



FINAL REPORT

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

2022-2023 Case Studies Cohort
France

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Climate Change Education Through Pedagogical Intervention in French Middle School | France Case Study

Summary

In this case study we were able to specifically have access to the impact of climate change education of one middle school through the discourse of four 12-year-old girls who followed during one full year a specific pedagogical intervention we designed, based on three dimensions: knowledge, emotion and action.

In the present report, we firstly present the pedagogical intervention and how we at the Office for Climate Education (OCE) helped out the implementation of such a project in schools. This was allowed by the engagement of teachers and the whole 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 the brainstorming of 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 analysis we conducted. It is based on the grounded theory analyses of three successive focus group transcriptions with a group of 4 students we have been following the full year. Each interview was conducted after one of the steps described earlier.

We deliver 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.

Results are challenged with some difficulties for students to fully grasp what climate change is, and clear confusion with pollution or biodiversity loss. But the data also demonstrated the importance of working on emotional aspects that enhance students' concern and motivation. Finally, they express, at the end of the year, more motivation towards actions and some realistic ideas of what they could do at their level, even if they express climate action as not 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 elaborated some reflections around how this project can go further, highlighting first the positive levers of such action but also the different challenges it is facing. According to the results first, it seems important to acknowledge the difficulty for young students to fully grasp the complexity and abstraction of climate change. We also found out the high motivational capacity and engagement of the students for such a project since it is close to their own individual concerns and that teachers give them voices and listen to students' ideas.

Finally, we report how such local case study can be a very good example of best practice in CCE and how this can go further and can be adapted in other contexts.

Report

The CCE Initiative

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

This program was carried out by a pluridisciplinary teachers' teams in the first year of middle school ("6^{ème}" - 11 / 12 years old) in 10 schools in France. For a total of around 500 students. Teachers involved in the project are from various parts of France and committed to use key turn activities provided by OCE on climate science, psycho-affective and motivational aspects and finally project based learning activities. OCE has created various school activities adapted to 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 pedagogical approach lies in the 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 on, classes developed and implemented a project of attenuation or adaptation to climate change, focused on specific local questions.

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

Teachers from the project were attending online webinars provided by OCE throughout the school year where they accessed scientific knowledge and pedagogical guidance in order 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 in relation to the students' brainstorming. Nevertheless, it was important that they followed roughly a schedule regarding the three parts during the year: first: understanding, then: emotions and finally: action.

Among the ten schools engaged in the project the qualitative research project has been focused on a specific school that followed the approach we recommended. Our focal teacher in Biology choose 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" (see [the activity](#)), or "The greenhouse effect: an analogy" (see annex 2) or "climate justice" (see [the activity](#)).

Then she engaged the students into an activity regarding the emotions and motivations on climate action (see [the activity](#)). And finally, she engaged the school into a local project on adaptation to climate change. Following the methodology developed at the OCE, called the Climathon (see [this project methodology](#)), the students and the whole school community participated in the launching of a project to change the school yard, and 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, especially because of the phenomenon of "Urban Heat Island".

The Case Study

The main research question was to verify if this pedagogical approach based on the succession of understanding, emotions, motivations and actions would lead to changes in the discourse of the students.

Will it reduce eco-anxiety and promote pro-environmental behaviour?

“Office for Climate Education” OF France is the organization, who are conducting this case study. Simon Klein, sciences officer is the key person for the case study.

Case study methods and participants

In order to answer those questions, we chose a qualitative research approach often used in psychology to understand the links between one's life trajectories and its 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 analysed. It is used to uncover such things as social relationships and behaviour of groups. This is particularly well suited to classroom contexts and theory of change of individuals and group behaviours regarding climate action.

In our case, we conducted a series of three focus groups with the same 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 economical background of the participants, as well as their ethnic origin. Nevertheless, the Collège Edouard Herriot, in Nogent sur Oise where we conducted the study is placed in a “priority educational network” or “Réseau d'Education Prioritaire”: which concerns students originating from families with low income and at a majority from first, second or third generation of migrants. In our focus group 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 east european country, announcing she arrived a few years ago in France.

Because of the legal reasons and as we choose to focus the analysis mainly on the role of school projects and school environment onto their understanding, emotion and motivation regarding climate change, the familial background was not taken into account during the interviews.

