

ISSUES IN CLIMATE CHANGE LITERATURE: CHALLENGES FOR ENVIRONMENTAL EDUCATION

TEMAS DA LITERATURA DE MUDANÇA CLIMÁTICA: DESAFIOS PARA A EDUCAÇÃO AMBIENTAL

TEMAS DE LA LITERATURA SOBRE EL CAMBIO CLIMÁTICO: DESAFÍOS PARA LA EDUCACIÓN AMBIENTAL



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ABSTRACT: How is climate change or the climate crisis addressed in Latin American literature in the areas of education, environmental studies, public administration and political science? The aim of the article is to interpret the approach and understand the presence of environmental education in a sample of this literature. Methodologically, we carried out a systematic search and selection of texts indexed in the Web of Science, identified and classified analytical axes and carried out a synthetic analysis of the results. The analysis showed that the selected texts on climate change and crisis are crossed by the following themes: education and awareness; anthropogenic causes of climate change/crisis and their socio-economic and political consequences that unequally affect social groups and territories; and the debate on institutions and decisions in the context of national and international public policies. The results showed that environmental education is confined to the field of education and is a thematic niche. These results can contribute to the literature on climate issues.

KEYWORDS: Climate crisis. Climate change. Environmental education.

RESUMO: *Como a mudança ou a crise climática é abordada na literatura latino-americana, das áreas de educação, estudos ambientais, administração pública e ciência política? O objetivo do artigo é interpretar as abordagens e compreender a presença da educação ambiental em uma amostra dessa literatura. Metodologicamente, realizamos as fases de busca e seleção sistemáticas de textos indexados na Web of Science, identificamos e classificamos eixos analíticos e realizamos uma análise sintética dos resultados. A análise demonstrou que os textos selecionados sobre mudança e crise climática são atravessados pelos temas: formação e conscientização; causas antropogênicas da mudança/crise climáticas e suas consequências socioeconômicas e políticas que afetam desigualmente grupos sociais e territórios; e o debate sobre instituições e decisões no âmbito das políticas públicas nacionais e internacionais. Os resultados evidenciaram que a educação ambiental está circunscrita à área da educação, constituindo-se como um nicho temático. Esses resultados podem contribuir com a literatura sobre questão climática.*

PALAVRAS-CHAVE: *Crise climática. Mudança climática. Educação ambiental.*

RESUMEN: *¿Cómo se aborda el cambio climático o la crisis climática en la literatura latinoamericana en las áreas de educación, estudios ambientales, administración pública y ciencia política? El objetivo del artículo es interpretar el enfoque y comprender la presencia de la educación ambiental en una muestra de esta literatura. Metodológicamente, se realizó una búsqueda y selección sistemática de textos indexados en la Web of Science, se identificaron y clasificaron ejes analíticos y se realizó un análisis sintético de los resultados. El análisis mostró que los textos seleccionados sobre cambio climático y crisis están atravesados por los siguientes temas: educación y sensibilización; causas antropogénicas del cambio climático/crisis y sus consecuencias socioeconómicas y políticas que afectan de manera desigual a grupos sociales y territorios; y el debate sobre instituciones y decisiones en el contexto de las políticas públicas nacionales e internacionales. Los resultados mostraron que la educación ambiental se circunscribe al ámbito de la educación, constituyendo un nicho temático. Estos resultados pueden contribuir a la literatura sobre cuestiones climáticas.*

PALABRAS CLAVE: *Crisis climática. Cambio climático. Educación ambiental.*

Introduction

Climate change is the main planetary challenge and its effects reveal socioeconomic and territorial inequalities, as shown in studies by Chancel (2022), Nobre and Marengo (2017) and the Report of the Intergovernmental Panel on Climate Change/UN (IPCC, 2022), between others.

This challenge involves changes in political culture (Lima; Torres; Rebouças, 2022), in social learning (Lampis *et al.*, 2020) and in educational practices (Serantes-Pazos; Sorrentino, 2022). The ongoing development of literature on the topic offers not only the theoretical foundation, but also guiding parameters for public policies. Therefore, contributing to this debate was our motivation for preparing the article presented here.

We seek to answer the following question: how is climate change or the climate crisis addressed in Latin American literature, in the areas of knowledge of education, environmental studies, public administration and political science? The objective is to interpret the approaches and understand the presence of environmental education in a sample of this literature.

