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Exploring school-based climate change and sustainability education: a case study of teachers' practices from Brazil

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ACKNOWLEDGEMENTS:

The authors would like to thank all the teachers who participated in the survey, workshop and focus groups, and, in particular, Danielle Aparecida Reis Leite, for her support with the in-person workshop.

To cite this report: Rushton, E., Silva, L.F., Quiroz Martinez, D. & Walshe, N. (2025). Exploring school-based CCSE: a case study of teachers' practices from Brazil. UCL Centre for Climate Change and Sustainability Education.

This research was funded by the UCL Institute of Education International Fund.

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Executive summary

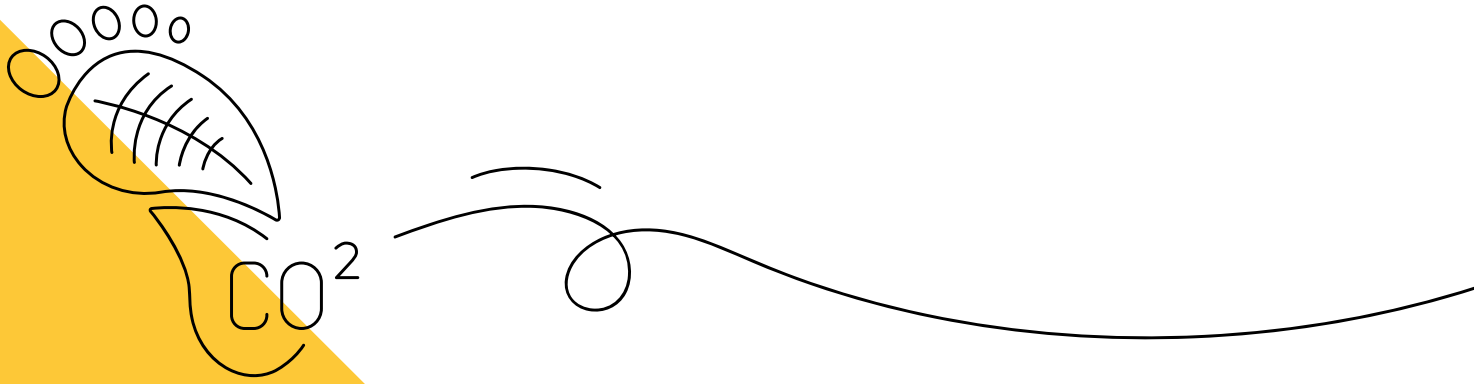
This report provides insights concerning school-based climate change and sustainability education (CCSE) in Brazil, drawing on empirical research involving over 140 teachers. During November 2024 – August 2025, teachers shared their experiences in a variety of ways, including a survey, workshop and/or focus groups.

We identified three interconnected barriers which constrained the agency teachers could achieve in relation to CCSE. These included:

- Educational structures; for example, the content-heavy and rigid structure of the national curriculum and high-stakes examinations.
- The lack of a shared understanding of the value of responding to environmental issues, including climate change and sustainability, both in terms of the students they teach and a perceived lack of interest from the wider public.
- A lack of funded and structured opportunities for CCSE-focused professional learning in both Initial Teacher Education and in-service professional learning.

We also identified three broad enablers of teacher agency, which included:

- Opportunities to engage in cross-subject curriculum making focused on CCSE, working with teachers from different schools and areas of subject and age-phase expertise to develop holistic CCSE.
- Access to sustained and funded professional learning focused on CCSE throughout a teachers' professional life, which enables teachers to root CCSE in specific school subject knowledge and wider disciplinary expertise.
- Effective school leadership which provides equal access to resources and professional learning and enables a culture of support for CCSE.



Implications for policy and practice

Drawing on learning from across the barriers and enablers identified in this research, we present the following implications for consideration and further discussion:

1. **Regional and Federal governments** should explicitly value CCSE in their local, regional and national policies and improvement plans.
2. **Regional and Federal governments** should allocate funding to support teachers' career-long professional learning focused on CCSE.
3. **Regional and Federal governments** should consider how to further integrate the role of community groups and partnerships in school-based CCSE.
4. **Regional and Federal governments** should enable in-service teachers to learn, explore and discuss CCSE with a range of experts.
5. **Regional and Federal governments** should fund the development of a new research-informed framework to support Higher Education Institutions who provide Initial and continuous Teacher Education to enhance CCSE.
6. **School leaders** should support teachers to engage in professional learning focused on CCSE and provide opportunities for teachers to share their learning across the school community.
7. **School leaders** should prioritise opportunities for teachers from across different subject areas and contexts to collaboratively plan and reflect on their practice with a focus on CCSE.