During these 30 to 40 minutes focus group interviews, that have been recorded and anonymised, a series of open questions have been given to the students: regarding three main aspects of their learning, attitudes and beliefs. Original French interview grid and its translation can be found as an annex.

First questions focused on the comprehension of climate change as a phenomenon (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?

A group of questions concerned their feelings about it. “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 interviewer stimulated discussion within the group, in order to gather more information and reflections concerning individual but also social attitudes and values.

The interviews were done three times during the school year after the three pedagogical approaches (understanding, feeling and motivation and action), with a similar set of questions.

First interview was conducted at school, right after the specific class activity on the “proof of climate change”, in November 2022.

Second interview was conducted with the students gathered at school but the interviewer at a distance using video call software. It 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 already started the mitigation and adaptation project regarding the greening of the school yard.

Therefore, it is possible to, at the same time, reveal consistency in the discourse and analyse the influence of such innovative pedagogical approaches on the students' answers.

Grounded theory analysis was performed after the collection of data at two levels: first the analyses of a specific interview, and then all the three interviews together. Each transcription was firstly coded: each sentence is translated into simple ideas and general themes are collected throughout the data and ideas grouped according to these themes.

Grounded theory as a qualitative approach does not need a control group as the methodology is based on the discourse analyses and collecting individual and social attitude and values within students benefiting from this innovative approach.

As the interviews were conducted in French, rough data are not available in English. In the next part of the report, main findings are presented. If needed, rough data can be provided under demand.

Advancing Quality CCE through this Case Study (findings)

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

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 interviews, they struggled to recall what they learned in class, and finally delivered some aspects which were quite 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 - as a reference to the activity developed by OCE, [see here](#)).

But the phenomenon of the greenhouse effect was hard for them to recall and explain, even after some help from the interviewer. 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 they finished discussing specific aspects of class activities, they engaged into 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 how come 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 interviews. 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 starting from the first to the last interview.

These findings reveal several aspects to take into account in future development of formal education interventions: for young people, as these pre-teenagers, climate change is a very complex concept to understand fully, and repetitions as well as development of complex thinking are important.

Psychosocial dimension

Concerns:

During the different stages of the study, the group was able to answer questions around their emotions regarding climate change either directly through answering specific questions around their emotion, motivation or fear, but also throughout 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 of them were referring 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 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, or, often also, the negative impact of pollution such as plastic pollution on animal species. This link demonstrates also 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 interview, Turkey suffered from a strong earthquake that highly affected local populations. The group of students explained how they envisioned the future with climate change as a disaster like the Turkish earthquake. They described potential future impacts of how climate change would affect populations such as how the earthquake affected populations in Turkey, even so 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 the motivation and interest in studying the subject or to be involved in the action project. They said that even if they can 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 interview students were able to develop further these emotional aspects thanks to the activity based on the emotion's cards.

Even though they communicated high 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 somehow surprising finding which needs further research and confirmation,

showing that worry triggered in class does not necessarily influence functioning and psychology of the students outside of the school.

Motivation

Students were generally very motivated by the topic as it sounded, for them, different from usual teaching classes in sciences. They were positively engaged in the activities concerning their emotions and brainstorming solutions as their personal views and desires were taken into consideration by the teachers and the group. The same high motivation level was detected during the project specially because they were able, during the specific day of the climathon, to express their voices in front of adults who are involved in political and logistical decisions concerning any changes in the schoolyard.

Their motivation was high to engage into projects regarding cleaning up nature from pollution, mainly plastic. The students show high engagement and concrete ideas to develop either sensitisation and actions in order to reduce plastic waste and pollution. This is still in line with misconceptions and confusion between pollution and 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 that it was a high motivation to act as “good citizens” and don’t 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 take 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 interviewees. 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 there is, for these pre-teenagers, the importance of 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 group-age in respect of 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 good 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 a large influence of this mass culture icons for preadolescents.

Action-learning dimension

The action-learning aspects were important during this specific phase of the climathon: in this case study, students were able to learn a lot of different skills regarding project management and planning, about 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 and 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 had an impact on their motivation, especially, during the last interview, students naturally talked about some very practical process to have local changes (such as writing letters to the mayor). As a general aspect, their motivation and ideas of action was clearer and more 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 mainly based on recalling what they learned during class, but it did not arise during the discussion as a matter that seemed to concern 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. But the format of project based learning, under this "climathon" form, is a good lever to tackle indigenous knowledge if appropriate in some contexts or regions.