To this end, we carried out the systematic search and selection phases of texts indexed in the Web of Science database, identified and classified analytical axes and also carried out a synthetic analysis of the results.

The article is organized into four items, in addition to the introduction and conclusion. The first is a brief theoretical reference, followed by the presentation of the method, results and discussion item.

Theoretical Reference

Climate change is associated with natural phenomena and is also the result of human action. In this work, we highlight anthropogenic climate change that involves biophysical processes, “the way it interferes with human activity; the consequences of altering the atmosphere for humanity; the biosphere and its economic, political, energy and social policy implications for adaptation and mitigation (Guimarães; Cartea, 2020, p. 31).

The concepts of climate change and the climate crisis go through varied discussions and concepts depending on the disciplinary focus and political-ideological conceptions about causes and ways of coping. However, a common point is that such transformations put the well-being and even the existence of human beings and communities of life in different ecosystems at risk.

We start from the premise that climate change, especially anthropogenic changes, leads to crises that affect everyone, but in an unequal way, with greater severity for groups in vulnerable situations. In this way, we understand that this conceptual discussion is related to the debate on climate justice, that is, on human rights (Souza; Sato, 2019; Jacobi *et al.*, 2011; Sato, 2020).

Guimarães and Cartea (2020, p. 23) summarize that the crisis is related to the civilization model, as well as its development pattern and the paradigms adopted. Crisis that exposes its limits of reproduction on a global scale due to the “hegemonic way of thinking and living” through the “way of producing and consuming” forged in the economy of exploitation and socio-environmental degradation. However, it is this model of society and its socio-environmental relations that have led to the collapse of the conditions for the sustainability of life, in which climate change and its drastic consequences are the most striking evidence that we are experiencing a crisis on a planetary scale.

As already mentioned, studies on crisis and climate change are multidisciplinary and rich in possibilities for related sub-themes. For our objectives, we mainly mobilize theoretical references on environmental education. It was also necessary, due to data requirements, to briefly approach the notions of justice/environmental issues and sovereignty. Therefore, in addition to the texts mentioned above, we include those described below.

For the notion of environmental (in)justice, the basic texts we mobilized were Acselrad (2013) and Andrade, Barreto, Henriques (2020), which deal with environmental risks and their disproportionate effects on social and territorial groups. These last authors even add to the debate about the ecological debt that governments and corporations owe to such groups. Regarding the challenges to sovereignty and reconfiguration of relations between States, international organizations and private corporations, we brought two texts by Viola (2002) and Viola and Basso (2016). The understanding of environmental policy as a body of ideas, values, beliefs, and knowledge, often divergent, was reinforced by Capelari *et al.* (2020, p. 1695). These basic notions served as support and are presented in the discussion of results item.

Regarding, specifically, environmental education, Layrargues and Lima (2014, p. 24-28, our translation) observe that there are “many possible ways of conceiving and realizing the means and ends of Environmental Education”, and systematized an interpretative model of political-pedagogical macro trends in Brazilian environmental education called conservationist macro trends; pragmatic; and criticism.

The conservationist macrotrend is linked to a “green agenda” from the perspective of ecology, attributing value to the “affective dimension in relation to nature” in defense of “change in individual behavior”, in the relationship with the environment and from the perspective of “cultural change”, aiming to relativize anthropocentrism. The pragmatic trend is linked to the principles of “ results environmentalism, contemporary pragmatism and market ecology”. It aims to meet neoliberal hegemony, after the 1980s, expressing a “brown agenda”, which is linked to the pragmatic interest of market logic. These two macrotrends represent “the same lineage of thought”, neoliberal and pragmatic. In turn, the critical macrotrend seeks to review “the foundations that provide the domination of human beings and the mechanisms of Capital accumulation”, within the scope of the political struggle for the end of inequalities and socio-environmental injustice. This macro-trend brings together currents of Popular, Emancipatory, Transformative Environmental Education and Environmental Management that, with variations, are aligned in the contextualization and politicization of the environmental debate, problematizing the “contradictions of models of development and society”, in opposition to conservative trends (Layrargues; Lima, 2014, p. 30-35, our translation).

