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Editorial: Designing for contemporary relevance and authenticity—Identity as a lens for reimagining science activities at the interface of science education and communication

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Editorial on the Research Topic
Designing for contemporary relevance and authenticity—Identity as a lens for reimagining science activities at the interface of science education and communication

In today's fast-paced world, science plays an increasingly vital role in shaping our understanding of the universe, addressing complex global challenges, and driving technological advancements. For learners of all ages, developing scientific literacy is not merely a matter of academic importance; it is a fundamental necessity to navigate the complexities of contemporary life (e.g., Ke et al., 2021). To achieve this goal, it is imperative to provide science education that is both relevant and authentic. This Research Topic contributes to this endeavor.

Traditional science education often falls short of meeting the diverse needs and aspirations of learners. To bridge this gap effectively, we consider the role of identity, particularly STEM (Science, Technology, Engineering, and Mathematics) identity (Carlone and Johnson, 2007), as a powerful lens for the design of inclusive and engaging science learning experiences. By prioritizing STEM identity as a central mediator of learning, we aim to support the creation of science activities that resonate with the unique backgrounds, interests, and experiences of learners, fostering a deeper connection to and understanding of contemporary scientific concepts (e.g., Ambrosino and Rivera, 2023). Through this multifaceted lens, the contributors to this Research Topic work to make science learning more accessible, relevant, and authentic in the context of classrooms, museums, and other informal settings.

Four papers focus on the classroom setting; De Zuani Cassina et al. identify a gap between formal scientific education and real-world issues. Their project encompasses secondary school activities focusing on current challenges to increase students' engagement in science education through interdisciplinarity, new languages, and future-oriented

education. They discuss two activities, "Mocku for change" and "Physics of clouds", utilizing creative writing and mockumentary to help students emotionally connect with topics like sustainability and complexity. Taconis and Bekker explore the conceptual potential of Challenge-Based Learning (CBL) in shaping STEM identity development in engineering classrooms. By refining the definition of CBL and examining analogous education approaches, the authors suggest that CBL can enhance STEM identities by boosting motivation, increasing perceived competence, and offering an enjoyable, experiential approach to STEM learning. Vamvakas et al. discuss efforts in Australia to represent scientists and their research practices as a context for learning in classrooms. They present results of a survey of science teachers that highlights their positive attitudes toward representing contemporary science, yet identify structural barriers limiting implementation. They describe the development of online resources that connect students with scientists and their work demonstrates enhanced engagement, potentially fostering identity development and agency in students. Grimm et al. discuss what classrooms might look like in the near future and explore the concept of responsible learning analytics to address STEM identity development in underserved students. Their framework not only addresses the potential inequalities associated with learning analytics but also offers six guiding suppositions for the use and future research of learning analytics in STEM education. Their research informs policy decisions regarding fair opportunities for STEM identity development in all students.

Two papers are situated within the museum context, focusing in particular on the intersection of science education and science communication. Kellberg et al. investigate the impact of visiting a socio-scientific museum exhibition on energy transition on students' willingness to act pro-environmentally. The study emphasizes the significance of comprehending socio-cultural identities and personal values, and it suggests that socio-scientific museum exhibitions can complement formal education by offering opportunities for identity development and encouraging pro-environmental actions on a global scale. Kaplan et al. outline the conceptual framework, methodology, and early findings from research aimed at informing the design of an exhibition at the Smithsonian National Museum of American History focused on the history of invention and innovation in sports. Their research draws on the Dynamic Systems Model of Role Identity and design principles for identity exploration. It discusses the challenges of a situative identity perspective and presents initial findings from sessions with underrepresented groups, informing the exhibition's design.

Three papers step outside of the museum context to focus on other informal learning environments. The perspective article by Rahm and Gonsalves explores the power of narratives as it considers how digital storytelling can foster affective placemaking in an after-school "Convoclub" for girls. The study draws on conversations with a program coordinator which inform the evolution of club activities and how these activities shape informal science learning environments from a posthumanist perspective. Cisneros et al. also explore the power of narratives. They conceptually introduce Eco-Digital Storytelling (EDS) as an innovative informal educational approach designed to enhance STEM identity and career interest, particularly among teenagers from historically excluded groups in STEM fields. By placing emphasis on community-based action and cultural learning pathways, EDS promotes inclusivity and sustainability within STEM fields and contributes to the creation of more promising and sustainable futures. Although informal STEM learning opportunities have the potential to foster positive STEM identities in learners, they often fail to reach historically excluded groups, perpetuating educational disparities. Çolakoğlu et al. review 13 publications and identify key concepts such as competence, recognition, and agency that influence STEM identity development in underserved youth. They also emphasize the importance of supportive relationships and personal connections, and they call for the design of out-of-school programs tailored to underserved students and recommend changes in traditional STEM education patterns to empower these learners in constructing their own STEM identities as self-directed individuals.

The studies in this Research Topic reinforce the imperative of prioritizing STEM identity development in contemporary science learning. From classroom innovations to CBL's impact and narratives in supporting identity development, each contribution amplifies the call for inclusive, relevant, and authentic science education. We believe that these papers both advance the field and provide critical insight into supporting learners, especially underserved students, to engage in self-directed STEM learning and prepare to participate in a dynamically evolving world.

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