



EMOTIONS, CLIMATE CHANGE, AND THE CLASSROOM: A RESOURCE FOR PRIMARY SCHOOL TEACHERS

Case Study Final Report

France

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Emotions, Climate Change, and the Classroom: A Resource for Primary School Teachers | France Case Study¹

Executive Summary

In this case study we assessed the impact of climate change education (CCE) in one middle school through the discourse of four 12-year-old girls who participated in a CCE initiative designed by the Office for Climate Education (OCE) for a year. Assessments were based on three dimensions: knowledge, emotion and action.

In the present report, we present the pedagogical intervention and how we at the OCE carried out the implementation of this project. This was facilitated through the engagement of teachers and the entire school community. The program follows three steps based on key-turn activities developed by the OCE:

- First, the understanding of climate change through various science activities based on active pedagogies.
- Second, a set of two activities targeting psycho-affective dimensions of the topic: an activity of expression of emotions based on emotions cards and an activity of motivation to action based on brainstorming solutions.
- Finally, the implementation of a project of mitigation or adaptation action within the school context.

We then give some preliminary results of the qualitative case study we conducted. This is based on the grounded theory analyses of three successive focus group transcriptions with a group of 4 students we have been working with for the full year. Each focus group was conducted after each one of the steps described above.

We present here some aspects of the results concerning the three dimensions explored during the interviews: understanding the concepts, emotions about climate change and concern about the future, and, finally, motivation to action.

Challenges included difficulties for students in fully grasping what climate change is and confusion on topics such as pollution or biodiversity loss. The data also demonstrated the importance of working on emotional aspects that enhance students' concern and motivation. Finally, the students expressed, at the end of the year, more motivation towards actions and more realistic ideas of what they could do at their level, even if they do not express climate action as a top priority for them at the moment. Even if they are raising high concern for the future, often associated with overestimation of the risk, the group of students unanimously agree that they do not feel any worry or concern about climate change when at home.

Then, we elaborate on how this project can go further, highlighting first the positive levers of such action, and the different challenges it is facing. According to the results, it seems important to acknowledge the difficulty faced by young students in grasping the complexity and abstraction of climate change. We also found high motivational capacity and engagement in the students for such a project since it is close to their concerns, and teachers give them voices and listen to students' ideas.

¹ The views in the report are not necessarily endorsed by the MECCE Project, which funded the research.

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Finally, we report how this CCE initiative can be a good example of best practice in CCE and how this can be adapted in other contexts.

CCE Initiative

In this case study, we followed a full-year CCE initiative developed in middle school classrooms based on innovative pedagogical approaches, mixing science, active learning, psycho-affective approach, and project-based learning.

The CCE initiative was carried out by pluridisciplinary teachers' teams in the first year of middle school ("6^{ème} - 11 / 12 years old) in 10 schools in France. There were a total of approximately 500 students. Teachers involved in the initiative were from various parts of France. They were committed to using key turn activities provided by OCE on climate science, psycho-affective and motivational aspects, and project-based learning activities. OCE has created various school activities adapted to the middle school level based on active pedagogies such as inquiry-based learning. All these activities, based on science reports such as the IPCC special reports, have been validated by an international scientific and pedagogical committee and tested in various class contexts.

The originality of the CCE initiative pedagogical approach lies in its pluridisciplinary and successive approach:

- In the first part of the school year (September to December), classes worked on the nature of science and how the climate system works.
- Then, in December, the groups worked on students' emotions and motivation regarding climate change, working on a specific activity using emotion cards, and individual and group work on brainstorming solutions.
- Finally, in every school, from January until the end of the school year, classes developed and implemented a project of attenuation or adaptation to climate change, focused on specific local questions.

This approach aims to respond to the potential eco-anxiety of the students and promote pro-environmental behaviours.

Teachers from the initiative attended online webinars provided by OCE throughout the school year, where they accessed scientific knowledge and pedagogical guidance to implement the activities in their classrooms. Teachers were granted personal initiative to choose and adapt OCE resources to their school context and to develop their own local project concerning the students' brainstorming. Nevertheless, they needed to follow a schedule regarding the three parts during the year: first, understanding; then, emotions; and finally, action.