Thus, we understand environmental education as a social and pedagogical practice, marked by intentionality and permeated by historically determined relationships, changes and transformations. Souza (2016, p. 41, our translation), when dealing with pedagogical practice within the school, remembers that intentionality expresses “conceptions of the world, society and education, which can be conservative or transformative of social relations”. In the context of environmental education, specifically, intentionality may be manifested in those macro trends systematized by Layrargues and Lima (2014), that is, conservationist, pragmatic and critical of the societal project.

According to Loureiro (2005, p. 1490, our translation), environmental education is constituted as praxis, as a social practice of educating to transform in a dialogical and conflictive sense, involving “social actors who have distinct societal projects, who materially and symbolically appropriate nature unevenly.”

In addition to projects and visions of society, Tristão (2004, p. 50) reminds us that environmental education, from the perspective of critical transversality, constitutes a “web of knowledge”. Jacobi (2004, p. 28), in turn, reaffirms that environmental education demands emerging knowledge to face complexity and environmental risks.

In Brazil, particularly, critical environmental education is a theoretical field under construction and in the process of becoming its own area, which permeates and is permeated

by a network of formal, non-formal and informal knowledge, therefore, a network of actors of various positions, conceptions and social and institutional spaces that compete for the hegemony of different political-pedagogical projects of environmental education.

In this context of the emergence of new knowledge and project disputes, the content of environmental education is in movement, and one of the extremely important contents is that of change and the climate crisis, which is also in movement.

Method and Materials

To develop the article, we performed a systematic search and selection of texts in the indexing database of Web of Science (WoS) journals. We chose the entry by titles, abstracts and keywords, applying the following *string* or textual formula: ("climate crisis" OR "climate change"). We narrowed down the results through the filters of (a) areas – political science, public administration, environmental studies, and education³; (b) types of texts – articles, as this is the predominant format of scientific publication; (c) languages – Portuguese, English and Spanish; and (d) the region of the authors' institutional affiliation – Latin America, our region of interest.

With these procedures, 169 articles were obtained. From this total, we chose the WoS areas/categories with the highest number of articles and also all in the area of education (table 1).

Table 1 – Articles on climate change and crisis, by area – Web of Science, search on 06/15/2023.

Web of Science Categories	Record count	% of 169
Political Science	68	40,237
Education Educational Research	46	27,219
Public Administration	32	18,935
Environmental Studies	24	14,201
Sociology	18	10,651
Regional Urban Planning	12	7,101
Development Studies	8	4,734
Social Sciences Interdisciplinary	6	3,550
Education Scientific Disciplines	3	1,775
Social Issues	2	1,183
Demography	1	0.592

³ We understand that these are areas that deal with the theme from the interdisciplinary perspective of public policies and are also of interest to the authors.

Total

223

Subtitle: text records in more than one category - which is why the number of records (223) is greater than the number of articles (169). The highlighted categories/areas are the first 4 that contain the largest number of articles and all of them are education.

Source: Prepared by the authors with data from the Web of Science -WOS database.

In the second stage, we reduced the total number of articles (169) using the Pareto principle, according to Kauchakje and Rosa (2020). There remained 34 texts (20% of the total) that were distributed among the areas maintaining the proportion of the number of texts in each of them: 40% for political science (13 articles); 29% for education (10 articles); 19% for public administration (06 articles); 14% for environmental studies (05 articles).

For the data extraction phase, we evaluated the articles by reading their abstracts to choose those that best adhere to the question and our objectives. The qualitative result was 35 articles, which made up the study's database (Table 1). At this stage, we oriented ourselves towards the conception of texts as data (Izumi; Moreira, 2018) and identified and classified four analytical axes, discussed in the next item.

Results: analytical axes

The analysis of the texts selected for this study followed our classification into analytical axes and distribution into areas of knowledge (Chart 1). We seek, therefore, to articulate the discussion between the authors, their central themes, objectives and results, in order to establish a dialogue between the articles, and highlight essential aspects of each axis in focus.

In the analytical axis of school education and environmental education (10 texts) are studies on climate crisis and change in the school context and within the scope of formal, non-formal and informal environmental education.

The analytical axis of culture, ideology and perception (8 texts) groups investigations focusing on values, beliefs, subjective expressions and attitudes related to the climate debate.

