

# Development of an Integrated STEM Teacher Identity for Climate Education: The STEM-id project

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**Abstract.** The STEM-id project responds to the critical need for an integrated STEM teaching approach in the wake of accelerating climate change. In a first phase eight qualified science teachers (4 physics teachers and 4 primary teachers) collaborate with science education and climate science researchers to create integrated STEM modules on climate change. In a second phase, 24 in-service teachers will use these materials with the support of mentors to promote STEM teacher identity through group mentoring. STEM-id aims to provide insights into effective contexts and experiences for STEM teaching identity development, focusing on climate education.

## Introduction

Climate change constitutes an inherently interdisciplinary field, in which many disciplines interact, involves a plethora of societal aspects and is related to many real-world problems and debates that currently take place. Therefore its educational negotiation requires an integrated STEM teaching approach where various S-T-E-M disciplines intersect, in order to equip citizens with i) knowledge on climate change causes, consequences, and mitigation-adaptation measures, and ii) sustainability competences. However recent research reveals that both primary and secondary education science teachers face difficulties in embracing an integrated STEM teaching approach, therefore suitable professional development programs for science teachers need to be designed. For science teachers to enact effectively an integrated STEM teaching approach they have to transcend their disciplinary teacher identity and align it with a more integrated STEM teacher identity. Such teacher identity development occurs through participation in learning communities, through the engagement with specific professional activities and during the interpretation, narration, and thus recognition of that participation by self and others [1]. Based on the aforementioned issues, STEM-id project aspires to support the reconstruction of primary and secondary education science teachers' identities towards integrated STEM teacher identities for climate change. Particularly STEM-id aims to equip in an organized manner, in-service primary and secondary education teachers with both the necessary subject matter knowledge, teaching methods repertoire and structured reflection opportunities to develop their STEM teacher identities and effectively negotiate climate change topics and their societal issues.

## Theoretical Framework and Research Questions

A recently adopted lens for studying teacher development is the construct of teacher identity [2]. Science teacher identity involves the ways teachers position and view themselves regarding teaching, learning, science, as well as the way others recognize them. The conceptualization of interdisciplinary STEM approach calls on teachers to be more than deliverers of science and

mathematics content; they are called to build bridges between STEM disciplines and real-world challenges. This positioning creates identity tensions for science teachers who are expected to fill wide-range scientific roles while teaching multiple subject areas with deep STEM content knowledge expectations [3]. The main research question that drives STEM-id project's methodology is: *How do in-service teachers develop an integrated STEM teacher identity in the context of teaching climate change competences?*

## Methods

The STEM-id project is structured in three consecutive phases. The first phase begins with the formulation of a Community of Learners (CoL) consisting of STEM education researchers and lecturers, climate science researchers and eight skilled in-service science teachers. Aim of this phase is the formulation of a common scientific, theoretical and methodological ground regarding the key elements of climate science and interdisciplinary STEM teaching which takes place through face-to-face and on-line workshops. In a second phase, the CoL will design and develop an integrated STEM module on climate change which will also be piloted by the in-service science teachers. In the third phase, each skilled teacher, from the second phase, will act as a mentor in a group mentoring format and will introduce 3 other teachers into the key elements of the developed integrated STEM module within new CoLs. Particularly the materials developed in the previous phase will constitute the subject and means of STEM teacher identity development for primary and secondary education teachers. After the familiarization with the STEM module, the participating in-service teachers will be called to implement the integrated STEM module in their classrooms.

## Expected results & Conclusion

By using theory driven development approaches and a well-targeted evaluation system, STEM-id project will generate a better understanding on the professional development of in-service science teachers regarding integrated STEM teaching on Climate Change from an identity lens. As it examines the development of science teachers' integrated STEM teacher identity, it will give very useful insights regarding the characteristics of the contexts, the resources and the experiences that are suitable for enhancing such a development. Specifically, through the continuous assessment of all the stages of the STEM-id project, conclusions will be drawn about (i) the convergence field that can be achieved among STEM education and the framework for sustainability competences in the context of the interdisciplinary topic of climate science, (ii) the characteristics of the educational curriculum materials and the mentoring process as resources for STEM teaching identity development, (iii) the different routes towards integrated STEM teacher identity development in-service teachers follow.

## References

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