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EU MISSIONS
RESTORE OUR OCEAN & WATERS

Integrating Citizen Science in Formal Education

POLICY BRIEF

April 2025

https://otters-eu.aua.am

OTTERS
Citizen Science for Water Stewardship

OTTERS: Citizen Science for Water Stewardship

OTTERS is a project co-funded by the EU Missions "Restore our Ocean and Waters" that aims to change hearts and minds through citizen science and promote societal transformation for sustainable marine and freshwater ecosystems.

Focusing on several dimensions of citizen science, the project aims to foster care for marine and freshwater ecosystems and encourage a sense of agency, leading to the improvement of ecosystems and human well-being.

The project is structured in several work packages focusing on:

- Establishing standardization of methods in citizen science, in line with policy and scientific objectives.
- Overcoming institutional and ethical challenges in citizen science.
- Deepening understanding of the effectiveness of citizen science campaigns in marine and freshwater domains.
- Cocreating "Spring to Sea" campaigns that promote cooperation and support among existing citizen science initiatives.
- Promoting capacity building and training in education (schools and universities)
- Cocreating a roadmap to integrate citizen science in formal education.

The project involves the following institutions:

*This Policy Brief in based on the **deliverable 4.1 – Roadmap towards integrating CS into school curricula and activities and creation of the OTTERS school hubs –** of the OTTERS project, which has received funding from the European Commission's Horizon Europe Coordination and Support Actions programme under grant agreement No. 101094041. However, the information and views here presented are entirely those of the authors and do not necessarily reflect the opinion of the European Commission*

Summary

Insights from 333 teachers reveal that although citizen science presents untapped potential for education, systemic barriers such as extensive curriculums, lack of time and lack of training might hinder its integration into the schools' activities. Results from a participatory bottom-up approach lead to relevant policy recommendations to advance citizen science as a powerful pedagogical approach.

Context and why it matters

Citizen science entails the active engagement of citizens in the field of education, bringing an immense value for society, fostering scientific literacy, building trust in science and leveraging the "power of people" in the generation of new scientific knowledge.

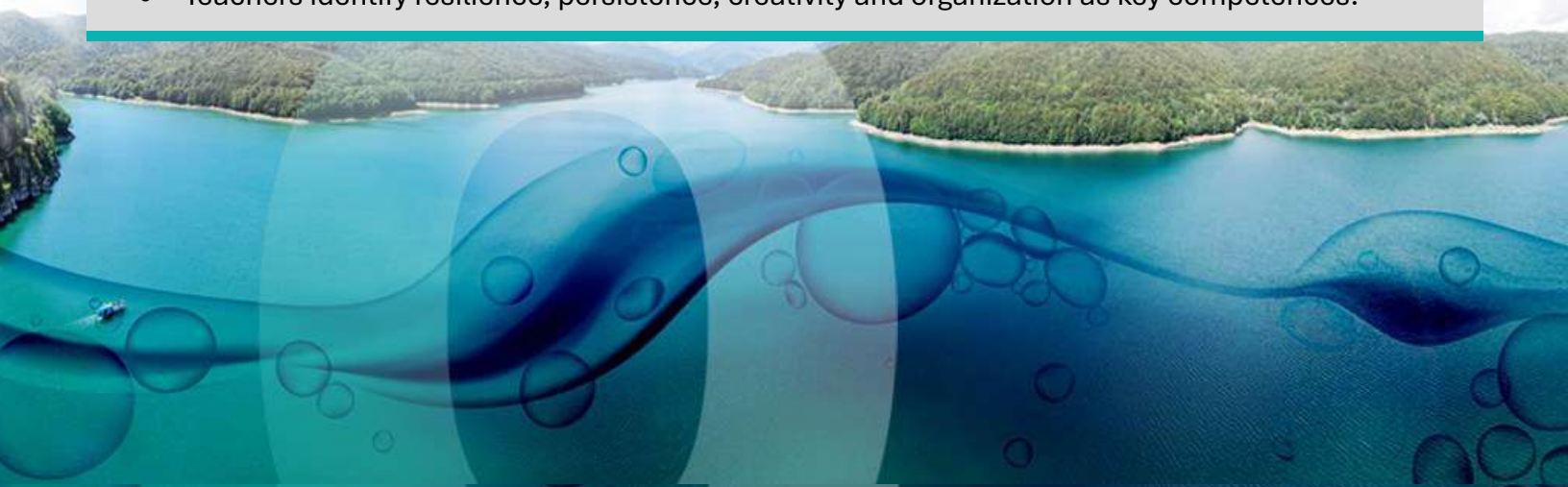
By engaging citizens directly with research and connecting them with real-life situations, it promotes agency and care for our planet.