The analytical axis of poverty and exclusion (3 texts) brings reflections on conditions of vulnerability, socioeconomic insecurity, forced immigration of social groups and populations, related to the crisis and climate change.

The analytical axis of State, government and public policies (13 texts) focuses on political and governmental structures, and on the decisions and actions of their agents, which influence and are influenced by international and national environmental issues.

The distribution of articles into axes/areas is shown in Table 1.

Table 1 – Studies on environmental change and crisis: analytical axes by area of knowledge.

AXES/AREAS	EDUCATION *	STUDIES ENVIRONMENTAL	ADMIN. PUBLIC	SCIENCE POLICY
SCHOOL EDUCATION AND ENVIRONMENTAL EDUCATION	Calixto-Flores and Amigón (2018) Calixto-Flores (2022) Núñez-Rodríguez and Carvajal-Rodríguez (2021) Moser <i>et al.</i> (2021) Gonzalez (2021) Gallego-Torres and Castro-Montana (2020) Riaño -Vargas and Rocha-Salamanca (2020) Gavilanes Capelo and Tipain Barros (2021) Vieira, De Moraes and Campos (2020) Aló <i>et al.</i> (2020)			
CULTURE, IDEOLOGY AND PERCEPTION	Calixto-Flores and Amigón (2018) Calixto-Flores (2018, 2022) Valdanha Neto and Jacobi (2022)	Valdanha Neto and Jacobi (2022)	Stuhldreher (2021)	Mildenberger and Tingley (2019) Poma and Gravante (2021) Toni and Chaves (2022) Borovinsky (2022) Bohoslavsky and Cantamutto (2022) Schulman (2019, 2021) Archambault and Pretz (2022)
POVERTY AND EXCLUSION	Valdanha Neto and Jacobi (2022) Aló <i>et al.</i> (2020)	Valdanha Neto and Jacobi (2022)		
STATE, GOVERNMENT AND PUBLIC POLICIES		Bartle (2009) Lucon and Goldemberg (2010) Fearnside (2012) La Rovere <i>et al.</i> (2013) Solorio (2021) Niemeier, Grattet and Beamish (2015) Farstad (2019)	Fearnside (2012) La Rovere <i>et al.</i> (2013) Solorio (2021) Niemeier, Grattet and Beamish (2015) Aguilera and Larrain (2021) Giddens (2015) Stuhldreher (2021)	Barnett (2008) Bartle (2009) Aguilera and Larrain (2021) Toni and Chaves (2022) Mittiga (2022) Estevo (2020) Humphrey (2009) Borovinsky (2022) Bohoslavsky and Cantamutto (2022) Farstad (2019) Giddens (2015)

Subtitle: The total number of articles considered (35) are distributed across the axes/areas, however some texts are relevant to more than one area or axis considered.

* The Education area also includes areas categorized in WoS as Research in Education and Education – Scientific Disciplines.

School education and environmental education

The analytical axis of school education and environmental education is concentrated in the areas of education and educational research (Table 1).

Calixto-Flores and Amigón (2018) identified that one of the components of the social representations of university students in Mexico about climate change are emotions. The components of social representation, among the subjects investigated, are described in Calixto Flores (2018) based on three contents: effects of climate change and how to address them in education; questions about its causes; and emotions related to the theme. These contents are classified into three orders, respectively, hegemonic, emancipated, and controversial. In another research, Calixto-Flores (2022), now with high school students, obtained results that indicated, in the content of the representations, on the one hand, more notions and opinions than scientific knowledge and, on the other, feelings favorable to the environment. The author considers that environmental education is a factor that influences this feeling to be positive.

Likewise, among a small sample of teachers in training at a university in Colombia, social representations about climate change and global warming were vague in content, reflecting everyday knowledge and little scientific rigor, according to a study by Gallego-Torres and Castro- Montana (2020). In this sense, the authors expressed concern about the social and cultural consequences of these representations for environmental education related to climate change in the school context.

The importance of education is also addressed by Núñez-Rodríguez and Carvajal-Rodríguez (2021). The article discusses the social function of the school and the importance of trained teachers for the formation of resilient citizens and, at the same time, capable of participating in environmental regeneration actions, aiming to mitigate and compensate for the effects of climate change, in particular, from causes anthropogenic.

