For an evidence-based climate change education and its integration into school curricula

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Plan of the talk

- Who am I and why do I do what I do?
- What is the Office for Climate Education?
- What does science tell us about Climate Change Education (CCE)?
- What are the current global ECC recommandations?
- How about France?

Who I am and why do I do what I do?

From teaching to research and back

Biology teacher by training (agregation @ENS de Lyon)

Research in ecology: wicked issue regarding pollinators loss

How to integrate complex issues like biodiversity loss or climate change in disciplinary teaching?

From pre-service training how to adjust it via in-service training

What is the Office for Climate Education?

What is the Office for Climate Education ?

https://oce.global

OFFICE FOR CLIMATE EDUCATION

- Created in 2018 in response to article 12 of the Paris Agreement
- Operational team of 15 persons
- Head Office in Paris – Sorbonne University
- Network of ~ 70 partners in ~ 30 countries

Centre under the auspices of

unesco

Observing organisation of

ipcc

Founding members

cnrs

METEO FRANCE

IRD

météo et climat

SORBONNE UNIVERSITÉ

Co-coordinator of

Greening Education Partnership

Main French partners

IPSL

FONDATION La main à la pâte

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

OCE's objectives and missions

Targets

Primary and secondary schools

France and international

Professional development and communities of practice

(teachers, trainers, inspectors, etc.)

Production of pedagogical resources

Research-action programs

Support to public policies

Expertise

Pilot projects

Our guiding principles

Scientific foundation

Based on IPCC reports

Interdisciplinarity

Climate, biodiversity, human and social sciences, arts…

Active pedagogies

Inquiry-based science education, project-based learning

Cooperation

Empowerment of local actors, UNESCO ministries, NGOs…

Accessibility and relevance

Multilingual, free, open resources
Adapted to local contexts

Long term impact

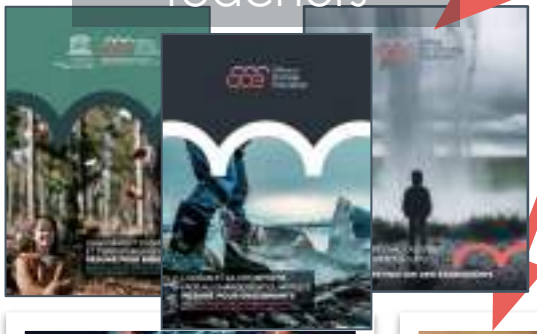
Scale, legacy

Useful resources

OCE resources: https://oce.global/

Summaries for teachers

IPCC REPORTS



Teacher handbooks

Teacher training protocols

Videos & multimerdia animations

https://oce.global/

What does science tell us about Climate Change Education (CCE) ?

Some references on this question (research papers)

Sandhu et al. (2022) Centring indigenous worldviews in environmental education

Li et al. (2022) Effectiveness Evaluation of a Primary School-Based Intervention against Heatwaves in China

Wang et al.(2022) Fear emotion reduces reported mitigation behavior in adolescents subject to climate change education.

Hickman et al. (2021) Climate anxiety in children and young people and their beliefs about government responses to CC: a global survey

Barrable et al. (2021) Enhancing Nature Connection and Positive Affect in Children through Mindful Engagement with Natural Environments

Bhattacharya et al. (2020) Empirical research on K-16 climate education: A systematic review of the literature

Trott et al. (2020) Science Education for Sustainability: Strengthening Children's Science Engagement through Climate Change Learning and Action

Monroe et al. (2019) Identifying effective climate change education strategies: a systematic review of the research

Murphy et al (2019) A Starting Point: Provide Children with Opportunities to Engage with Scientific Inquiry and Nature of Science

Williams et al. (2017) As the climate changes: Intergenerational action-based learning in relation to flood education

Learning policy institute (2017) Effective Teacher Professional Development

Hu et al. (2016) Place-based inter-generational communication on local climate improves adolescents' perceptions and willingness to mitigate climate change

Ojala, M. (2012) Hope and climate change : The importance of hope for environmental engagement among young people

Some references on this question (reports)

JustEd (2023) Advancing climate action, justice and equity goals through environmental education: Lessons for policy and practice from the JustEd study

Smithsonian Science Education Centre (2023) Educating for Sustainable Development, perspectives of U.S. and Global Educators

AFD (2023) Worldwide effects of climate change education on the cognitions, attitudes, and behaviors of schoolchildren and their entourage

UNESCO (2022) Youth demands for quality climate change education

UNESCO (2021) Getting every school climate-ready : how countries are integrating climate change issues in education

ALLEA (2020) A snapshot of climate change education initiatives in Europe

UNESCO (2019) Country progress on Climate Change Education, Training and Public Awareness

Does it work?

NO! (most of the time)

> "Environmental education in schools is not improving learners' skills, attitudes or behaviours as they relate to climate change"
> (JustEd 2023)

- Barrier 1: content is decontextualized from learners' daily lives
- Barrier 2: misrepresentation of individual actions for reducing carbon emissions
- Barrier 3: shallow pedagogies which prevent learners from engaging in critical thinking, analysis and evaluation
- Barrier 4: does not recognise the rights of nature itself to survive and thrive

YES, it works! (when it is done properly)

- CCE leads to improvement of knowledge, attitude and skills for students
  (AFD 2023, Li et al. 2022, Trott et al. 2020, Monroe et al. 2019, Hu et al. 2016)

- As well as for parents and grand-parents
  (Li et al., 2022, Parth et al. 2020, Williams et al. 2017, Hu et al. 2016)

  - Intergenerational learning effect (children educate their parents) for knowledge and mitigation/adaptation behavioral intentions

  - This effect is stronger with girls

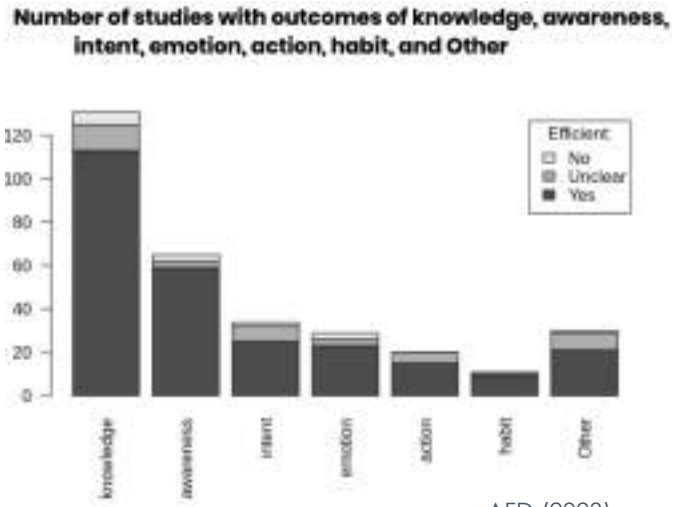
What works?