Case Study Methods

The Office for Climate Education (OCE) is the organization that conducted this case study. Simon Klein, the Sciences Officer, is the key person for the case study. Among the ten schools engaged in the initiative, this qualitative case study has focused on a specific school that followed the approach we recommended. Our focal teacher in Biology chose to implement the following activities: during the first part of the school year, she focused on the comprehension of climate change, with activities such as "The Proof of Climate Change" or "The Greenhouse Effect: An Analogy" or "Climate Justice".

Then, she engaged the students in an activity regarding the emotions and motivations for climate action. And finally, she engaged the school in a local project on adaptation to climate

change. Following the methodology developed at the OCE called the Climathon, the students and the whole school community participated in the launching of a project to change the schoolyard, specifically working on the greening of the yard, which is, for now, mainly based on concrete. Such an environment is highly impacted by climate change because of the phenomenon of the Urban Heat Island.

The case study's main research question was to verify if the CCE initiative's pedagogical approach based on the succession of understanding, emotions, motivations and actions would lead to changes in the discourse of the students and if it reduces eco-anxiety and promotes pro-environmental behaviour.

To answer this question, we chose a qualitative research approach often used in psychology to understand the links between life trajectories and social environment. We used a grounded theory (GT) approach. GT approach is a research methodology based on the generation of a theory which is "grounded" in the data that has been systematically collected and analyzed. It is used to explore social relationships and the behaviour of groups. This is particularly well suited to classroom contexts and the theory of change of individuals and group behaviours regarding climate action. In our case, we conducted a series of three focus groups with four young girls (11 and 12 years old).

For ethical and legal reasons concerning the French educational system, we did not get access to the social and economic background of the participants or to their ethnic origin.

Nevertheless, the Collège Edouard Herriot, in Nogent sur Oise, where we conducted the case study, is placed in a "priority educational network" or "Réseau d'Education Prioritaire," which concerns students originating from families with low income and a majority of first, second or third generation of migrants. In our focus groups, all the students were first- or second-generation migrants: one from Portugal (as it appeared when she talked about her family), two from Sub-Saharan African countries, and one from an Eastern European country, announcing she arrived a few years ago to France.

Due to legal reasons, we focused the analysis mainly on the role of school projects and the school environment in their understanding, emotion and motivation regarding climate change. The familial background was not taken into account during the interviews. During these 30 to 40-minute focus groups, which were recorded and anonymized, a series of open questions were posed to the students regarding three main aspects of their learning, attitudes and beliefs. The original French interview grid and its translation can be found as an annex.

The first questions focused on the comprehension of climate change as a phenomenon (for example: "Do you understand what climate change is, or not really?"; "Thus, can you explain the greenhouse effect / extreme weather, for instance.") Then, a group of questions focused on where they discuss climate change: do they talk about it with friends? With family? Do they learn about it at school? On social media? Television? Another group of questions concerned their feelings toward climate change. "Are you scared of climate change, or not really?"; "What are your feelings about the future?". Another group of questions concerned their motivation to learn more and to act: "What do you want to do about climate change? At school? With friends or family?"

Thus, with these open questions, the research team stimulated discussions within the group to gather more information and reflections concerning the individual, but also social attitudes and values. The focus groups were held three times during the school year after the three pedagogical approaches (understanding, feeling motivation, and action), with a similar set of questions. The first focus group was conducted at school, right after the specific class activity on the "Proof of Climate Change" in November 2022. The second focus group was conducted with the students gathered at school, with the research team joining via video call software.

This was done right after the activity on emotions and motivations in March 2023. Finally, the last interview was done at school in May 2023, when the students started the mitigation and adaptation project regarding the greening of the schoolyard. Therefore, it is possible to, at the same time, reveal consistency in the discourse and analyze the influence of such an innovative CCE pedagogical approach on the student's answers.

Grounded theory analysis was performed after the collection of data at two levels. First, the analyses of a specific focus groups, and then all three focus groups together. Each transcription was first coded, with each sentence being translated into simple ideas. General themes were collected throughout the data, and ideas were grouped according to these themes. Grounded theory as a qualitative approach does not need a control group as the methodology is based on discourse analyses and collecting individual and social attitudes and values within students benefiting from this innovative approach.

