RESEARCH PROJECT

Title: Engaging and orienting the young in the complexity of climate change and sustainability to foster agency and deliberation in societally relevant choices

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State of art

Climate change (CC) is altering life on Earth with extreme rapidity. In the past decades, the Earth's global mean temperature has experienced an unprecedented rise. The last IPCC report signalled what was termed a "code red for humanity" by the UN's general secretary (McGrath 2021). Yet, as the IPCC warns us, the worst is still to come (IPCC 2022), meaning business-as-usual is an insufficient response. The general population seems increasingly aware of CC (Eurobarometer 2019; Leiserowitz et al. 2019). Groups such as Fridays for Future are spreading awareness and organising demonstrations worldwide to place pressure on political leaders to take immediate action. However, we face a twofold problem. First, false beliefs concerning CC are widespread, even among the young who are willing to act (Eurobarometer 2019, Leiserowitz et al. 2019). Such false beliefs may lead them to concentrate their efforts on ineffective actions. For example, they may focus on separating recyclable material from their waste and reducing their plastic consumption, which are hardly of any efficacy regarding CC. They may also engage in radical activism – such as throwing soup on famous paintings – that risks being counterproductive, though they intend to foster public support and political action (Patterson & Mann 2022). Such phenomena show a lack of orientation among young people, who often have trouble understanding how to become effective agents of change.

There is a lively debate among theorists about how to best conceive agency in the field of climate change. Some insist that individuals should work for and support political action, and thus take on mostly political (also called "collective") duties, rather than individual ones (Sinnott-Armstrong 2005; Cripps 2013). Others, including some economists, assert that individual action to reduce one's carbon footprint is crucial (Nolt 2011; Hourdequin 2010; Ricci & Banterle 2020; Stern 2020). In both cases, effective action has key requirements: it should meaningfully contribute to emissions reduction as well as favour a political response. Moreover, it should contribute to a process of transformation entailing complex changes at the personal, cultural, organisational, institutional, and system levels (O'Brien & Sygna 2013). People's widespread false beliefs should perhaps not come as a surprise. For nearly 60 years, UNESCO has been leading efforts to raise the public's scientific literacy. However, the improvement of science education in schools is still underrealised. Almost half of the national curricula worldwide do not refer explicitly to CC (UNESCO 2021), which gives a representative example of the delay formal education is creating in responding to this global emergency. The scenario we are seeing clashes with directions in the latest reports (OECD 2018; Bianchi et al. 2022), which state that schools should promote students' awareness of present and future issues, to equip them to deal with the complexity of real-life challenges they will face in this era of uncertainty.

The importance of incorporating social and transformative dimensions of science into school curricula has been widely investigated in science education in recent years (Sadler et al. 2017; Stuckey et al. 2013; Tasquier & Pongiglione 2017; Tasquier et al. 2022). However, the point is how to do this effectively since the complexity of the processes involved in CC and the difficulty of associating one's own actions with CC often lead to inaction. Educational systems are called to foster learners' ability to construct coherent pictures of the complexity of the present, which aligns with cultivating their improved scientific literacy and empowering them with the agency to be future-aware. According to GreenComp, "embracing complexity, envisioning futures, and acting" are fundamental areas of competence for dealing with CC and sustainability, to which systems and futures thinking and transformative agency greatly contribute (Bianchi et al. 2022).

Objectives

To face the changes and challenges to which our society is exposed, educational systems are called to develop learners' skills to construct coherent pictures of the complexity of the present. This will cultivate their scientific literacy and empower them to develop transformative agency, with which to participate in democratic debates on issues of public interest. Responsibility, which implies an understanding that actions have consequences and that people have the power to affect others, is at the core of a mature sense of agency (Leadbeater 2017). Based on that, the project aims to:

i)   analyse the interconnections of scientific knowledge, skills, and attitudes towards CC with scientific instruments can foster the agentic role of individuals in terms of their possibility to influence the collective dynamic and evolution of the system;

ii)   identify strategies, methodologies, tools, and space–time structures to equip students to critically engage with scientific knowledge, which will foster their decision-making and support them to become agents of change;

iii) produce results that will guide the design of effective teaching/learning experiences;

iv)   design educational experiences that incorporate insights, methodologies, and tools from three disciplines to promote new forms of literacies and skills that empower students to become agents of transformative change.

The aims will be articulated in the following expected results:

- Addressing the "knowledge–skill–attitude gap" related to agency by offering examples of how knowledge, skills, and attitude can be developed in science classes and in the space–time structure of schools
- Developing tools typical of science education to turn them into CC educational tools
- Innovating curricular science teaching so that it promotes agency and responsibility
- Providing guidelines for how inter/multi/transdisciplinary topics such as CC can be addressed in the school curricula
- Advancing the overarching disciplinary knowledge in the research area

In order to pursue the expected results, the project will be articulated in the following tasks:

Task 1 - Mapping the competence frameworks: analysis of the main frameworks and reports on CC and sustainability (OECD, GreenComp, etc.) will enable us to unpack the relationships between knowledge, skills, and attitudes. An important step in this analysis will be to organise a research workshop involving the EU JRC office to develop synergies at the EU level, the INDIRE group to develop synergies with the Italian Ministry of Education, and the local UNESCO chair in global citizens education to discuss innovative strategies for improving school curricula. The map created will produce design principles for teaching/learning experiences that can be integrated into school curricula.

Task 2 - Analysis of science education tools related to climate change and sustainability: narratives are a primary and crucial means of integrating factual scientific knowledge into real action (Tasquier et al. 2022). To elaborate on the transformative and agentic aspects enhanced by the use of narratives, this task will involve analysing existing tools based on scenario building, such as the SSPs Climate Scenarios (https://climatescenarios.org/primer/socioeconomic-development/), which represent five different narratives on how the world might evolve with different levels of mitigation achieved (O'Neil et al. 2017).

Task 3 - Analysis of school space–time structures to foster participation and agency: most teaching methods are transmissive and are not innovative or oriented towards organisational contexts capable

of supporting life skills training and thinking of the school as a complex learning environment for a place-responsive education (Schenetti 2022). In this task, an analysis of the main teaching methods adopted in secondary schools will be carried out to determine how we can promote students' active participation and enhance teachers' professional skills by rethinking school times and spaces.

Task 4 - Plan of teaching/learning experiences for implementation and draft design of case studies: a draft implementation plan will be producedby turning the research tools identified in previous tasks into educational activities. Draft case studies will be designed with tools for data collection able to capture agency in both individual and collective dynamics.

Task 5 – Dissemination and communication activities: contribute to the project dissemination and communication activities, submit an abstract to at least one conference, prepare at least two draft papers and submit at least one paper to a journal.

Task 6 – Management activities: contribute to the management of the project like, for example, participate in project meetings, writing bimonthly scientific reports, managing the datasets, etc.

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