CCE must build on strong science education (active pedagogies)

- Climate science is universal
- Misconceptions about CC are similar everywhere and often perpetuated by incorrect schoolbooks
  (Bonilla et al. 2023, AFD 2023, Bhattacharya et al. 2020, Choi 2015)
  - Confusion between climate/weather
  - GG/atmospheric pollution
  - GHE / ozone layer
  - natural/anthropogenic…
  - Base on solid science -> IPCC reports!
- Debunking misconceptions and practicing science activities is key and reduction of overestimation of the risk

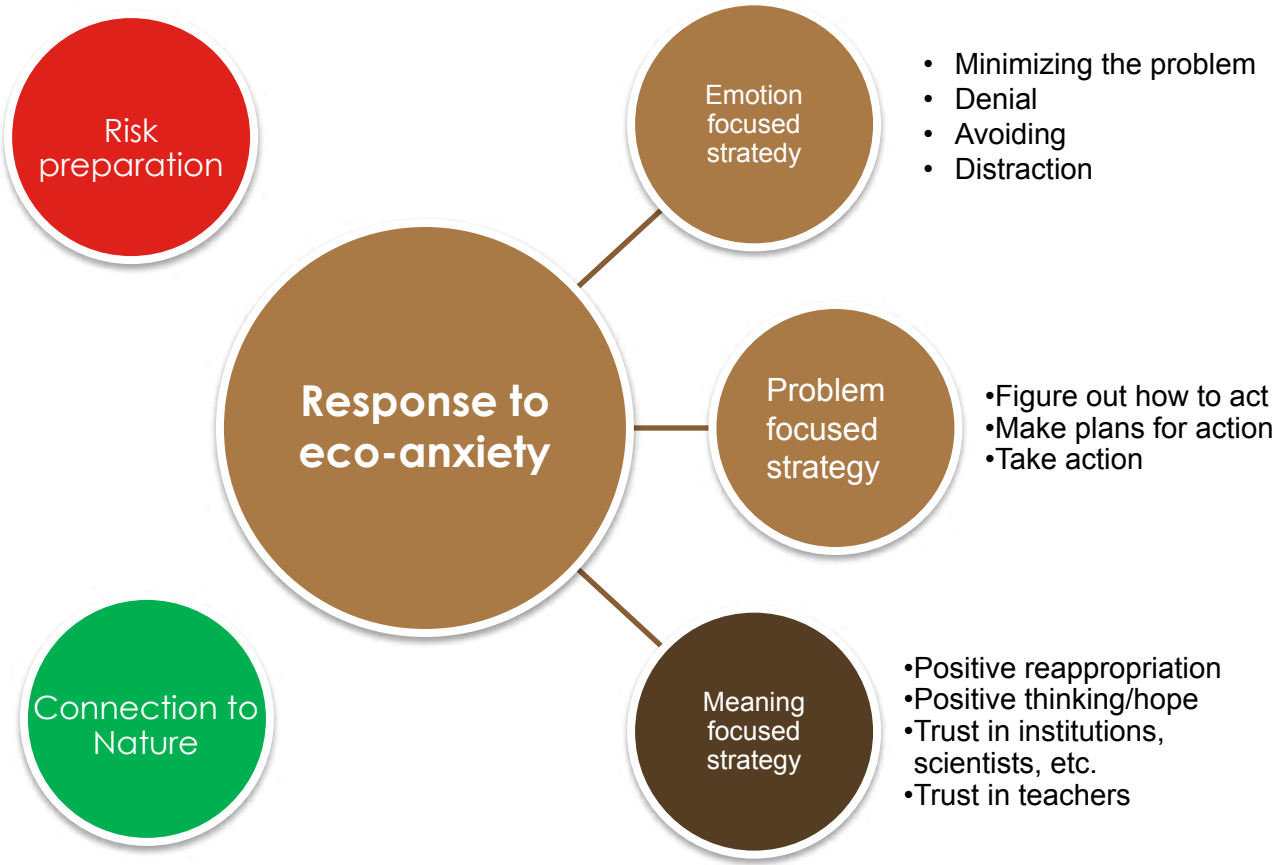
How to bridge the Knowledge – behaviour gap?

- Important to go beyond the "knowledge only" approach (Wang et al. 2022)
  - Creates anxiety
  - Does not lead to action
- Work on solutions and develop self-efficacy and promote agency
  - Project-based pedagogy (DeWaters et al. 2014)
  - Role playing games (Meya et al. 2018)
  - Outdoor activities (Khadka et al. 2021, Barrable et al. 2021)
  - Intergenerational contact (Hu et al. 2016)



AFD (2023)