As the focus groups were conducted in French, the raw data are not available in English. In the next part of the report, the main findings are presented. If needed, raw data can be provided upon request.

Case Study Findings

According to the results, we can draw some conclusions based on the themes gathered with grounded theory analysis. We decide to present here the most interesting findings according to three main aspects: (i) the degree of comprehension of climate change; (ii) concerns about it; and (iii) motivation to act, which are the themes developed through the CCE initiative.

Firstly, the main result is about the complexity of the concepts for the students to grasp. For the four students, who are pre-adolescents, there is not a clear comprehension of the phenomenon. Even if they have been studying climate change as a school subject during the full year, and even the years before in primary school, the concepts underlying climate change are quite vague for the students and some misconceptions are very strong. First, during the three focus groups, they struggled to recall what they learned in class, finally delivering some aspects which were specific to one example, one experiment, or one inquiry-based activity. More than the scientific knowledge, the elements they recall were more onto the specific activity (for instance, they were talking very clearly about a specific experiment to show to what extent sea level rise is due to glaciers).

However, the phenomenon of the greenhouse effect was hard for them to recall and explain, even after some help from the research team. The general systemic aspect of climate change and the complex thinking needed to understand the big picture was not clear to them, as they were only able to discuss various examples of the proof of climate change.

Once students finished discussing specific aspects of class activities, they engaged in the same main misconception they kept on following to talk about "climate change" in general: "pollution." Very often, the discussion went to plastic pollution and why the problem of "climate change" was due to plastic pollution around the school and in nature in general. This idea of plastic pollution as the main issue regarding climate change was consistent during the three focus groups. Elements of climate science they could have understood and remembered from class activities (such as extreme events, floods, drought, sea level rise or biodiversity loss) were weaker and weaker from the first to the last focus group.

These findings reveal several aspects to take into account in the future development of CCE initiatives in formal education: for young people, climate change is a very complex concept to understand fully, and repetitions and the development of complex thinking are important.

Psychosocial Learning Dimension

During the different stages of the case study, the group was able to answer questions about their emotions regarding climate change either directly through answering specific questions around their emotion, motivation, or fear but also through the various other answers and discussions that arose in the group.

Concerning the negative emotions that they were expressing, fear was the main one. They expressed fear for the future, and some referred to terms such as "the end of the world." The fear was thus associated with overestimation of the risk of climate change, potentially linked with a misunderstanding of climate science, but also the difficulty for such age groups to consider and appreciate the abstraction of climate change and the temporality of the impacts of climate change on their lives.

Their concerns were also rapidly linked with biodiversity: in their discussion, animals (more than plants) were often present, and they demonstrated empathy to other species regarding the impact of climate change on biodiversity, and, often, the negative impact of pollution such as plastic pollution on animal species as well. This link demonstrates the misunderstanding of some aspects of climate change where the topic of biodiversity, and especially animal species, is more attractive to students of such age.

Their fears were also somehow quite realistic in the sense of the description of the impacts of extreme events on human populations. At the time of the second focus group, Türkiye suffered from a strong earthquake that highly affected local populations. The group of students explained how they envisioned the future of climate change as a disaster like the Turkish earthquake. They described how potential future impacts of climate change would affect populations, such as how the earthquake affected populations in Turkey, even though they were aware that earthquakes are not due to climate change. This is potentially due to the high impact of visual representations and the media treatment of disasters. Such data indicates the importance of including more work on positive reappraisal of the future and the importance of visual representation of possible futures.

The students also directly or indirectly indicated positive reactions and emotions related to their motivation and interest in studying the subject or being involved in the action project. They said that even if they could express negative emotions such as fear or sadness, they did not regret learning about climate change and that they were excited and motivated to pass into action.

During the second and third focus groups, students were able to develop further these emotional aspects thanks to the activity based on the emotion cards.

Even though they communicated highly negative feelings and expressions related to disasters, such as the impacts of the earthquakes or statements such as '*this will be the end of the world*,' all of the four participants assured that they did not have such negative feelings outside school, during family time for instance. Indeed, for them, climate change is a topic related to school or science class and has no real link with the familial environment. This is an interesting and surprising finding which needs further research and confirmation, showing that worry triggered in class does not necessarily influence the functioning and psychology of the students outside of the school.