Another text that understands environmental education as a strategy for resilience, adaptation and mitigation to climate change is that of Gavilanes Capelo and Tipain Barros (2021). In this sense, the authors researched the effects of environmental education within the school community in the city of Cuenca, Spain, and proposed approaches and methodologies to be applied in a transversal and holistic way in contrast to the traditional environmental education curricular program.

The school content on tackling the climate emergency, in science teaching, is problematized by Moser *et al.* (2021). The text seeks to explore the potential of Morin's

complex thinking for a transdisciplinary approach to content, such as: human and environmental complexity; knowledge about the topic, among others.

The transdisciplinary approach to environmental education is observed in the article by Gonzalez (2021) who discusses the mathematical modeling of global warming carried out by teachers, concluding that, in learning, mathematics can be associated with education about climate change. In this vein of interdisciplinarity, Riaño-Vargas and Rocha-Salamanca (2020) used statistical education from a critical perspective to analyze the results of a survey on the fears of university students about climate change. Fears were classified into five levels: the highest relating to violence, especially physical violence; the second, of an economic nature, the effects of climate change and sexual harassment; next is fear of disease, natural disasters and displacement; and, at the last level, there are fears of social abuse and minor road accidents.

Also, Aló *et al.* (2020), suggested an interdisciplinary approach, using Arduino technology, with vulnerable students in Chilean schools. This approach had the purpose of dealing with problems within the scope of environmental and technological education in the school curriculum and, thus, improving students' attitudes towards science and technology.

Finally, the school is seen as a context in which environmental education has strength and, therefore, Vieira, De Moraes and Campos (2020) understand that it offers an opportunity for the development and implementation of instruments for evaluating environmental education policy in your cycle.

Culture, ideology and perception

This axis of culture, ideology, and perception (Table 1) cuts across four areas: education, environmental studies, public administration and political science.

In this axis there are two texts Calixto-Flores (2018; 2022) and one by Calixto-Flores and Amigón (2018) that deal with students' social representations of climate change. One of the contents of these representations is emotions, as already detailed in the education axis.

Emotions about the effects of climate change were also investigated by Poma and Gravante (2021), with, in this case, activists from the Mexican climate movement as subjects. The authors observed that activists are able to transform emotions such as fear, pain, sadness and helplessness into resistance, pride and hope of transforming reality.

Climate change and its effects on traditional ways of life and cultures are discussed by Valdanha Neto and Jacobi (2022), focusing on the social learning process in an Amazonian

riverine community. The text highlights the educational role of the Movement of People Affected by Dams and the contribution of social learning in coping with social vulnerability.

We found that the theme of the impacts of climate change is also present in the text by Stuhldreher (2021) together with that of articulation and participation in climate governance at the national level, in Uruguay. The author investigates how these aspects are perceived by actors in the Northeast region of that country and also discusses a design of policies for adapting and mitigating climate change.

In turn, Mildemberger and Tingley (2019), researched in the USA and China, the perceptions that individuals had about other people's climate beliefs (second-order belief). Overall, the content of the perceptions was biased and downplayed pro-climate beliefs. The authors demonstrated that individual support for climate-friendly policies increases when the individual expands their knowledge of others' beliefs. Therefore, a possible explanation for the low participation in climate policies would be second-order beliefs, because when political participation has an individual cost with collective benefits, as is the case with the climate issue, participatory engagement depends on individual perceptions about the beliefs of the others.

This axis ends with the following set of texts: Toni and Chaves (2022), which deal with climate denialism among far-right populists; Borovinsky (2022), who relates the challenge of the climate crisis to the need for a new planetary nomos; Bohoslavsky and Cantamutto (2022) who observe that neoliberalism has a minimalist view of human rights, obscuring the transformative potential of these rights to combat climate change. These three texts will be exposed in more detail under the State, government and public policies axis.

Poverty and exclusion

This analytical axis cuts across the areas of education, environmental studies and political science.

Poverty and exclusion are categories that permeate some texts from previously analyzed axes, in particular, education and culture/perception. In the article by Valdanha Neto and Jacobi (2022), the theme of social learning is linked to its role in contributing to overcoming social vulnerability. Aló's text *et al.* (2020), focused on vulnerable students in Chilean schools and technological strategies for environmental education.