Considering socio-emotional learning



- Minimizing the problem
- Denial
- Avoiding
- Distraction

•Figure out how to act
•Make plans for action
•Take action

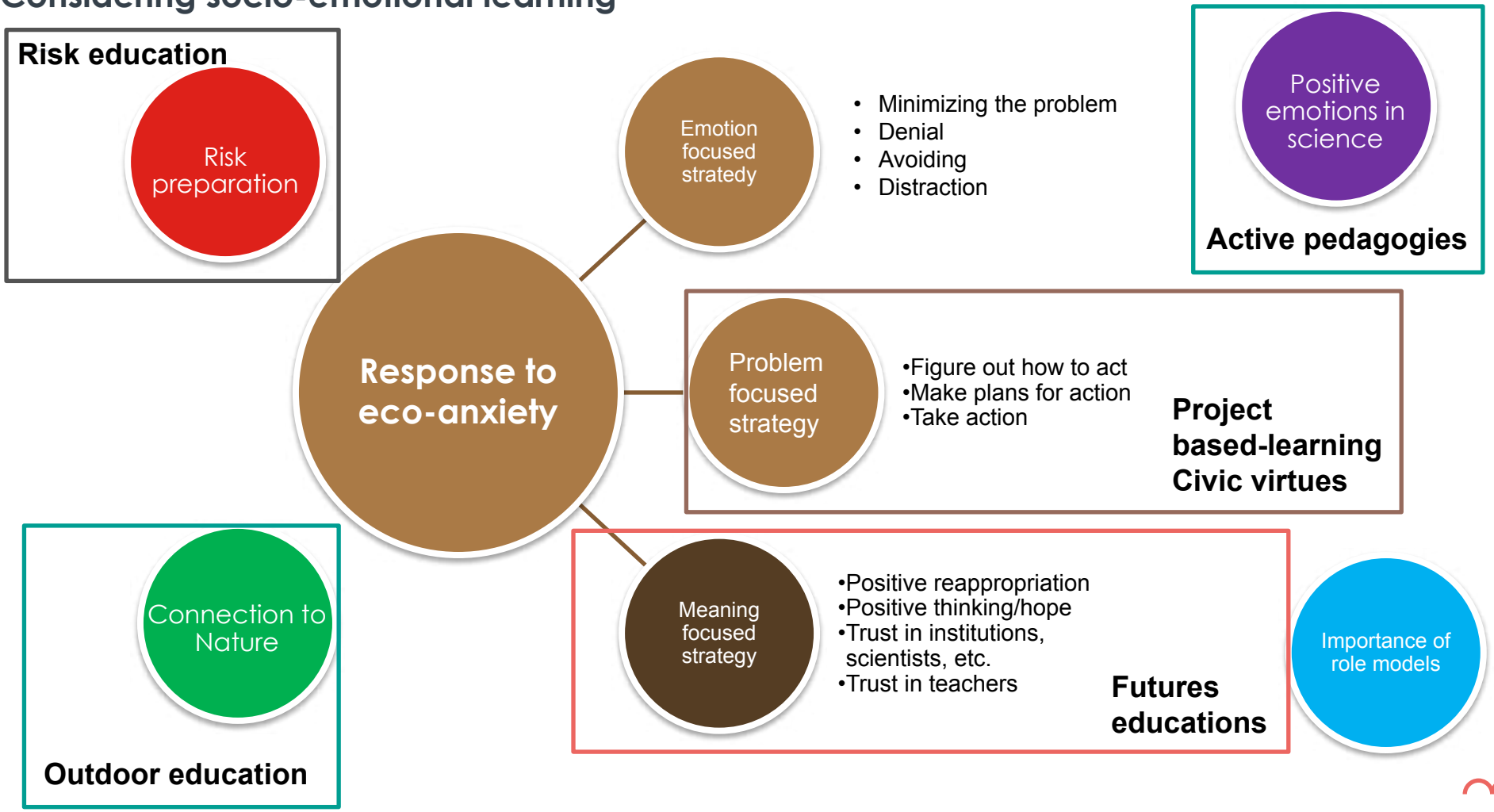
•Positive reappropriation
•Positive thinking/hope
•Trust in institutions, scientists, etc.
•Trust in teachers

Positive emotions in science

Importance of role models

Lazarus & Folkman, 1984 Ojala, 2012 Desbiolles, 2020

Considering socio-emotional learning



Be modest: CCE projects must remain education projects!

- Self-efficacy (DeWaters et al., 2014, Ojala, 2012)
  - Each small success reinforces the positive perception that success is possible
  - Failing to implement action will limit or annul otherwise effective interventions
- Vital role of local and personally relevant climate issues
  - reduces psychological distance
  - motivates students
  - develop of sense of responsibility
  - inspire action

Importance of indigenous cultures

Integrating Indigenous cultures and knowledges into CCE offers

(Sandhu et al. 2022)

- a different perspective on the relationship between nature and human beings
- a way to develop climate justice
- A motivation to act

How to provide teachers with effective professional development?

Effective teacher education for CCE…

ALLEA (2020), Monroe et al. (2019), Learning policy institute (2017)
+ OCE's experience (ALEC project since 2020)

- Is content focused
- Incorporates active learning
- Supports collaboration
- Uses models of effective practice
- Provides coaching and expert support
- Offers feedback and refection
- Is of sustained duration (~ 50-80 hours)

Where are we ?

Global overview of ECC public policies

A strong demand from the youth

A favourable international context…

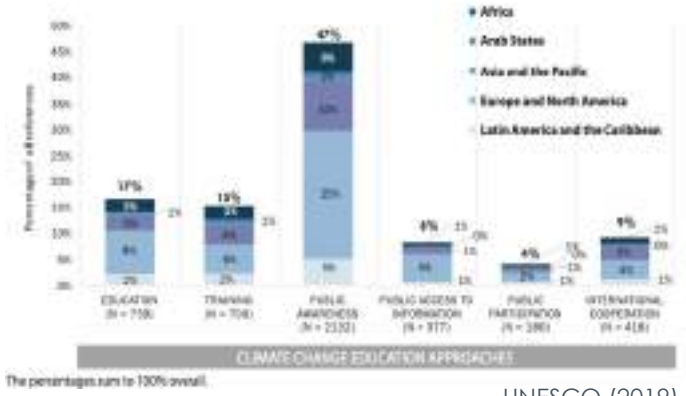
COP21 - CMP11
PARIS 2015
UN CLIMATE CHANGE CONFERENCE

Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement.

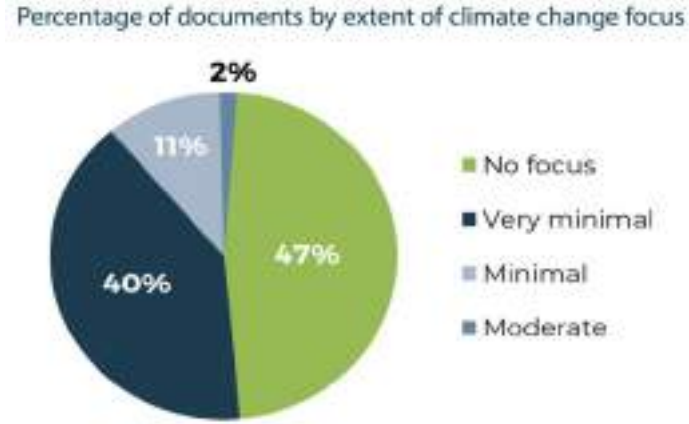
From ESD to ECC

A strong demand for CCE, but still very little implementation

- Public awareness preferred to education (UNESCO, 2019)
  - Only 27% of countries have a budget for CCE
- Teacher's needs (UNESCO, 2021)
  - Very low or no integration of CC in curricula
  - 95 % of teachers believe that CCE is important
  - Less than 30% fill able to explain the effects of CC in their region / country
  - Only 2% of Ecoschools implement CCE (FEE, 2021)