Motivation

Students were generally very motivated by the topic as it sounded different from usual science classes. They were positively engaged in the activities concerning their emotions and brainstorming solutions as their personal views and desires were considered by the teachers

and group. The same high motivation level was detected during the project, especially because they were able, during the specific day of the Climathon, to express their voices in front of the adults involved in political and logistical decisions concerning changes in the schoolyard.

Their motivation was high for engaging in projects regarding cleaning nature from pollution, mainly plastic. The students show high engagement and concrete ideas to develop sensitization and actions to reduce plastic waste and pollution. This is still in line with misconceptions and confusion between pollution, greenhouse gases, and climate change. This is also in line with the conception for such young people of visible pollution and how if nature is "clean," the problem of climate change is fixed.

This approach is also connected to another subject of discussion around health: climate change triggers ideas around pollution and individual or human health and hygiene. For the group, it was important to keep the "planet clean," and it was a high motivation to act as "good citizens" and not encourage plastic waste, for instance. This was even stronger for one of the students who argued that if we don't take care of the planet (by reducing plastic pollution, in her understanding), we can get sick as humans.

When considering taking action, students were quite creative but also quite aware of some technical aspects: they suggested making formal requests, such as writing a letter to the mayor concerning some actions they would like to see engaged in their district (such as reducing plastic waste, or greening and planting trees). The understanding of the necessity to act locally and with the power of local policy stakeholders might come from the project they started in their school when they met with local politicians. Even if they were committed to taking action personally, such as writing a letter to the mayor, they finally let it go, arguing they have other priorities, such as school homework, activities or going on holidays. The individual engagement sounded quite well-defined but not a top priority.

Community Engagement

There is a clear understanding that the future belongs to everyone, and the students advocated for including as many people as possible in action projects. For one of the students, projects such as cleaning up plastic waste can involve "children from six years old to grandparents".

There was also often a comparison between "us" and "them"; as if there were good citizens and bad ones, the ones who contributed to pollution, according to the students. In the discussion, they often mentioned "them" to describe people who were not having the right behaviour concerning climate change, or the ones who did not understand the issue. It was also observed that these pre-teenagers have strong values or even morals about what is good and what is bad.

Finally, it must be observed that the results are also affected by the general cognitive development of their age group, concerning the evaluation of time and space phenomena: it was quite unclear to the student how climate change is influencing, on a large scale and in the near future, their local life; but also what we can do to reduce our impact or to adapt to climate change. The confusions were also often driven by more local and visual aspects such as local biodiversity, and plastic waste at school or in the forest nearby. This, we found, is closely related to the fact that students this age struggle with the appreciation of the invisible and the abstraction that is inherent to the climate change phenomenon.

Cultural aspects, especially from this age group, were also quite present: even if they did not mention social media as a source of information or motivation, they mentioned advertising on TV as examples. For instance, one of the students explained how McDonald's restaurants were

fighting plastic pollution by proposing non-disposable tableware. The full group agreed and started a discussion on how virtuous such an initiative was. This reveals the influence of mass culture icons on pre-adolescents.

Action Learning Dimension

The action-learning aspects were important during the specific phase of the Climathon. In this CCE initiative, students were able to learn many different skills regarding project management and planning, making compromises and discussing with different stakeholders in order to plan the greening of the schoolyard.

By working in groups, students had a map of the playground and were able to plan what they would like to change and how this would benefit them in terms of adaptation to climate change. They would then exchange with different experts regarding the topic (people from local politics, gardeners, urban planners, researchers in climate science and so on).

This action-learning process is very important and impacted their motivation, especially during the last focus group. Students naturally talked about some practical processes to have local changes (such as writing letters to the mayor). In a general aspect, their motivation and ideas of action were more clear and realistic after they started the project-based activity.

Climate Justice

Students mentioned climate justice, as it was one topic they studied during class activity. Their point was based mainly on recalling what they learned during class, but it did not arise during the focus group discussions as a matter that concerned them personally.