Schulman's (2019, 2021) photo essays showed, respectively, the effects of climate change and Chinese intervention in Djibouti, on the African continent, which put the economy and the living conditions of the local population at risk; and, also, the fight for the survival of

the Yemeni population in the face of climate change and human intervention, which have transformed land that was previously fertile into an arid territory, with a water crisis and lack of water.

Finally, the notion of racial capitalism appears in the text by Archambault and Pretz (2022), which exposes its consequences in terms of the expropriation of racialized people and those from the Global South. The argument is about the requirement for an active approach (beyond limited negotiated coordination and subordination to racialized social and political institutions) in the context of the climate crisis, which prioritizes the needs and knowledge of the aforementioned people.

State, government and public policies

This analytical axis cuts across three areas: environmental studies, public administration and political science (Table 1).

The carbon market is the topic addressed in Bartle (2009) when discussing climate change regulation in the United Kingdom and the European Union. In the cases studied, of marked sociocultural plurality, the author points out that the objective of transparency and guaranteeing the public interest requires an economic instrument in conjunction with transparent policies and regulations that take that diversity into account.

The interest of the carbon market is also found in Fearnside (2012) who starts from the important role of the Brazilian Amazon Forest in mitigating global warming, and questions the negotiations that aim to reward the forest's carbon storage: its effects on the scale mitigation; the format of the market (voluntary or mandatory) and the generation of credits for reducing emissions that offset emissions elsewhere. The central point of the text's concerns is the risk of the Amazon rainforest reaching its tipping point due to the loss of its ability to recover. For the author, the solution would be to change the terms of the negotiations, and in Brazilian programs at national level congruent with the climate change agreements structured by the UN.

In turn, Giddens (2015) questions the emphasis on formal targets for reducing greenhouse gas emissions under UN parameters, shifting the importance to bilateral and regional agreements and, even more so, to global pressures and activism about climate change.

The discussion on greenhouse gas reduction targets can also be found in La Rovere *et al.* (2013) who, around ten years ago, made a positive diagnosis about Brazil being able to fulfill them. However, they indicated that this scenario could be reversed if actions were not taken to combat population growth and the demands arising from economic growth. In the same period,

Lucon and Goldemberg (2010) compared Brazilian change policies in relation to those in São Paulo. For the authors, the latter were effective in improving air quality, recovering the Atlantic Forest and producing ethanol from sugar cane, and thus led Brazilian policies during the period investigated.

However, the paths of environmental public policy are also influenced by the government's ideological positions, as Toni and Chaves (2022) suggest. Research on climate denialism and other environmental issues by the Bolsonaro government demonstrated that the Brazilian president was unable to obtain international repercussions translated into support, despite his alignment with global far-right populists.

When it comes to authoritarian governments and policies, Mittiga (2022) questions whether the climate crisis, representing a risk to collective security, could open space for the legitimization of this type of government. The author justifies the question given the experience of restrictions on some individual freedoms, such as the right to come and go and association, as a guarantee of security and protection. In this sense, lies the political importance of preventing the climate crisis, as a means of avoiding the legitimization of authoritarian government measures.

Bohoslavsky and Cantamutto (2022) criticize the excessive power of the IMF, an institution aligned with neoliberal ideology, whose interpretation of rights is minimalist (focused on civil/individual and political rights) and disseminates a stance of distrust of the State to the detriment of human rights. The authors oppose this minimalist vision and highlight the transformative potential of human rights, which can be a method to achieve objectives such as: reducing poverty, inequality and climate change.

The debate on international financial aid is also found in Barnett (2008) who argues that in small islands/states, such as Niue, this aid has positive effects on access to resources and governance for adaptation to climate change. On the other hand, there is the negative possibility of losing the legitimacy of government policies and increasing the country's vulnerability to climate change.

Stuhldreher (2021), when analyzing actors' perceptions about participation in climate governance, discussed the design of climate change adaptation and mitigation policies in Uruguay. This text is also part of the culture axis.

Humphrey's text (2014) provokes questions focusing on Western citizens' demands for environmental policy. It discusses evidence that these demands can be “simulative”, that is,

without aiming for their implementation. To explain this behavior, the author recommends that game theory and rational actors be used.