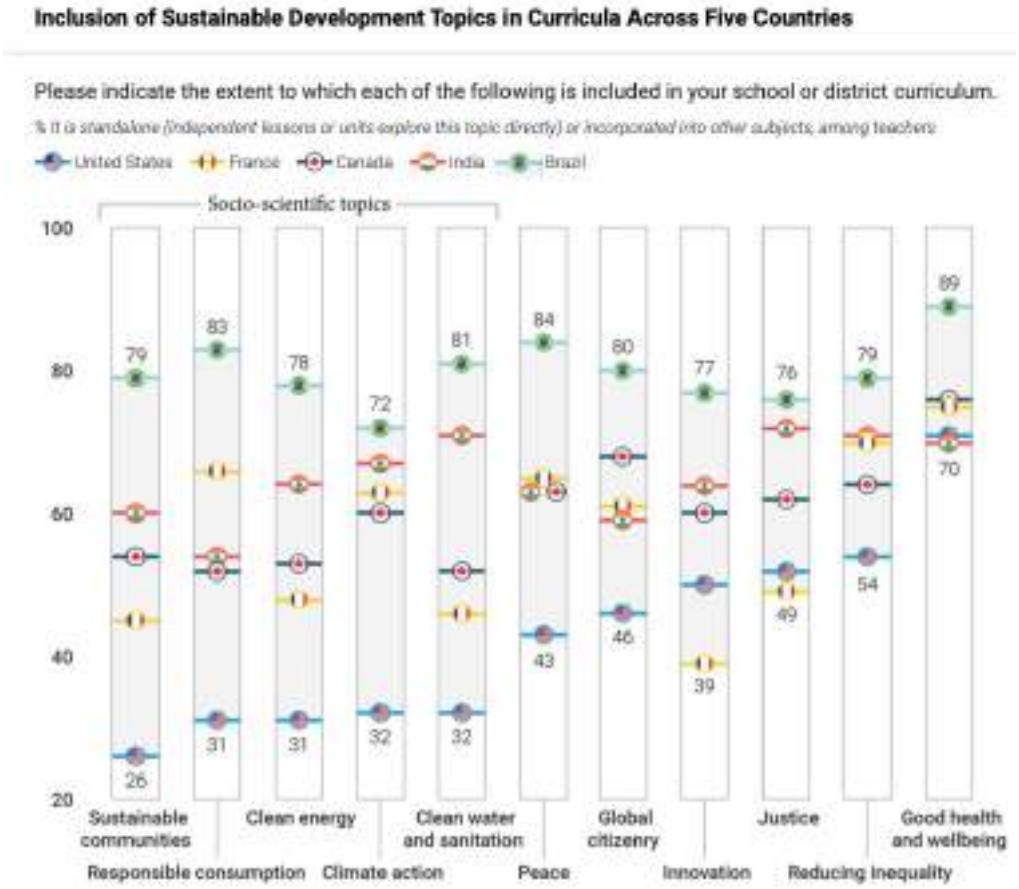


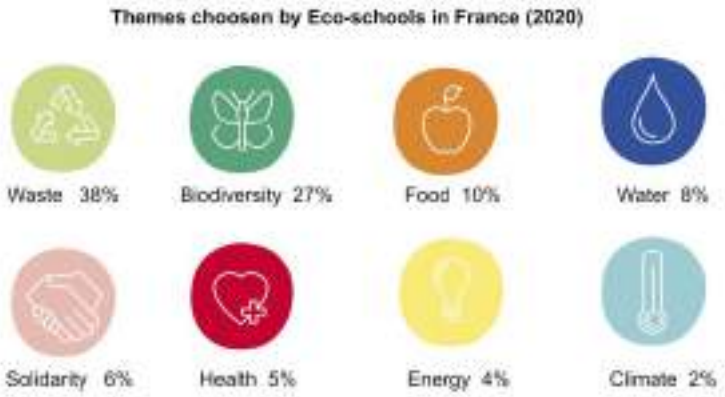
UNESCO (2019)



UNESCO (2021)

A strong difference between institutional's and teacher's points of view





Teragir & Foundation for Environmental Education (2021)

Consequences on students

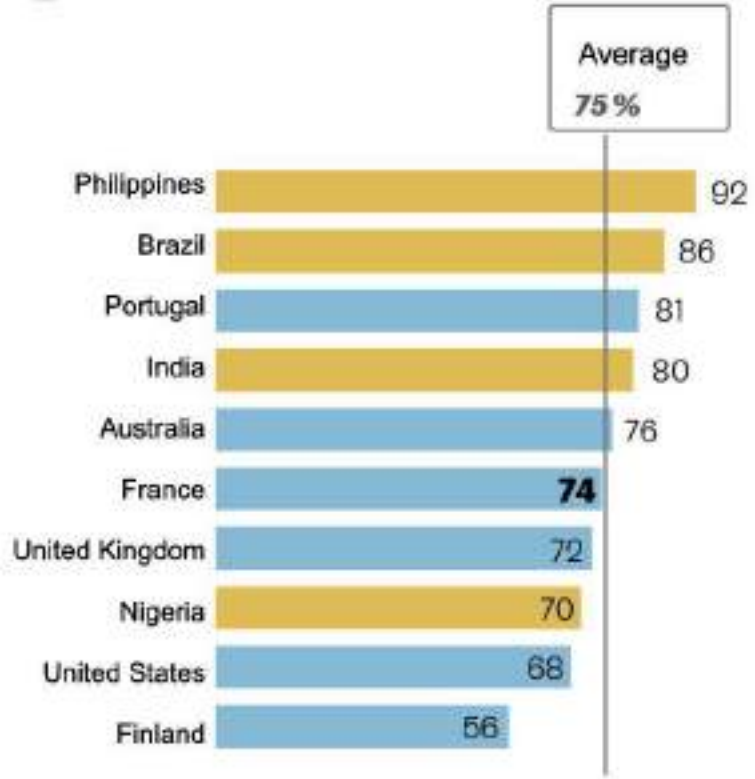
- 70% of the Youth **cannot explain** CC

  (UNESCO, 2022)

- 75% of teenagers and young adults suffer from **eco-anxiety**

  (Hickman et al. 2021)

Fraction of Youth suffering from eco-anxiety
(Hickman et al., 2021)



Climate education as part of climate adaptation

“Education is the most transformational climate adaptation action”

Stefania Giannini

Assistant-Director General for Education, UNESCO

COP27, Sharm El Sheik

UN's Greening Education Partnership

*The **Greening Education Partnership** is a global initiative that takes a whole-of-system approach to support countries to tackle climate crisis by harnessing the critical role of **education**.*

UN's Greening Education Partnership

97 countries and over 1,900 organisations

are now part of the Greening Education Partnership

96,000 schools in 93 countries are green schools

according to the Green school quality standard

The Green school quality standard aims to transform 50% schools

into green schools in all countries by 2030

Education currently receives less than 2% of total climate finance

a gap that must be closed if we are to scale education's contribution to climate resilience