Considering that students represent a significant proportion of society, their participation in citizen science can result in the fast advancement of scientific research. Furthermore, it enhances school education by promoting active learning, related to real-life situations and fosters the development of key competences such as critical thinking, systems thinking, collaboration, scientific reasoning, among others.

Methodological note: To develop a roadmap to integrate citizen science into formal education, a bottom-up, participatory approach was performed with 333 school teachers from Portugal, Greece, Armenia and Italy, from May 2024 to April 2025. A SCOT analysis was carried out, related to teachers' inner Strengths and Challenges and existing Opportunities and Threats related to the integration of citizen science in their practice. Key results can be seen in figures 1 to 3 and in table 1.

Key findings

- A large proportion of teachers are not familiar with the concept of citizen science.
- Teachers identify "lack of time and "extensiveness of the curriculums" as the main threats for the integration of citizen science in formal education.
- Teachers consider "the existence of a supportive ecosystem within the school" and "partnerships with local stakeholders" as the main opportunities to work with citizen science.
- Teachers identify curriculum flexibility and support from leadership as important factors when introducing citizen science in their practice.
- Teachers consider that lack of know-how and training can be hindering for the integration of citizen science in formal education.
- Teachers identify resilience, persistence, creativity and organization as key competences.



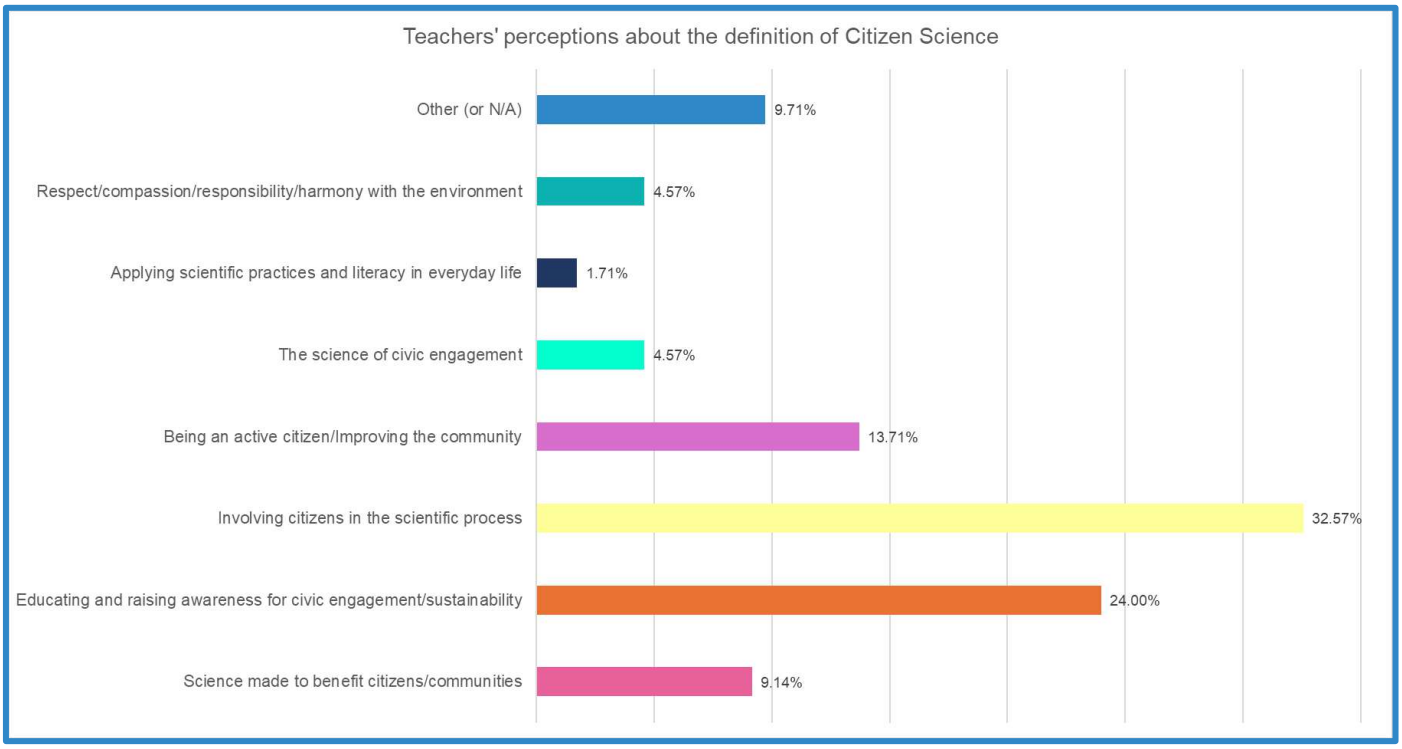


Figure 1. *Perceptions of 159 Portuguese teachers about citizen science.*

Table 1: Cross-border SCOT analysis results (174 teachers from Portugal, Armenia, Italy and Greece) derived from initial engagement activities

Strengths	**Portugal**	**Armenia**	**Greece**	**Italy**
Self-Confidence and motivation	•			
Competences: Resilience/ persistence/ creativity	•			
Caring for the environment / environmental awareness	•			•
Challenges	**Portugal**	**Armenia**	**Greece**	**Italy**
Insecurity / Fatigue		•		
Lack of time/ articulation with curriculum	•	•	•	•
Lack of know-how / skills / training	•	•	•	•
Ensuring validity and credibility of data		•		•
Opportunities	**Portugal**	**Armenia**	**Greece**	**Italy**
Collaboration with colleagues/ support from leadership	•	•	•	•
Alignment with the curriculum/curriculum flexibility	•	•	•	•
Training and professional development	•	•	•	
Existence of school clubs and projects where CS integrates	•	•		
Support from external partners / collaboration with other schools	•	•	•	•
Available resources (digital tools, labs, technical equipment, etc.)	•	•	•	
Threats	**Portugal**	**Armenia**	**Greece**	**Italy**
Lack of students' motivation and engagement	•	•	•	•
Lack of support from school leadership/external support/parents	•	•		•
Student assessment and size of classes	•		•	
Size of classes		•		
Lack of resources	•	•	•	•
Bureaucracy	•	•	•	•