Solorio (2021) highlights the importance of climate federalism, and, in the Mexican case, emphasizes that problems in the integration of climate policy between the different levels of government have compromised the implementation and limited results of innovative national legislation in this field.

Also discussing the implementation of environmental policy, Niemeier, Grattet and Beamish (2015), deal with the approach called “blueprinting”, in the city of Sacramento/California. The authors demonstrated that their result was not promising for planning sustainable land use for transport, as even with the application of this approach, total CO₂ emissions increased significantly.

An approach aimed at public scientific policies in emerging countries is that of Aguilera and Larrain (2021), who understand that such policies can encourage transdisciplinary research in territories where there are natural laboratories, such as in Chile, and, in this way, contribute to predicting the impacts of climate change and promote the protection of biodiversity in alignment with the Sustainable Development Goals (UN, 2023).

Estevo (2020) analyzes China's national and international climate policies, up until the 2015 Paris Agreement, which aims to reduce greenhouse gas emissions. The text highlights China's centrality in climate negotiations, as the country is considered the largest global emitter of gases already mentioned, due, in particular, to its energy matrix based on coal and oil.

Farstad (2019), when researching party politics on the topic of climate change, in Australia and Norway, concluded that among the factors that matter in moderating party behavior and building consensus on the topic among them are: size geographical area of the State and, most significantly, cooperation between the State and civil society institutions, as well as compensatory agreements aimed at well-being. It is noteworthy that the economy was one of the least important factors.

Finally, with Borovinsky (2022), the discussion based on countries or regions is moved to a planetary scale. The author reflects on the challenges that the climate crisis poses to contemporary sovereignty in relations between states, and considers that the present opens up the possibility of a new nomos of the Earth.

Discussion of results

The objective of this item is to present, in a synthetic way, the approach of the selected literature on the crisis and climate change. We will discuss the analytical axes, extracting core categories or themes from them, in order to understand them based on the theoretical framework.

As we have seen, the texts in the *school education and environmental education axis* are concentrated in the areas of education and research in education. On the one hand, it is expected that discussions about school education and its relationship with climate issues will be grouped in the field of education. On the other hand, given the relevance of the environmental issue and the climate emergency, the expectation was that environmental education would be widespread among areas of knowledge, whether as a theoretical basis for academic debate or for social and political actions. The fact that, in our sample, this inter-area spread was not observed, may denote that environmental education, both formal and non-formal, has not been effective for civic and professional training in other areas of knowledge. This compromises not only the transversality recommended in educational policy legislation, but also that other knowledge, which participates in guiding public decision-making (such as public administration and political science) is permeated by environmental themes and issues.

In this sense, Jacobi (2004, p. 28, our translation) reaffirms that environmental education is centered on “awareness, behavior change, development of skills [...] demanding the emergence of new knowledge to understand complex social processes and environmental risks that intensify.”

Underlying the conception of environmental education is the critical perspective of transversality, since environmental education “works with notions, concepts, principles from the most different areas, although its methodology has the mark of participation, interaction and emancipation”, characterized as a “web of knowledge [...] in motion, in a constant process of transformation and without previously marked territories” (Tristão, 2004, p. 50, our translation).

An axis that crossed the “territories of knowledge” was that of *culture, ideology and perception* with the majority of texts in the area of political science, followed by education. The most discussed categories were ideology – with reference to right-wing positions, climate denialism and neoliberalism – and social representation on climate crisis and change. In this way, it is noted that these themes and categories mobilize different areas of knowledge.

According to Capelari *et al.* (2020, p. 1695, our translation), in particular, environmental policy has the characteristic that, in addition to mobilizing different areas, it also mobilizes

“ideologies, beliefs, actors, geographic limits, human activities, economic sectors and public policy subsystems”. Environmental policy itself can be understood as a “body of ideas, beliefs and specialized knowledge, and a place of contestation”.

The notion of a social field as constituted by a diversity of social and institutional actors, in this case, involved in the debate and practices on climate change and crisis, broadens the understanding of the core categories of the axis (ideology and representation), as, according to Layrargues and Lima (2014, p. 25, our translation), in a social field, those actors “differ in their conceptions of the environmental issue and in the political, pedagogical and epistemological proposals they defend to address environmental problems”.