Green School Quality Standard: Greening Every School

A climate-ready green learning environment should…

SCHOOL GOVERNANCE	TEACHING AND LEARNING
…entrust the Green Committee to develop a Green School vision and policy and cover 1/3 of suggested activities on	**…develop lesson plans on ESD and climate change education and cover 1/3 of suggested activities on**
▶ Cultivating sustainable practices ▶ Ensuring daily sustainable practices ▶ Resilience and climate proof governance ▶ Establishing a green community	▶ Integrating ESD with an emphasis on climate change in teaching and learning ▶ Fostering meaningful connections beyond the school ▶ Hands on projects and initiatives ▶ Leadership and capacity building
FACILITIES AND OPERATION	**COMMUNITY ENGAGEMENT**
…set up a monitoring team and cover 1/3 of suggested activities on	**…organize awareness campaigns for the school and the surrounding community and cover 1/3 of suggested activities on**
▶ Climate education, awareness and training ▶ Developing a climate-friendly infrastructure ▶ Ensuring climate resilience and disaster preparedness ▶ Promoting school safety and educational continuity management ▶ Promoting green procurement and WASH purchasing	▶ Building climate resilience in the community ▶ School's contribution to community resilience to climate change ▶ Local community support for education responses to climate change ▶ General community-based climate awareness

BY 2030
At least 50% of schools in each country greened

Schools have incorporated ESD and climate action in the curriculum demonstrating commitment to holistic learner development and equipping learners with skills to tackle real-world sustainability challenges within their communities.

Schools raise community-wide awareness on climate change and preparedness, by empowering learners to meaningfully engage with diverse stakeholders within the local community, promoting shared responsibility and sustainable practices to foster a culture of resilience and sustainability.

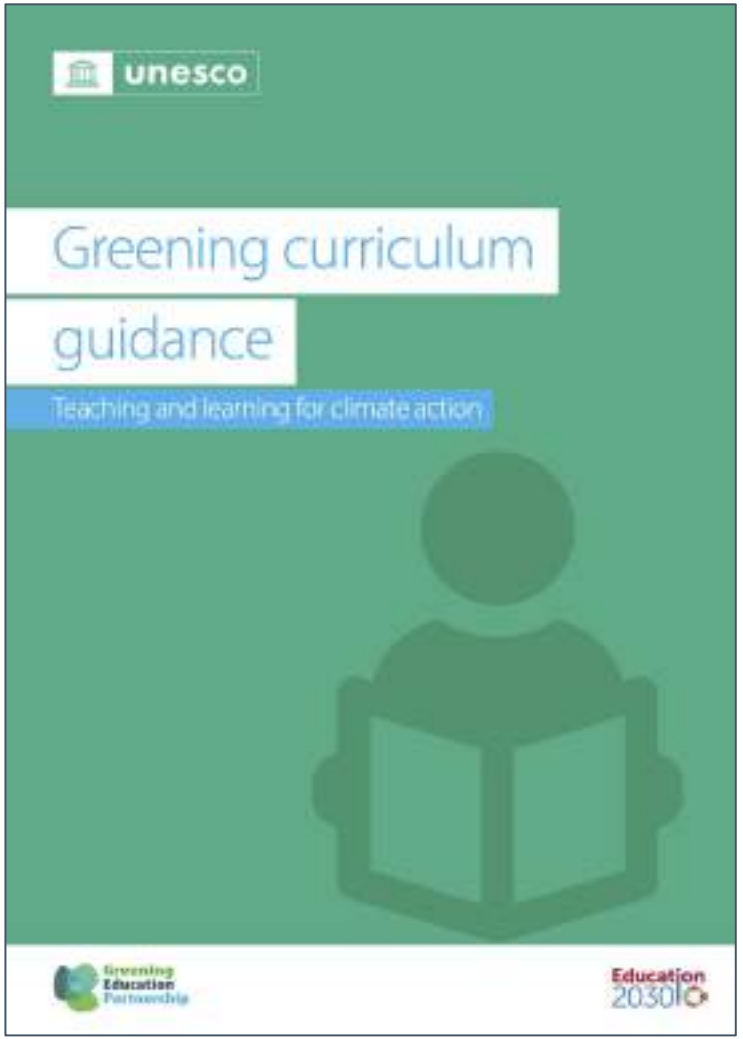
Schools have an inclusive governance that engages the entire school community through participatory decision-making and active engagement to combat climate change, enhance resilience and foster sustainable practices.

Schools have reduced risk through climate-proof facilities and operation, emergency preparedness upskilling, and cultivating sustainable practices by actively engaging learners in monitoring the school's progress on becoming a green climate-ready school.

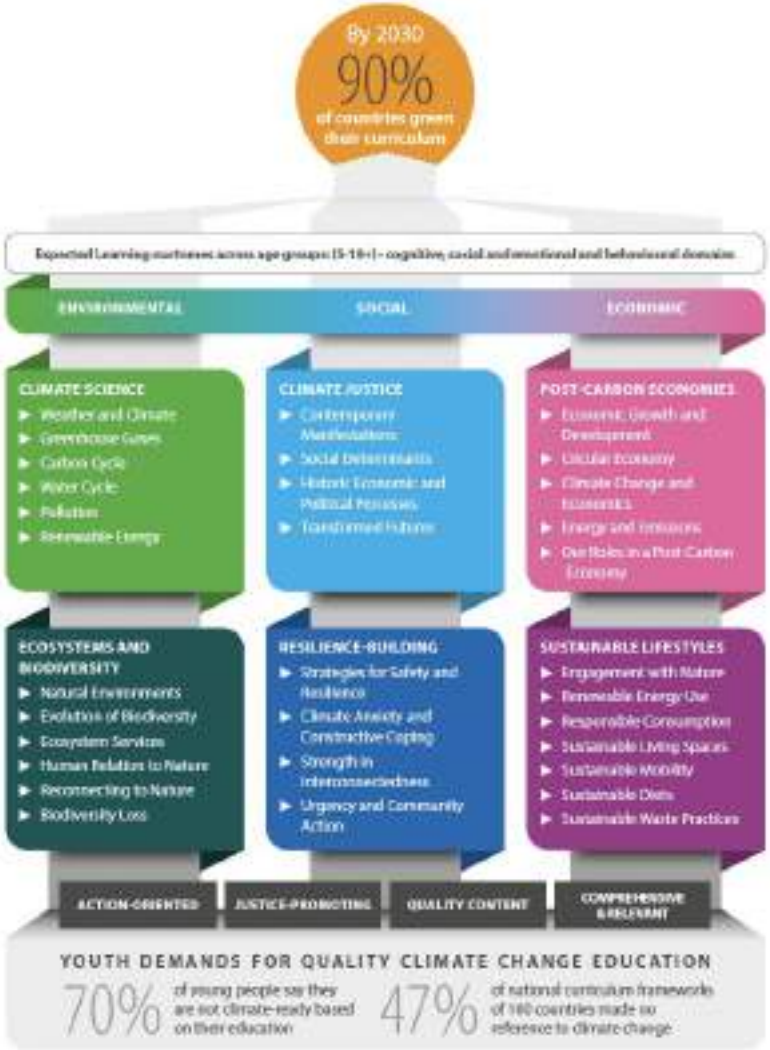
Greening Education Partnership

Greening Curriculum guidance

Published in June 2024



Greening Curriculum Guidance: Principles and strategies



Topic 2.1. Natural environments: ecosystems and biodiversity (land and ocean)

