of good quality. When the school is unable to train people capable of sensitizing students to environmental issues, the media comes into play, and even though the intention is to sensitize, it often uses overly dramatic and catastrophic scenes, even making "guesses" that are unlikely to happen and with little scientific basis, which can mislead the viewer [13] [14]. This type of transmission can even increase the number of climate change skeptics, who consider that the supposed climate crisis may be political propaganda by radical liberal environmentalists [15]. Hence, the school has an important role in enriching literacy and appealing to the critical and responsible sense of its students. This is one of the reasons why the big picture proves that, in fact, society's climate literacy is extremely low. Agreeing with Sommerville when he states that the widespread public ignorance of scientific explanations of the fundamentals of climate change illustrates an extremely serious educational failure. [16] Few students selected books or radio as sources of information about climate change. In fact, although there are some books for children on climate change, Portuguese children read less and less, and Portugal is the country in Europe that reads the least books [17]. Regarding the analysis of the variables - age, gender, residence, year of schooling, geographical contexts, parents' occupation or the fact that the students come from highly educated households. One would expect that these factors combined would enhance higher performance, but this did not turn out to be the case in our study. In other words, in the school year the students are attending, and their parents occupation and education do not influence the students' perception of climate change. It is the children who may actually influence their parents' behavior and positions on climate issues, and not so much the other way around. [18]

Regarding the students' willingness to learn more about climate change, a large part of the sample was interested in learning more, as we can see in table number 4.

*Table 4: Distribution of the averages of answers to question #11:
"I would like to learn more about climate change".*

	<i>I totally disagree</i>	<i>Disagree</i>	<i>Indiferente, I don't know</i>	<i>I agree</i>	<i>I totally agree</i>
Vinhais	1	1	4	17	22
Vila Flor	0	1	3	25	22
Carrazeda de Ansiães	0	5	3	24	8
Total	1	7	10	66	52

Of the results found in this item, only a minority of students, corresponding to 6% responded that they would not be willing to know more about climate change, with this figure being more prevalent in the Carrazeda de Ansiães school. Of the sample, 7.4% said they would be indifferent to know more about the subject. It is noteworthy that 86% said they want to learn more about climate change.

In conclusion, and as we had already mentioned, the results obtained seem to reveal that most students recognize the existence of the environmental crisis and admit that it is urgent to change values and current behaviors by others more adjusted. According to the analysis of the data collected throughout this research, we can say that the perceptions of the students of the three municipalities are not very different. Despite the students' concern for the problem in question, there are still many aspects to be worked on, otherwise, if nothing is done it may influence their attitude as citizens towards the environment. The results obtained are in line with other studies in the literature, such as [1], [2] and [3], which show a lack of knowledge on this subject. There seems to be a deficit in the school's ability to raise awareness about climate change, as alerted by a previously mentioned work carried out by the School Education Gateway in 2020, which showed that teachers do not have adequate skills to educate students about climate change and this is reflected in students' perception of the subject. Therefore, it is undeniable that the school in collaboration with other educational agents has the task of preparing children for the challenges of society, in the context of an uncertain/unpredictable future, by developing skills that allow them to question established knowledge, integrate emerging knowledge, communicate effectively and solve complex problems.

4 CONCLUSIONS

We are aware that climate change is an urgent issue to be solved. We must combat the low climate literacy that is being felt, so as not to fall into the already widespread climate illiteracy. This ignorance and common misconceptions affect children, youth, and adults alike. Climate science includes complicated topics (e.g., the interaction between climates at local, regional, and global scales) that are associated with largely unfamiliar terms (radiative forcing, aerosols, etc.), making it challenging to achieve climate literacy. But it is hoped that children will be able to understand the basics, such as the causes and consequences of climate change. Although the Portuguese educational system has been the target of recent and "deep" curriculum "reforms"/revisions or that twenty-three years have passed since the publication of the Basic Law of the Educational System (1986-2009), we are not sure that the level of climate literacy, reached by our students, is the desirable and indispensable for an intervening citizenship and promoter of an environmentally sustainable socio-economic development. In what concerns our study, we believe to have built a process that allows the survey and monitoring of the perceptions of the students of these study cycles in Portugal. This tool may allow us to collect information in the future and be used in local, regional or national interventions and obviously contribute to the achievement of Education resolutions regarding climate literacy. [12]. Our study showed that although climate change is a concern for students and they want to know more about it, it seems that their perceptions are less than an ideal, which is in line with the existing literature of [1][2]. In addition, it may help its recipients to make awareness and change attitudes and behaviors in their daily praxis, becoming more pro-environmental. In this way, we hope that the children of today, and the men and women of tomorrow, will exercise a more active, coherent and responsible citizenship. We also believe that this work may awaken the rethinking of teaching practices, as it enables reflection and redefinition of educational measures that reinforce the need for an education that contributes to a correct perception of the state of the world and prepares citizens for the development of responsible attitudes and behaviors towards a physically and culturally sustainable development [19]. We are of the opinion that education must play a primary role in creating attitudes and improving understanding of those problems that affect the environment. The school, from early childhood education to higher education, as an institution responsible for the integral formation of citizens, has a social duty to develop and implement a system of knowledge for the protection and preservation of the environment. Finally, societies have to believe in their potential, for a change, for the sake of future generations and biodiversity. In order to do this, we have to leave aside anthropocentric attitudes and face Climate Change as a serious problem, considering it as the great challenge of this 21st century. If we do nothing our lives will be significantly affected by climate change and therefore society, schools and governments must prepare us to adapt to the climate crisis and must also enable us to contribute to solutions that will allow us to achieve climate justice and mitigate the problem. In this context, it is essential to know the perceptions and literacy level of the populations and subsequently propose changes or educational reforms that meet Unesco's commitments in the need to find solutions that help mitigate the climate crisis.

ACKNOWLEDGEMENTS

This Work has been supported by FCT – Fundação para a Ciência e Tecnologia within the Project Scope: UIDB/05777/2020.

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