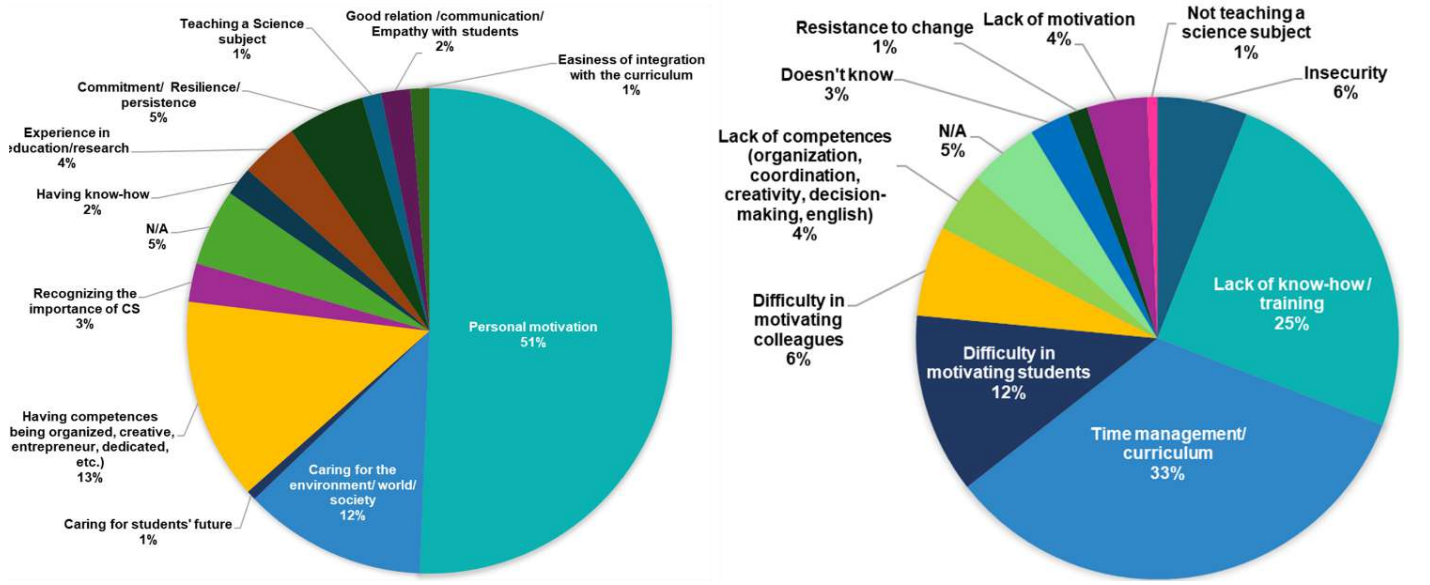


*Figure 2. SCOT Analysis results: Inner **Strengths** and existing **Challenges Threats** for the integration of citizen science in formal education as perceived by Portuguese teachers (quantitative analysis of combined results of Portuguese participants in engagement activities and teacher training course: 266 total)*