Biodiversity is a scientific definition of the variability among living organisms from all sources, including, inter alia, terrestrial, marine and other aquatic ecosystems and ecological complexes. It is important for the learners to understand the concepts as well as experience the richness of animals, plants, or fungus species and how they interact with each other and with the elements such as climate or soil, forming an ecosystem (a complex of living organisms and the abiotic environment with which they interact in a specified location). Knowledge of ecosystems and biodiversity, especially local ones, is a key element for encouraging its conservation.

	Cognitive	Social and emotional	Behavioural
5-8 years	**KEY IDEA: Ecosystems are animals and plants in interaction with each other, as well as with land and weather.**		
	Learners should be able to: ▶ describe how biodiversity entails different species, both as groups and individual members ▶ identify and contrast how animals/plants are different, including behaviours and habitats; ▶ explain that human kind is also a species and is part of nature.	Learners should be able to: ▶ enjoy spending time in natural environments. ▶ feel appreciation that humans share the planet with other species and are not superior to them.	Learners should be able to: ▶ take care of a natural environment by visiting it, helping out the interactions between species and reducing human impacts ▶ seek out and enjoy experiences in the wild with family members and friends.
9-12 years	**KEY IDEA: Biodiversity is the variety of plants and animal life in the world/a particular habitat. It is also a broader notion to define nature in non-scientific discussions.**		
	Learners should be able to: ▶ recognize the diverse presence of biodiversity across ecosystems, including urban areas and marine environments.	Learners should be able to: ▶ feel a connection with local nature by engaging with the sights, sounds, and features of their local natural environment;	Learners should be able to: ▶ encourage the preservation and enhancement of local ecosystems (e.g. through gardening, reforestation, fostering closer connections with

Guiding towards implementation

Planners may wish to anticipate the following steps in designing, implementing and improving efforts to integrate learning outcomes into the curriculum:

- **Step 1.** Review existing education policies for footholds and rationales for strengthening the presence of greening education in the curriculum.
- **Step 2.** Establish and ensure inclusive participation of stakeholders in the curriculum development process, including youth and community members.
- **Step 3.** Decide on curricular strategies for infusing greening education within and across subjects and grade levels in schools, as well as recommendations for the non-formal education sector.
- **Step 4.** Develop a detailed curriculum that ensures action-oriented learner outcomes, including the use of transformative and 'place-based' pedagogy.
- **Step 5.** Prepare and pilot sample instructional resources within and across subject areas to test the new curriculum and solicit feedback from numerous stakeholders, especially youth.
- **Step 6.** Finalize, produce and distribute learning resources, including suggestions for assessment, with an associated communication and publicity strategy.
- **Step 7.** Provide substantive orientation to greening education for textbook writers, examination board staff and other stakeholders, and obtain any necessary approvals.
- **Step 8.** Provide educators with quality pre- and in-service training and continuous professional development opportunities, in cooperation with higher education institutions and CSOs.
- **Step 9.** Implement the Guidance through whole institution approaches and strengthen partnerships between schools, CSOs, municipal authorities and the private sector to implement greening education.
- **Step 10.** Monitor and assess the results of education programming on climate change competencies in an ongoing manner.

Each of these steps are addressed in this section. The reader may want to consult other resources for more detailed guidance on curriculum mapping, curriculum development and curriculum supports.[9]

- Useful resource for inspiration and opening up new approaches in curriculum.
- Based on a syllabus with learning objectives
- Not a competency framework nor a perfect and exhaustive curriculum for climate litteracie

European Competency Framework: Greencomp

AREA	COMPETENCE	DESCRIPTOR
1. *Embodying sustainability values*	1.1 **Valuing sustainability**	To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.
	1.2 **Supporting fairness**	To support equity and justice for current and future generations and learn from previous generations for sustainability.
	1.3 **Promoting nature**	To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and res
2. *Embracing complexity in sustainability*	2.1 **Systems thinking**	To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.
	2.2 **Critical thinking**	To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.
	2.3 **Problem framing**	To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.
3. *Envisioning sustainable futures*	3.1 **Futures literacy**	To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.
	3.2 **Adaptability**	To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk.
	3.3 **Exploratory thinking**	To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.
4. *Acting for sustainability*	4.1 **Political agency**	To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.
	4.2 **Collective action**	To act for change in collaboration with others.
	4.3 **Individual initiative**	To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

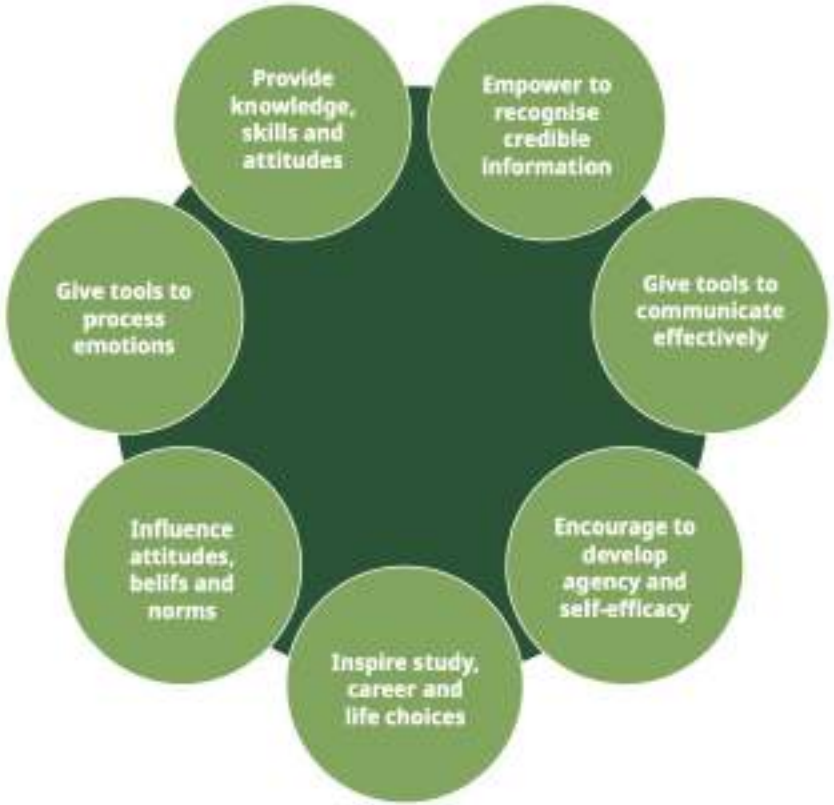
International competency evaluation: PISA ~ work in progress – available this month