Indigenous Knowledges/Participatory Methods Influence

This point was not necessarily relevant in this specific context in France: indeed, on French territory, there is no real question regarding Indigenous knowledge. However, the format of project-based learning, under the “Climathon” form, is a good lever to tackle Indigenous knowledge if appropriate in some contexts or regions.

Cultural and Regional Context Influences

The cultural context is critical in the design of the action component of the CCE initiative (the Climathon) as it is based on the needs of the school and its community. For instance, the schoolyard is particularly dysfunctional for heat protection during heatwaves. Thus, it was important for the school community to work on greening the playground. In other contexts, schools might choose other projects: for instance, one school located in a remote village where most students would come by car have worked on promoting bike commute to school by implementing different projects around the access to school via bike lane, for instance.

Sharing Learnings Across Geographies

This CCE initiative, based on the three dimensions of learning knowledge, expressing emotions and taking action in the school context, as a whole school approach and local community engagement work is a good initiative to be implemented anywhere and can be adapted for different age groups.

Case Study Impacts

The case study shows the importance of considering CCE as three-dimensional aspects, all as important as the other: learning basic concepts of climate change, learning about students' emotions, beliefs and motivation, and finally putting the student in a situation of project action.

The case study findings show how such an approach triggers children's motivation to learn and to act. This is also an important approach to allow students to express their feelings and to authorize them to feel concerned about the topic. In our findings, it seems clear that the topic of climate change started to be more than just a science class topic and that, by the end of the school year, the students were more empowered to act and engage in actions they desired to pursue.

Internal Impacts

The case study has confirmed the importance of enlarging CCE in a school context toward more than just science-based activities. It is certain that aspects, such as climate justice, are important to include in CCE and also psycho-affective aspects, such as activities around the expression of emotion and project-based learning. The positive aspect of the pluridisciplinary approach is the gain of motivation of the students to engage in pro-environmental behaviour. Concerning psycho-affective aspects, it seems clear that there are some concerns and negative reactions expressed by the students that we can qualify as some degree of eco-anxiety. It exists, and it is somehow disconnected from a realistic representation of the future and is often exaggerated, but can be reduced by engagement and project-based activities.

It is also an interesting finding that such eco-anxiety was expressed only during class context but did not affect the students while at home with family or outside of school with friends. Nevertheless, this point requires more investigation. These findings enhanced the importance of school as a place of experimentation and expression of one's feelings and motivation. It is also an important place to develop a sense of community needed for climate action. It also demonstrated the complexity of climate science and how it is important to have several sessions regarding climate science for young students in order to avoid misconceptions such as plastic pollution.

This case study also indicated to us the importance of age and cognitive development in several aspects regarding the understanding of climate science, the type of engagement and the influence of climate change on their future life. In this case study, students were too young to express clearly a sense of responsibility or even a clear comprehension of the abstract aspects of climate change or the temporality it represents. However, these students were able to show high engagement in collective pro-environmental actions. This energy and motivation to act is an important lever to engage students in learning. It would be interesting to develop further action-learning aspects of such pedagogical aspects. Moreover, it would be interesting to develop more case studies with older students, such as older teenagers at the middle school or high school level.

The case study findings are also a confirmation of the effectiveness and importance of investing time in teacher preparation and training to develop a full school year program. For OCE, the majority of the work was based on online training and proposing specific school activities concerning the needs of the teachers, as well as networking with various stakeholders, which could be of interest to some schools. This low-profile support was sufficient for the teachers to conduct the CCE initiative efficiently throughout the school year. Nevertheless, all of the initiatives followed and supported by OCE were initiated by highly motivated teachers who were convinced by the importance of ambitious CCE. Thus, the question that is still open for the community working on CCE in formal education is how to enhance prior engagement to any teacher to generalize such practices as a bottom-up approach.

External Impacts

This CCE initiative is very innovative at the school level, especially in the French educational system and for middle school classes where curricula are designed in a way where knowledge is scattered onto disciplines that are very well defined and separated, with teachers being experts in one domain only. But climate change is, in essence, a pluridisciplinary subject needing various approaches with strong basics in climate science. Therefore, it seems important to promote such an approach that can be developed by one specific teacher or a group of teachers who receive some prior pedagogical and/or scientific knowledge during teacher learning sessions and then feel able to conduct such an ambitious CCE initiative.