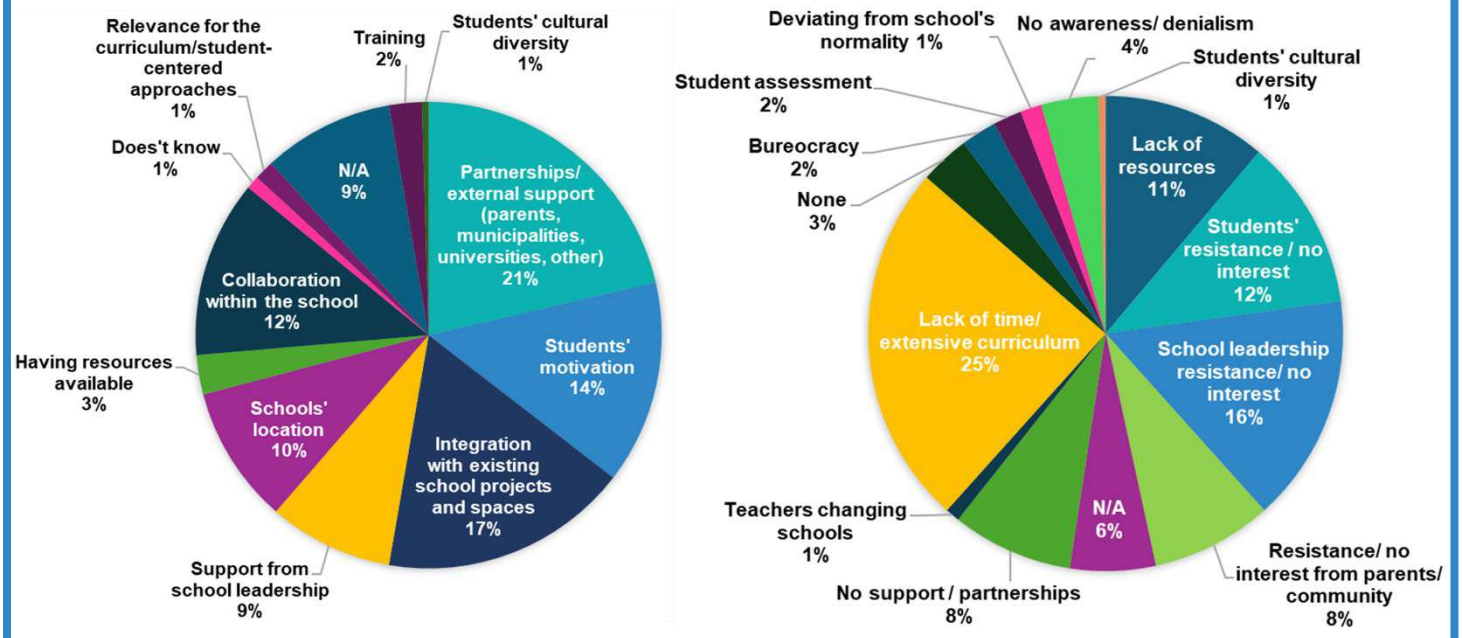


*Figure 3. SCOT Analysis results: Existing **Opportunities** and **Threats** for the integration of citizen science in formal education as perceived by Portuguese teachers (quantitative analysis of combined results of Portuguese participants in engagement activities and teacher training course: 266 total)*

A roadmap for change

Integrating citizen science into formal education requires a cross-sector approach involving policy makers, scientists, citizen scientist, national educational authorities, providers of initial and continuing education and training and school communities. Figure 4 demonstrates how they can work together to advance citizen science in formal education.