PISA 2029 Climate Literacy

The PISA 2029 Climate Literacy assessment will generate international data on students' capacity to apply knowledge, skills, attitudes, and values across disciplines to understand and address climate change. The data will help identify how education systems prepare students to respond to climate challenges and contribute to sustainable futures.

Competency		Three sub-competencies		
1	**Understand and explain human induced climate change**	Understand and explain climate, other Earth systems and their interactions	Understand and explain how humans affect the climate and other Earth systems.	Understand and explain ways to reduce human impact on Earth systems
2	**Apply evidence-based reasoning to climate challenges**	Identify reliable evidence on human-induced climate change	Investigate climate issues using models and data	Integrate diverse sources of evidence to inform decisions on climate issues
3	**Engage with arguments and perspectives on climate change**	Identify and evaluate diverse arguments about climate change	Identify and evaluate diverse perspectives	Construct arguments and communicate on climate change
4	**Exercising agency for climate futures**	Envision just and sustainable futures	Formulate strategies and plan projects	Reflect critically on projects and solutions

Objectives of Climate change education



And how about France?

Climate change education in France

- Analysing french context:
  - PhD in French textbooks quality analysis
  - CLIMASCO project

Le changement climatique et l'océan dans l'enseignement et les manuels scolaires en France

Stefania Rosolen (LOCEAN-IPSL, CNRS, OCE)

Éric Guilyardi (LOCEAN-IPSL, CNRS, Paris), Benjamin Quesada (Université du Rosario, Colombie), Yoann Demoli (Université de Lille), Elena Pasquinelli (OCE) et Simon Klein (OCE)

Context and research questions

- **Education au Changement Climatique (ECC) - specific research field**

  ✓ **Invisible phenomenon** in a complex system; **large time and space scales;** has **delayed effects** of actions; **is a socially controversial topic, addressing justice, inequalities, and emotions**

- **Ocean Literacy -** understanding of the ocean's influence on oneself and one's influence on the ocean

- **Textbooks – complex tools with four essential functions: Reference; Instrumental; Ideological; Documentary**

Questions de recherche:

(1) **How much and how do textbooks refer to climate and ocean change? (**Does the content reflect the latest scientific findings? What aspects of causes, impacts, and possible "solutions" are specifically addressed? What types of educational activities and illustrations are highlighted in these textbooks (experiments, documentary studies, serious games, photos, diagrams, etc.**?**

(2) **How is the process of designing and producing textbooks organized in France?** (What skills and knowledge from the curriculum are selected for inclusion in these books, and according to what criteria? How do authors and publishers prioritize scientific knowledge relating to climate change and the ocean in order to include it in textbooks?)

Methodology

Quantitative

- **Textbook analysis grids (Lycée et cycle 4 - SVT, HG, PC, ES – Bordas, Belin, Hatier, Hachette)**
- **Data processing by code and percentages**
- **Comparison between the presence of ECC and ocean in curricula and textbooks**
- ***Objective: to identify the extent to which climate change and ocean issues are addressed in formal education in France.***

Qualitative

- **Content analysis :**
  - ✓ ***Curriculum***
  - ✓ ***Textbook***
    - *Scientific validity*
    - *Quality of illustrations*

Climasco Project

CONTEXT

- Train educational staff on climate change and ecological transition, beyond raising awareness.
- Five-year pilot project aimed at strengthening ECC in schools through the development of: continuing education for educational staff, the production of teaching resources, the development of communities of practice, and a unique research and evaluation component.

OBJECTIVES

1/ For teachers, trainers (and, by extension, for students)

Development of ECC skills with a target of 110,000 hours of continuing education

2/ For the education system

Assess the impact of different training programs

Develop recommendations based on the results of the impact assessment to support scaling up

TARGET AUDIENCES

Primary and secondary education stakeholders (middle school, high school, vocational school): teachers, trainers, school principals, ESD advisors, teaching assistants

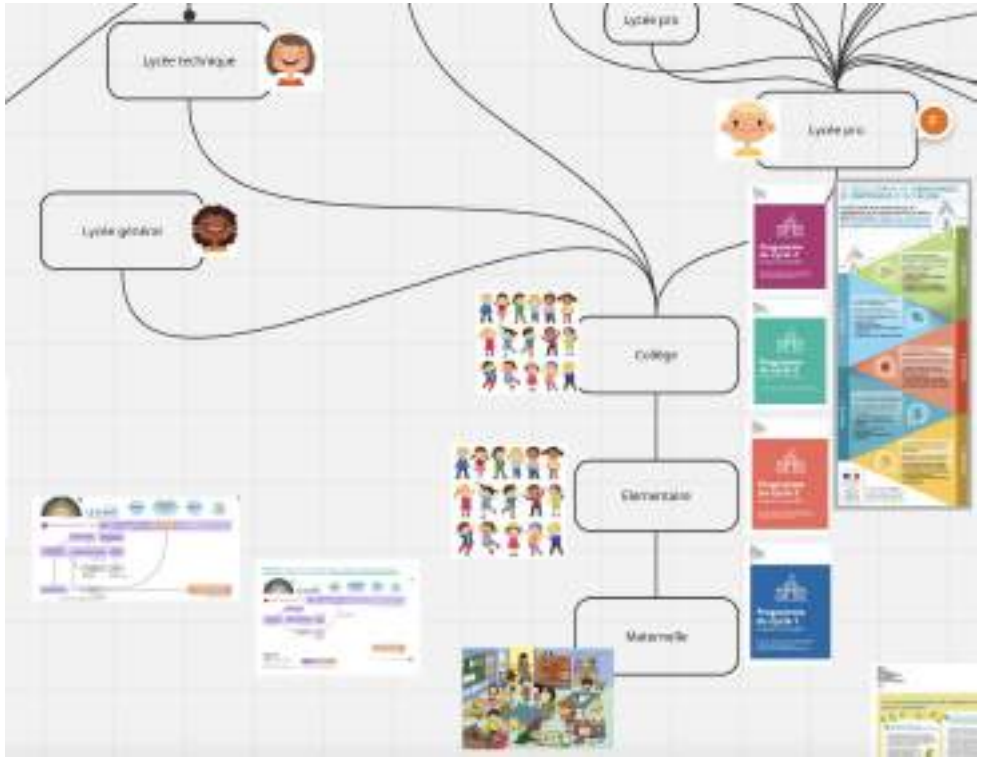
RESEARCH WORK PACKAGE: Current situation and state of the art