Resumo Executivo

Este relatório apresenta reflexões e evidências sobre a Educação para as Mudanças Climáticas e a Sustentabilidade nas Escolas (EMCS) no Brasil, a partir de uma pesquisa empírica que envolveu mais de 140 professores. Entre novembro de 2024 e agosto de 2025, os docentes compartilharam suas experiências por meio de diferentes instrumentos, incluindo questionários, workshop e/ou grupos focais.

Foram identificadas três barreiras inter-relacionadas que limitaram a agência[1] dos professores em relação à EMCS:

- Estruturas educacionais rígidas, como um currículo excessivamente conteudista e/ou exclusivamente direcionado aos exames admissionais do ensino superior e/ou sistemas de avaliação de rendimento escolar;
- Ausência de uma compreensão compartilhada sobre o valor de abordar questões ambientais, incluindo as mudanças climáticas e a sustentabilidade, tanto em relação aos estudantes quanto à percepção de desinteresse do público em geral;
- Falta de oportunidades estruturadas e financiadas de formação profissional voltadas à EMCS, tanto na formação inicial de professores quanto na formação continuada em serviço.

Também foram identificados três fatores que favorecem a agência docente, entre eles:

- Oportunidades de atuação interdisciplinar na construção curricular voltada à EMCS, envolvendo professores de diferentes escolas, áreas do conhecimento e etapas educacionais, promovendo uma abordagem holística da temática.
- Acesso contínuo e financiado à formação profissional docente sobre EMCS ao longo da carreira, permitindo que os professores integrem a EMCS aos conhecimentos específicos de suas disciplinas e a saberes interdisciplinares mais amplos.
- Liderança escolar eficaz, que assegure acesso equitativo a recursos e formação profissional, além de fomentar uma cultura institucional de apoio à EMCS.

1 Agência poder ser amplamente comprendida como a capacidade de uma pessoa de agir de forma independente e fazer a suas propias escolhas.

Implicações para políticas públicas e práticas educativas

Com base nas barreiras e potencializadores identificados nesta pesquisa, apresentam-se as seguintes implicações para reflexão e discussão:

1. **Os governos Estadual e Federal** devem valorizar explicitamente a EMCS em suas políticas e planos de melhoria locais, regionais e nacionais.
2. **Os governos Estadual e Federal** devem destinar recursos financeiros para apoiar a formação profissional contínua de professores com foco na EMCS.
3. **Os governos Estadual e Federal** devem fortalecer a integração de grupos comunitários e parcerias nas ações escolares voltadas à EMCS.
4. **Os governos Estadual e Federal** devem criar condições para que professores em serviço aprendam, explorem e debatam sobre EMCS junto a especialistas de diferentes áreas.
5. **Os governos Estadual e Federal** devem financiar o desenvolvimento de um novo referencial orientador, baseado em evidências de pesquisa, para apoiar as Instituições de Ensino Superior que ofertam formação inicial e continuada de professores, com vistas a aprimorar a EMCS.
6. **As lideranças escolares** devem incentivar a participação dos professores em formações voltadas à EMCS e criar oportunidades para o compartilhamento de aprendizagens dentro da comunidade escolar.
7. **As lideranças escolares** devem priorizar espaços colaborativos entre docentes de diferentes áreas e contextos, favorecendo o planejamento e a reflexão conjunta sobre práticas pedagógicas relacionadas à EMCS.

Exploring school-based climate change and sustainability education: a case study of teachers' practices from Brazil

Introduction

Education, including school-based education, has been positioned by international organisations and national governments as a vital response to complex global challenges that confront the world, including climate change, biodiversity loss and pollution. Indeed, education is widely recognised as being essential to ensuring every child and young person develops the knowledge, skills and capabilities to live with uncertain futures and respond to these complex challenges.[i,ii,iii,iv,v,vi,vii,viii] Brazil is a country with a vast territory whose population is already experiencing the impact of climate change, including extreme weather events.[ix] Recent research has underlined that young people in Brazil experience climate distress, including sadness, despair and anxiety, and that school-based climate change education is not sufficiently solution-oriented.[x,xi] Similarly, in Chile – another Latin American country experiencing climate change-related challenges[xii] – research exploring the ways in which school science teachers integrate sustainability into their practice has highlighted a tendency for them to focus on personal actions and environmental protection, rather than the broader economic and political dimensions of sustainability.[xiii]