Cultural and regional contexts influence

The cultural context is very important in the design of the action project (the climathon) as it is based on the needs of the school and its community. For instance: , the school yard is particularly dysfunctional for heat protection during heatwaves. Thus, it was important to the school community to work on greening of 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 project, 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 very good project to be implemented anywhere and can be adapted to different age groups.

Impacts of the Case Study

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

The research project shows how such an approach is triggering their motivation to learn and to act. This is also an important approach to allow students express their feelings and authorise them to feel concerned about the topic; in our finding, it seems clear that the topic of climate change started to be more than just science class topic and that, by the end of the school year, the students were more empowered towards acting and engaging into action they desired to pursue.

Impacts at the Internal Level

The project has confirmed the importance of enlarging climate change education, in school context, towards more than just science-based activities. It is for sure that aspects, such as climate justice, are important to include in CCE; but also, psycho-affective aspects such as activities around the expression of emotion and finally project based learning. The positive aspects regarding the pluridisciplinary approach are the gain of motivation of the students to engage into 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, as we found, 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 on several aspects regarding the understanding of climate science, but also 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. But 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 into learning and it would be interesting to develop further action-learning aspects of such pedagogical aspects.

Moreover, it would be interesting to develop more case studies for older students, such as older teenagers at middle school or high school level.

The project is 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 in relation to the needs of the teachers, as well as networking with various stakeholders which could be of

interest for the projects in some schools. This low-profile support was sufficient for the teachers to conduct the project efficiently through the school year.

Nevertheless, all of the projects followed and supported by OCE were initiated by highly motivated teachers who were convinced by the importance of ambitious CCE. Thus, the question is still open for the community working on CCE in formal education is how to enhance prior engagement to any teacher in order to generalise such practices as a bottom-up approach.

Impacts at Different Levels

This approach is very innovative at school level, specially in the French educational system and for middle school classes where curricula is done in a way knowledge is very scattered onto disciplines that are very well defined and separated, with teacher's expert in one domain only. But climate change is by 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 proved to be doable at national (or even international) level is the teacher training protocole done online which showed to have important positive scaling up effects. With a set of 4 different training sessions, we were able to empower up to 10 middle school teachers' teams to develop such projects. With more capacity and the development of MOOC (see the MOOC we develop on climate change education [here](#)) we would be able to reach out to more teachers.

Then, once individual teachers or full 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 organise locally some action days (such as the climathon) including local stakeholders and researchers for instance.

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

Finally, this case study project is a first step into the recognition of the importance of developing psycho-affective and action-learning in formal education. Following this project and developing more research-action projects to enhance the recognition of the effectiveness of such program, it is thus important aspects to include in educational policies: including these aspects in national curricula for instance (as top-down approach based on bottom-up initiatives), and enhance teachers vocational learning policies on this topics and methodologies.

Applicability and Scaling of the CCE Initiative

At the OCE we work internationally with the development of 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 for instance; and we are starting a large project in Africa including Mauritius, Kenya and Senegal. Including such projects into other countries is thus facing some challenges regarding firstly the school culture and curricula: some curricula are more easily already 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 context.

The most interesting and highly valuable aspect regarding the various international context has to do with the action learning part: because we want to promote climate action at the school level for very local aspects, we have been following and promoting various class projects such as construction of biodigesters in Colombia concerning local cultural aspects of cooking (see this [example here](#)).

Regarding students' beliefs, understanding and worries about climate change, it would be very valuable to pursue qualitative research based on grounded theory in various contexts worldwide. Some quantitative research, such as Marks *et al.* in 2021¹, have been showing high degrees of eco-anxiety for 16-25 years-old people in various countries, but higher psychological effects for countries more at risk regarding climate change such as Brazil or the Philippines, compared to Europe or North America. More research needs to be done at international level, but also with younger students, such as here with 12 years olds; but also, with a qualitative approach more able to grasp what are the interlinks between learning about climate change and eco-anxiety.

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

¹ 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.3918955>



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