Projet »**LA CLASSE D'OSCAR** (work in progress)

My son started school in September, let's analyse what are the various opportunities he and his classmates will meet at school from now until end of highschool to develop his »climate competences »

For the sake of the exercise, we say that there will be no curriculum changes, and that PISA competences evaluations will be in place for him at the end of middleschool.

RESEARCH WORK PACKAGE: Current situation and state of the art



Climasco Project

RESEARCH WORK PACKAGE: Current situation and state of the art

First impressions:
There is core curriculum, based on notional aspects

There is room for developping key competences such as PISA Competency 4 (Exercising agency for climate futures), through project based learning, eco-délégués, labellisations E3D or various projects

There is room for improvement to increase interdisciplinarity, education to complexity, socio-emotional learning and prospective thinking for instance

…

Climasco Project

Now from curriculum to implementation…

The *intended curriculum* is a set of formal documents that specify what the relevant national education authorities and society expect that students will learn at school in terms of knowledge, understanding, skills, values and attitudes to be acquired and developed, and how the outcomes of the teaching and learning process will be assessed. The intended curriculum applies also to organized learning in non-formal education settings.

The *implemented curriculum* involves the actual teaching and learning activities taking place in schools through interaction between learners and educators as well as among learners; that is, how the intended curriculum is translated into practice and actually delivered. It is also referred to as the 'curriculum in action' or the 'taught curriculum'.

The *attained curriculum* comprises the knowledge, understanding, skills and attitudes that learners actually acquire as a result of learning processes. It can be assessed through different means and/or demonstrated in practice, and it may also differ from the intended and the implemented curriculum

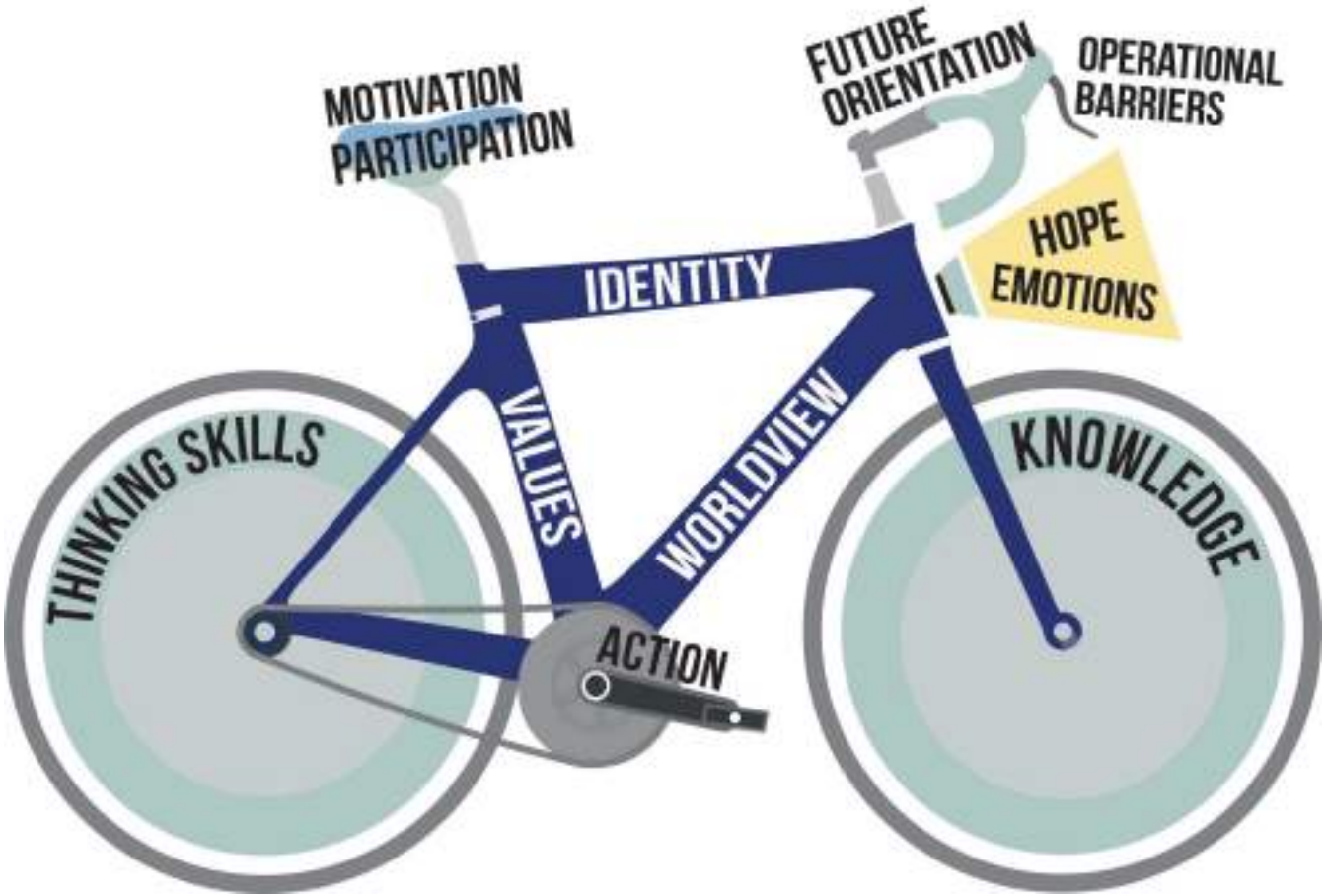
The *hidden curriculum* refers to unintended learning that takes place as a result of the culture of the classroom or school, relationships between students and teachers, as well as unintended features of the curriculum, such as gender or cultural bias.

Source: UNESCO-IBE, 2013.

…the need to experiment teachers professional development programs!

Wrap-up

The multi-dimensions needed by teachers to tackle climate change education



Pyörä et al. 2018

Founding members

With the support of