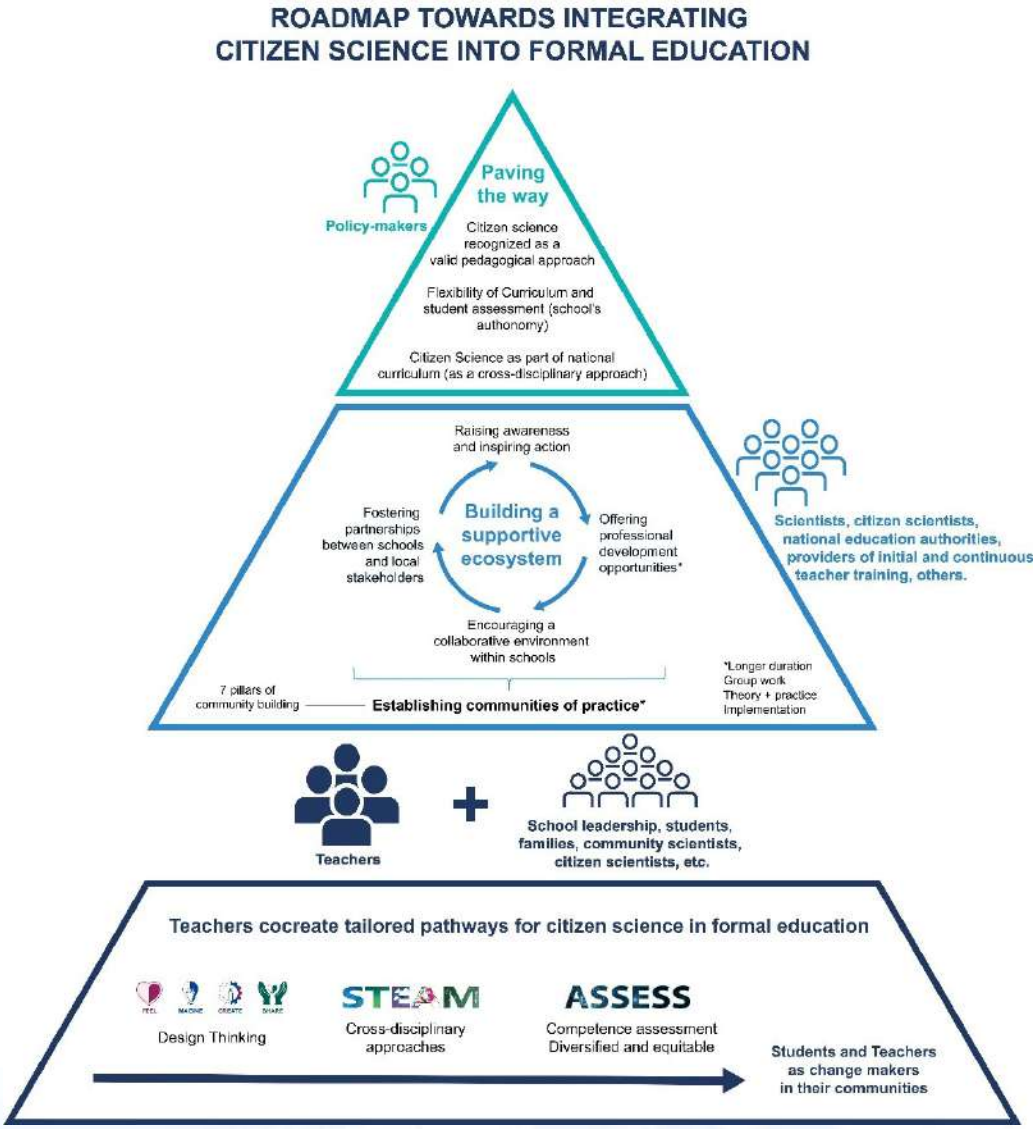


Figure 4. The OTTERS roadmap towards integrating citizen science in formal education (from deliverable 4.1)

Key Policy Recommendations:

- **Recognizing Citizen Science as a valid pedagogical approach**
  Citizen science is a powerful cross-disciplinary approach that motivates student-centered and active learning, and the development of digital, scientific, green as well as socio and emotional competences. Education authorities should recognize it as a valid pedagogical approach and integrate it as part of the national schools' curriculum in the context of cross-disciplinary learning, development of competences and transversal skills and active citizenship.

- **Ensuring curriculum flexibility**
  Curriculum rigidity leaves no room for innovation and creativity. National governments should enable curriculum flexibility and school autonomy to allow teachers to define the best learning pathway for students and cocreate their tailored citizen science approach. While integrating citizen science as part of a specific discipline's curriculum might require systemic curriculum reforms, enabling curriculum flexibility and integrating citizen science as an approach to cross-disciplinary learning can facilitate the process and ensure its applicability in all EU countries.

- **Student assessment flexibility and diversity**
  Standardized tests can hinder innovation and development in education and fail to assess student development. More robust measures should be developed to assess competences in contexts rich in human diversity. Using diverse assessment methods improves inclusiveness while privileging rubrics and other objective measures, ensures transparency in assessment criteria. Alignment with EU competence frameworks is recommended.

- **Encouraging teachers' professional development and lifelong learning**