For the teachers' training session, one element that proved to be doable at the national (or even international) level is the teacher training protocol done online, which showed positive scaling effects. With a set of four different training sessions, we could empower up to 10 middle school teachers' teams to develop the CCE initiative. With more capacity and the development of MOOC (see the MOOC we developed on climate change education [here](#)) we could reach out to more teachers.

Then, once individual teachers or teams of teachers are engaged, the following challenge is to create a positive dynamic locally: it is then either in the hand of the teachers and/or the school Dean to promote local action, to organize locally some action days (such as the Climathon), and including local stakeholders and researchers for instance.

The researcher's community is generally highly engaged in such initiatives with positive responses to solicitations from local schools. One of the important missions of OCE is to strengthen the links between the research community, especially in climate science, and schools. It can be done by webinars for teachers or the development of online material such as videos (see the [CLIM series](#) developed by OCE), but also some networking actions to put in contact with schools and researchers when possible.

Finally, this case study project is a first step toward the recognition of the importance of developing psycho-affective and action-learning aspects in formal education. Following this initiative and developing more research-action case studies is important to enhance the recognition of the effectiveness of such CCE initiatives and to include different learning aspects in educational policies. It is also important to include these aspects in national curricula, for instance, (as a top-down approach based on bottom-up initiatives), and enhance teachers' vocational learning policies on these topics and methodologies.

Applicability and Scaling of the CCE Initiative

At the OCE, we work internationally to develop regional actions with partners in various countries. For instance, we have an ambitious international project in Latin America ([ALEC project](#)), including Mexico, Colombia and Chile, and we are starting a large project in Africa, including Mauritius, Kenya and Senegal. Including such projects in other countries is facing some challenges regarding the school culture and curricula. Some curricula are more easily turned towards pluridisciplinary than others. On the other hand, teachers' knowledge and understanding of climate change can be very different from one context to another, in different countries, but also for different school levels and social contexts.

The most interesting and valuable aspect regarding the various international contexts has to do with the action-learning part of the initiative. Because we want to promote climate action at the school level for local aspects, we have been following and promoting various class projects, such as the construction of biodigesters in Colombia concerning local cultural aspects of cooking.

Regarding students' beliefs, understandings, and worries about climate change, it would be

valuable to pursue qualitative research based on grounded theory in various contexts worldwide. Some quantitative research, such as Marks *et al.* in 2021², has been showing high degrees of eco-anxiety for 16-25 years-old people in various countries but higher psychological effects for countries at more risk regarding climate change, such as Brazil or the Philippines, compared to Europe or North America. More research needs to be done at the international level, but also with younger students, such as in this case study with 12-year-olds, using a qualitative approach more able to grasp the interlinks between learning about climate change and eco-anxiety.

Nevertheless, the next step, before going internationally, would be to generalize this case study from one school to some dozen schools in France to have enough data to publish a scientific report on the findings.

² Marks, Elizabeth and Hickman, Caroline and Pihkala, Panu and Clayton, Susan and Lewandowski, Eric R. and Mayall, Elouise E. and Wray, Britt and Mellor, Catriona and van Susteren, Lise, Young People's Voices on Climate Anxiety, Government Betrayal and Moral Injury: A Global Phenomenon. Available at SSRN: <https://ssrn.com/abstract=3918955> or <http://dx.doi.org/10.2139/ssrn.3918>

Annex: Focus group guide

Number of participants: between 5 and 7 secondary school pupils

Length of focus group discussion: 30 to 40 minutes

Questions :

Have you understood the causes of climate change, or not really?

What are the current impacts of climate change? And in the future?

Are there any things you already knew before you took part in today's class?

Do you hear about climate change outside school, or not really?

With your parents? With friends? On TV? On the internet? With other adults?

Do you worry about climate change, or not really?

Do you ever think about it outside class, or not really?

Are there things you would like to do as a class to prevent climate change?

[ask for details: what action, what procedure, how they would actually go about it. Pass the floor around]

Are you sufficiently prepared, or not really?

Are there things or people who could help you do this?

Can you change things with your class, or not really?

Who do you think can change things?

Would you like something to have changed at school next year (in your family, in your neighbourhood, etc.) or not?

If so, how can you help?



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