The *poverty and exclusion axis* has articles distributed in the areas of education, environmental studies and political science, and is another example in which different conceptions on the environmental issue are evident. More precisely, the axis categories express different worldviews, namely: vulnerability, exclusion and expropriation. Some of the articles name the conditions that these categories express just to describe the subject of the study. While other texts blame the crisis and climate change for such conditions. But there is also the article in which climate change is the context for the discussion about the structural economic cause of racial and geographic dispossession.

We can summarize the subject of this axis with the notion of environmental (in)justice in the terms of Acselrad (2013), for whom environmental injustice designates the

phenomenon of disproportionate imposition of environmental risks on populations less endowed with financial, political and informational resources (...). In contrast, the notion of environmental justice was coined to name a desirable life framework, in which this environmental dimension of social injustice can be overcome (Acselrad, 2013, p. 62, our translation).

In this sense, the categories in the axis take us to “scenarios of environmental and climate injustice, imposing, mainly on the most vulnerable territories, the costs of ecological debt” (Andrade; Barreto; Henriques, 2020, p. 14, our translation).

Responsibility for ecological debt can be attributed to governments themselves, from a public point of view, and also, as Andrade, Barreto, and Henriques (2020, p. 4, our translation) reminds us to “corporate governments for the environmental impacts caused”.

The emphasis on government actions in relation to the crisis and climate change is typical of the *State, government and public policies axis*. Here you will find the largest number of articles in the sample located in all areas, except education. This is strange, because one of

the main themes of the axis is environmental and climate public policy, which is also the pedagogical content of education.

In this axis, the central themes related to the crisis and climate change were: national states, relations between states, international organizations and agreements, environmental and climate policies, ideological positions guiding government measures. Within the scope of these themes, the discussion on greenhouse gas emissions stood out.

In addition to our sample, in the literature on theoretical foundations, decarbonization is a common point on the global environmental agenda, and when it comes to mitigation, the responsibility of climate powers in the climate regime is crucial “given the amount of their emissions of carbon and its human and technological potential to promote decarbonization” (Viola; Basso, 2016, p. 13, our translation).

The crisis and climate change have modified relations between States and the formation of international environmental regimes imposes “restrictions on the sovereignty of the vast majority of States” (Viola, 2002, p. 26-27, our translation).

In fact, for Viola and Basso (2016, p. 1-2, our translation) the “concept of national interest needs to be updated [...] it is necessary to deepen global governance, which implies the transfer of sovereignty in favor of intergovernmental agreements [...]”.

Despite the challenges to sovereignty and changes in interstate relations, an important part of the articles in this axis dealt with States and national policies, whether with an internal focus or addressing their external relations. We understand that this is due to the fact that States are the so-called “contracting parties” in environmental regimes, carrying out agreements and negotiations with other States and international organizations.

Finally, we observed the methodological strategies used in articles with empirical research. In all axes, qualitative methods and techniques predominated, such as: data collection and text analysis, testimonials, narratives, interviews, free evocation, the associative framework, narrative design and the attitude scale.

The joint analysis of the axes allowed us to answer the question of this article, as will be seen below.

Final remarks

In this article, we seek to answer how climate change and the climate crisis are addressed in Latin American literature, in specific areas. The objective was to interpret the approaches and understand the presence of environmental education in a sample of literature.

The analysis demonstrated that climate change and the climate crisis are crossed by themes relating to: training and awareness about the climate issue; anthropogenic causes of climate change and crisis and also their social, economic and political consequences that unequally affect social groups and territories; and, finally, the debate on institutions and decisions within the scope of public policies, at national and international levels.

The results showed that environmental education is limited to the area of knowledge of education, constituting a thematic niche. The invisibility of environmental education in other areas of knowledge indicates the fragility of elements of transversal or interdisciplinary content, which is congruent with what is observed in the disciplinary practice of this field, not aligning, however, with the theoretical perspective of the critical macrotrend, as proposed by Layrargues and Lima (2014), previously announced.

These results are pertinent to the sample analyzed on an exploratory basis, therefore, it is not possible to extrapolate them. Therefore, reflection on the broader literature, based on them, requires attention to this limit. In future articles we intend to present expanded and in-depth results and analyses, arising from this ongoing research.

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