  Professional development and teachers' lifelong learning culture should be a top priority in educational policies. These should address teachers' well-being and capacity building and promote the valuing of the teaching profession. Investment should be made in recognition mechanisms aligned with national and EU priorities. Accreditation of learning outcomes related to citizen science can be aligned with relevant frameworks such as DigiCompEdu, GreenComp, EntreComp and LifeComp.

- **Evaluation and impact assessment**
  Evaluation is key in ensuring the success of innovation as it allows for constant monitoring and improvement of educational. Evaluation measures should be put in place to allow evidence-based decision-making. Leveraging student assessment for this purpose should be considered. AI enhanced digital platforms to centralize student assessment data for research purposes can be a long-term goal to support evidence-based policies in education.

- **Fostering the Whole School Approach**
  Schools can act as strategic actors in community development. By engaging students with real-life situations, citizen science encourages active citizenship and the scientific development of surrounding communities. National governments should support schools in establishing an open schooling approach and equitably integrate the whole school community and its surrounding as actors in students learning.

Professional development programs should follow strict criteria for success:

- **Organised during a longer period of time** (as a sequence of sessions, instead of short stand-alone courses): To allow enough processing time and enable deep exploration of the citizen science, combining theory and practice.

- **Be coherent with the school's ongoing work:** In the SCOT analysis, 16% of teachers considered that having existing ongoing projects that could be integrated with citizen science was an opportunity. Professional development courses should consider the existing projects and resources and be tailored to each school context.

- **Be clear on the skills and knowledge they are meant to develop**: Being clear from the start about which competences should be developed and how teachers can assess their development, can improve the learning outcomes.