In this context of multi-dimensional challenges related to climate change, and as part of their professional lives, school teachers make decisions about complex situations; as such, their agency is widely viewed as being vital. Because of this, understanding teachers' practices through the framework of teacher agency, including their choices, goals, beliefs and responses to policy reform, has been a central feature of educational research.[xiv,xv] The ecological approach to teacher agency developed by Priestley et al. (2015)[xvi] understands agency as an emergent phenomenon, not the capacity of an individual teacher. It is dependent on various conditions and qualities, including cultural, material and relational resources available, and people's opportunity to use them. Further, teacher agency is recognised as being temporal –informed by the past, oriented towards the future, and enacted in the present.[xvi] Previous research has underlined the comparatively limited opportunities that Brazilian teachers have for achieving agency[xvii], and, in Chile,[xviii] researchers have identified how some teachers sustain agency through a focus on student relationships and professional learning in a policy context of 'hyper-accountability'.

In summary, teacher agency provides a useful conceptual framework for understanding why some teachers are equipped to engage in school-based climate change and sustainability education (CCSE) as part of their professional lives, whilst others are not. Research which has explored teacher agency in the context of school-based climate change education in England underlines the importance of school structures, including leadership, school culture and both curricular and extra-curricular spaces in fostering teacher agency.[xix,xx] To continue to improve CCSE for children and young people in Brazil, similar research is needed to understand the context-specific factors which enable (or constrain) teacher agency.

The educational context of Brazil

In Brazil, compulsory education is structured into three main stages: Educação Infantil (Early Childhood Education), Ensino Fundamental (equivalent to primary education, P1–P7 and secondary education, S1–S3), and Ensino Médio (equivalent to secondary education, S4–S6).[xxi] Ensino Fundamental itself is divided into two cycles. Ensino Fundamental I (Years 1–5) caters for children aged 6 to 10 and is usually taught by generalist teachers. Ensino Fundamental II (Years 6–9) corresponds to middle school and serves learners aged 11 to 14.[xxii] This latter stage marks a significant transition, as pupils move from generalist to subject-specialised instruction, consolidating the foundations for critical thinking, scientific literacy, and civic engagement.[xxiii]

The Brazilian National Common Curricular Base (Base Nacional Comum Curricular (BNCC)), approved in 2017 and progressively implemented across the country, establishes the learning objectives and competencies for all stages of education[xxiv,xxv] and represents one of the biggest reforms in basic education in Brazil.[xxiv,xxiii] This national policy was developed following Agenda 2030.[xxvi]

In the Ensino Fundamental II, the BNCC outlines subject-specific learning outcomes across subjects such as Portuguese, Mathematics, Natural Sciences, Human Sciences, and Languages. Teachers are expected to contextualise these competencies according to local realities and students' experiences, which creates opportunities for curricular flexibility and innovation.

Climate change and sustainability education

With respect to climate change and sustainability education (CCSE), the BNCC does not explicitly define this as a discrete curricular area. Instead, it is embedded within broader cross-curricular themes (temas contemporâneos transversais), including the environment, Earth and Universe, citizenship, and socio-environmental responsibility.[xxiv,xxiii] For example, climate change and sustainability topics are included as part of Natural Sciences and embedded within the broader cross-curricular theme, Earth and Universe. The BNCC indicates that, in year 7 of Ensino Fundamental, students should acquire the skills to:

> (EF07CI13) Describe the natural mechanism of the greenhouse effect, its fundamental role in the development of life on Earth, discuss the human actions responsible for its artificial increase (burning of fossil fuels, deforestation, forest fires, etc.), and select and implement proposals to reverse or control this situation.[xxiv]

Furthermore, as part of the BNNC, the Natural Sciences emphasises the interdependence of human activity and ecosystems, while Geography addresses environmental change and land use.[xxiii] Disciplines such as Philosophy and Sociology create space for ethical and social debates about development and sustainability.[xxiii]

Although the BNCC provides the curricular framework for the integration of CCSE, the Ministry of Education also plays a key role in supporting teachers' professional learning. One example is the Ministry's Virtual Learning Environment (VLE), which offers a wide range of courses organised by subject and school level. Whilst the VLE does not currently provide specific

courses dedicated to climate change, it includes content related to Natural Sciences and modules on curriculum implementation linked to the BNCC.[xxvi] These incorporate themes such as environmental education, sustainable development, and approaches to climate change.

The incorporation of CCSE into classroom practice depends heavily on teachers' initiative, local school priorities, and regional education systems. Although the BNCC establishes a national curricular framework, it leaves significant room for interpretation, which can result in uneven coverage across schools and subjects. This challenge is reflected in international assessments; for example, Brazil's participation in the 2018 PISA Global Competence assessment[xxvii] shows relatively weak outcomes in students' understanding of global issues, placing the country among those with lower levels of awareness of challenges such as climate change and global warming. It should be acknowledged, however, that the study's findings are based on a sample that covered only 50% to 75% of the Brazilian student population.

