



## EDITORIAL

# Advancing Inclusive, Expressive, and Transformative Pathways in STEM Education

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The December 2025 issue of the Journal of Research in STEM Education brings together four complementary studies that collectively reflect the evolving priorities of contemporary STEM education research. While situated in diverse contexts and employing varied methodological approaches, the contributions in this issue converge around a shared concern: how STEM education can be designed to be more inclusive, expressive, and transformative for learners and teachers alike. Taken together, these studies extend current discussions on creativity, communication, teacher professional learning, and equity, offering timely insights for both researchers and practitioners.

The issue opens with Zhou's conceptual contribution, 'Ah!-HaHa!-Aha!': A Tool of Creativity Development in STEM Education, which foregrounds the often-underexamined role of emotion in STEM learning and teaching. Moving beyond cognitive-only accounts of creativity, Zhou introduces a pedagogical tool that integrates curiosity ("Ah!"), joy and playfulness ("HaHa!"), and insight ("Aha!") into a coherent framework for fostering creative climates in STEM classrooms. By synthesizing inquiry-based learning, problem-based learning, playful learning, and teaching for deeper learning, the proposed model positions everyday experiences as fertile ground for creativity development. This work is particularly significant in its insistence that creativity is not an exceptional trait reserved for a few, but a situated, emotion-mediated process accessible across educational levels. As such, it sets a conceptual foundation for rethinking STEM education as a deeply human and affective enterprise.

Building on this emphasis on expression and meaning-making, Wang, Jacobsen, and Jackson offer an empirical investigation into science communication through their study A Text Analytical Study of STEM Inquiries in Grad Slam Competition. Employing text analytics and

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natural language processing, the authors examine transcripts of graduate students' three-minute research presentations to uncover patterns in STEM inquiry and communication. Their findings highlight how structured communication training, such as Grad Slam workshops, can strengthen both disciplinary understanding and confidence in public science communication—particularly within a Hispanic Serving Institution context. Methodologically, this study demonstrates the growing potential of computational approaches for analyzing rich qualitative data at scale. Substantively, it underscores communication as a core competency in STEM education, aligning with broader calls to prepare scientists and engineers who can effectively engage diverse audiences.

The third contribution, *STEM Research Experiences for Teachers: A Feasibility Study of the Sustainable Energy for Empowering Rural Communities Program*, by Simpson and colleagues, shifts the focus to teacher professional development and capacity building. Through a mixed-methods evaluation of a research experience program for rural teachers in the United States, the study documents how authentic engagement with sustainable energy research can enhance teachers' confidence, disciplinary knowledge, and classroom practice. Importantly, the authors situate their work within the specific challenges and strengths of rural educational contexts, emphasizing the value of place-based and context-sensitive professional learning models. The findings reinforce the argument that effective STEM reform depends not only on curricular innovation, but also on sustained investment in teachers as learners, researchers, and agents of change.

The issue concludes with Goreth and Lutz's large-scale quantitative study, *Gender and Diversity Awareness among STEM-Teachers: Mono Makes the Difference*, which directly addresses questions of equity and inclusion in STEM education. Drawing on survey data from over 500 teachers, the authors examine how gender, subject affiliation, and experience in mono-educational settings relate to teachers' attitudes and knowledge regarding gender and diversity. The findings reveal nuanced differences that have important implications for teacher education and professional development, particularly in relation to gender-sensitive pedagogical practices. By foregrounding teachers' beliefs and experiences, this study contributes critical empirical evidence to ongoing debates about how STEM education can challenge—rather than reproduce—structural inequalities.

Collectively, the four articles in this issue illustrate the multidimensional nature of STEM education research today. Creativity is framed not merely as cognitive problem solving, but as an emotional and social process; communication is positioned as a central outcome of STEM learning; teacher education is examined as a key lever for sustainable change; and equity is treated as an integral, rather than peripheral, concern. The methodological diversity represented—from conceptual modeling and text analytics to mixed-methods program evaluation and large-scale survey research—further reflects the field's increasing sophistication and openness to interdisciplinary approaches.

As STEM education continues to respond to global challenges such as sustainability, technological transformation, and social inequity, the studies presented in this issue offer both theoretical guidance and empirical grounding. We hope that readers will find in these contributions not only rigorous scholarship, but also inspiration for designing STEM learning environments that are inclusive, expressive, and transformative.