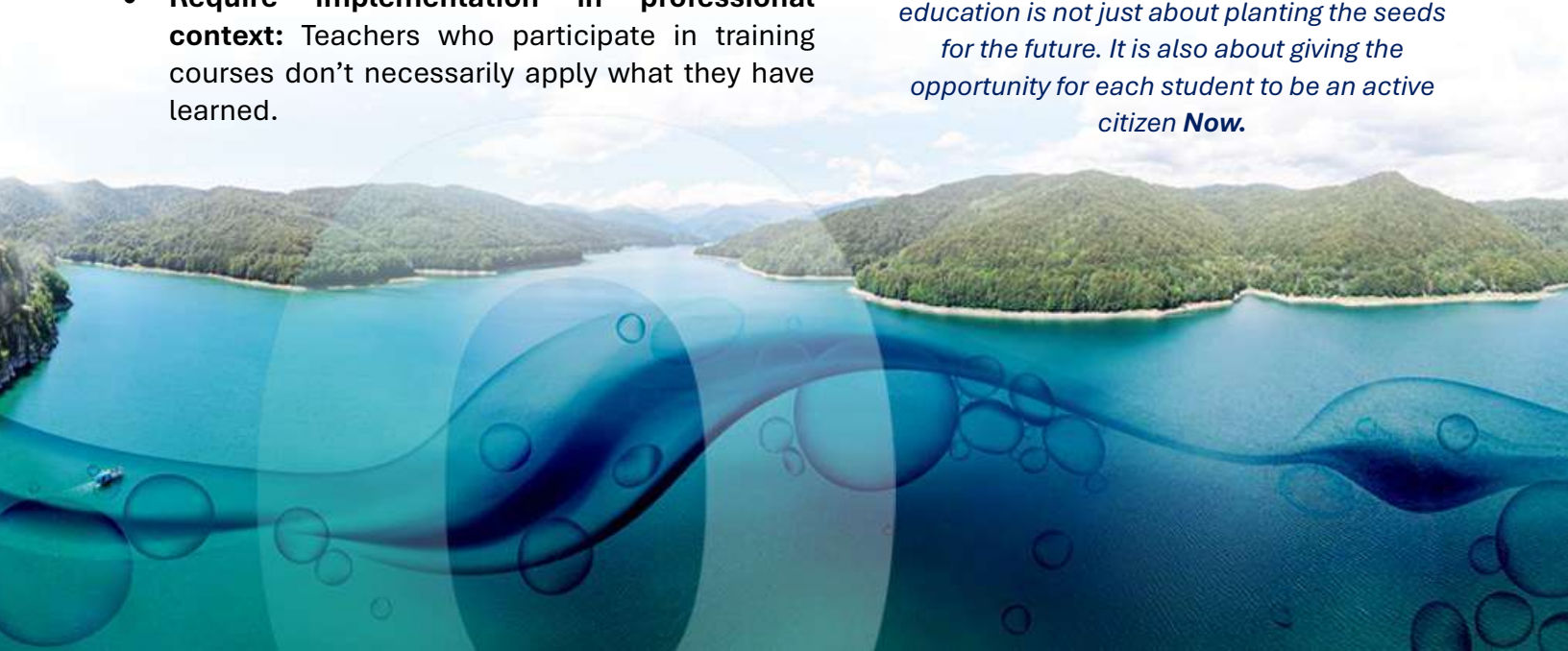
- **Require collaboration among teachers:** To develop collaboration skills and promote a collaborative ecosystem within schools. Teams should be interdisciplinary and have the possibility of carrying out all the required work together. By working together teachers also feel more supported and motivated.

- **Require implementation in professional context:** Teachers who participate in training courses don't necessarily apply what they have learned.

By including practical implementation as requirement teachers are encouraged to go out of their comfort zones and put their learning into practice. By implementing with students, teachers also can see the benefits of citizen science for their practice, which can lead to a continued implementation.

- **Offer regular support:** Offering teachers regular support is key in ensuring they feel comfortable enough to go out of their comfort zones and put their new knowledge and skills into practice. When requiring teachers to implement citizen science in their professional context, offering support is a necessary factor to ensure that they successfully achieve it.

*On this journey, we must be reminded that education is not just about planting the seeds for the future. It is also about giving the opportunity for each student to be an active citizen **Now.***



Detailed information about the study and policy recommendations can be found in Deliverable 4.1 of the OTTERS project: https://otters-eu.aua.am/

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By integrating citizen science in national curricula, we ensure a core step towards educating future-ready, literate and empowered citizens"

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