In sum, although sustainability-related themes are formally present in the curriculum, their integration into teaching and learning is inconsistent. This underscores the importance of understanding how teachers themselves perceive, interpret, and enact CCSE within their professional practice.

Study overview

This study was designed to explore teachers' perspectives on CCSE curriculum making practices within the Brazilian school context. Following institutional ethical approval,[xxviii] the research followed a three-phase design, combining a broad survey, an in-depth workshop, and online focus groups. This sequential approach allowed for both breadth and depth of understanding, ensuring that teachers' experiences were captured through different forms of engagement.

Phase 1: Survey (November 2024 – January 2025)

The initial survey provided a wide-ranging overview of teachers' profiles, teaching contexts, and views on educational practices. Of the 111 participants who began the survey, 82 completed it in full.

Participants represented expertise in a wide spectrum of subject areas, including Mathematics (18), Portuguese (16), Biology (15), Physics (12), Geography (12), Philosophy (8), History (6), English as a Second Language (6), Chemistry (4) and smaller numbers from subjects including Physical Education (3), Sociology (3), Arts (1) and Special Needs Education (1). Several respondents reported teaching across multiple subjects, reflecting the versatility often required in school practice.

In terms of professional experience, participants ranged from teachers with less than five years in the profession (41) to highly experienced practitioners with over 20 years of service (20). The majority were based in Minas Gerais (72 completed surveys), with smaller numbers from Rio Grande do Norte (5), Rio de Janeiro (2), São Paulo (2), and Bahia (1). This distribution reflects the regional emphasis of the study, while also offering potential insights from a broader geographical range.

Phase 2: Workshop (May 2025)

The second phase comprised a four-hour workshop, which brought together 23 teachers from diverse disciplinary backgrounds for collective dialogue and professional exchange. Participants included teachers of Biology (4), Chemistry (3), Physics (3), History (2), Portuguese (2), Mathematics (2), and Geography (2), alongside representatives of Agriculture, Arts, Finance, Sociology, and English as a Second Language.

The workshop provided a structured space for teachers to reflect critically on CCSE-related pedagogical practices, to share subject-specific challenges, and to explore cross-curricular approaches. Through facilitated activities, participants co-constructed ideas as to the future of school-based CCSE.[xxix]

Phase 3: Focus Groups (August 2025)

To deepen the exploration of emergent themes identified from the survey and workshop responses, two online focus groups were conducted in August 2025. The first group involved three participants (Sociology, Physics, and Chemistry), while the second brought together five teachers (Biology, Physics, Agriculture, and Geography).

These one-hour sessions allowed for more detailed discussions of teachers' experiences and insights. They provided an opportunity to triangulate the findings of the earlier phases, while also highlighting nuanced perspectives on subject-specific opportunities and constraints. Importantly, the focus groups revealed the ways in which teachers negotiate CCSE in practice, including the tensions between disciplinary content, curricular expectations, and local community concerns.

Data analysis

Data were gathered from (1) the survey responses, (2) the transcript of the workshop, (3) artefacts created by teachers during the workshop, including posters and padlet posts, and (4) focus group transcripts. All authors were involved in qualitative content analysis, where data from across the different activities were coded through iterative phases of group discussion and individual reflection, resulting in the identification of themes divided into two categories of barriers to and enablers of teacher agency for school-based CCSE.[xxx]

Barriers to and enablers of teacher agency for school-based CCSE

Across the data from over 140 teachers' responses to the survey, workshop and focus groups, we identified three interconnected barriers to teacher agency and three broad enablers of teacher agency in the context of school-based CCSE in Brazil.

Barriers

Educational structures

Educational structures which were experienced as a barrier to CCSE included the content-heavy and rigid structure of the national curriculum, which teachers reported limited their opportunities for collaborative and cross-subject teaching and learning. High-stakes national examinations created a further barrier for teachers as they required teachers to prioritise examination content, and a culture of accountability created high workloads. Teachers also highlighted that there were few opportunities within the existing curriculum to foreground real-world relevance of CCSE in ways which connected with young people's lives and everyday experiences. Underpinning the structural challenges that teachers identified was their experience of education and sustainability policies as being bureaucratic, top-down directives provided at national and state-levels, which frequently prioritises education for supporting future careers rather than critical education.

These findings are consistent with the wider literature, which underlines how educational structures, including the national curriculum, can act as a barrier to achieving agency in relation to CCSE.[vi,viii,xiii]

Value of CCSE

The lack of a shared understanding of the value of responding to environmental issues, including climate change and sustainability, was experienced as being a barrier by teachers, both with the students they teach and a perceived lack of interest from the wider public. This lack of value was experienced by teachers as student and community disengagement with environmental issues, sometimes due to the belief that there was little which could be done by individuals and communities to positively respond to these complex issues. Some teachers raised the challenges presented in responding to misinformation and 'fake news' relating to climate change, including content shared via social media.[iv]

The importance of the cultural dimension of teacher agency, with shared ideas, goals and beliefs in relation to CCSE, is also visible in previous research which has considered school-based CCSE.[xiii,xix,xx]

Teachers' professional lives

A lack of funded and structured opportunities for CCSE-focused professional learning in both Initial Teacher Education and in-service professional learning was underlined as a constraint to realising CCSE as part of teachers' professional lives. Teachers who shared their experiences frequently reported that they had insufficient or insecure knowledge and understanding of climate change, environmental and sustainability issues, which inhibited

their classroom practices. A further consequence of a lack of CCSE-focused professional learning was that teachers relied on self-taught approaches.

Teachers experienced a lack of context-specific resources to support their teaching of climate change and sustainability and reported challenges with accessing equipment for practical and fieldwork-based inquiries which could support them to contextualise CCSE for students. High workloads, accountability pressures and a lack of financial investment in CCSE underpinned the barriers which teachers experienced.

The prevalence of 'self-taught' as an approach to CCSE-focused professional learning in the absence of structured and adequately funded opportunities is also strongly visible in across the research literature.[xxxi]

Enablers

Community-focused curriculum making for CCSE

Teachers wanted greater opportunities to engage in cross-subject curriculum making focused on CCSE, working with teachers from different schools and areas of subject and age-phase expertise to develop holistic CCSE. Such opportunities should also support teachers to co-create educational resources which are context-specific and relevant to the lives of students. Community groups and organisations were recognised as having an important role in brokering local expertise and knowledge in the context of CCSE. Teachers underlined the ways in which partnerships with community groups could support educational approaches which cultivate a sense of belonging or responsibility towards the environment and raise the value attributed to CCSE. This recognition of the need for place-responsive CCSE is consistent with previous research.[xxxii,viii]

Subject-specific and sustained professional learning for CCSE

Across the responses from teachers there was a clear recognition that access to sustained and funded professional learning focused on CCSE throughout a teachers' professional life was vital. Such professional learning should enable teachers to root CCSE in specific school subject knowledge and wider disciplinary expertise.[xxxii,xxxiv] Consistent with the learning from the first enabler, such professional learning should equip teachers to be curriculum makers, developing CCSE with students, other teachers, teacher educators, community groups and regional and national bodies, to equip children and young people to respond to complex global environmental challenges.

Intentional leadership of CCSE across different spaces

Leadership in schools – and at local, regional and national level – was recognised as being central to providing equal access to resources (e.g., digital, equipment, financial) for teachers to implement CCSE and to engage in professional learning. The cultural aspect of leadership was also recognised as being vital in responding to resistance to CCSE from some actors across school, government and wider societal spaces. Teachers recognised the specific role of school leaders providing support to broker external partnerships, including with NGOs and universities, to achieve community-focused CCSE. At policy level, teachers identified the need for national frameworks and structures that support them to further integrate CCSE into the curriculum. This recognition of the role of leadership in realising CCSE is consistent with previous research.[vii,xix,xx]

Implications for policy and practice

Drawing on learning from across the barriers and enablers identified in this research, we present the following implications for consideration and further discussion.

1. **Regional and Federal governments** should explicitly value CCSE in their local, regional and national policies and improvement plans.
2. **Regional and Federal governments** should allocate funding to support teachers' career-long professional learning focused on CCSE.
3. **Regional and Federal governments** should consider how to further integrate the role of community groups and partnerships in school-based CCSE.
4. **Regional and Federal governments** should enable in-service teachers to learn, explore and discuss CCSE with a range of experts.
5. **Regional and Federal governments** should fund the development of a new research-informed framework to support Higher Education Institutions who provide Initial and continuous Teacher Education to enhance CCSE.
6. **School leaders** should support teachers to engage in professional learning focused on CCSE and provide opportunities for teachers to share their learning across the school community.
7. **School leaders** should prioritise opportunities for teachers from across different subject areas and contexts to collaboratively plan and reflect on their practice with a focus on CCSE.

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