The 9th ICMI-East Asia Regional Conference on Mathematics Education (EARCOME 9)

A Call for Proposals

Topic Study Group (TSG) 10. The Essence of STE(A)M Education

Overview

In today's rapidly evolving world, STE(A)M education plays a crucial role in fostering students' initiative and critical thinking, providing them with opportunities to develop the knowledge and experiences necessary to thrive after their K-12 education and navigate complex global challenges. While the importance of STE(A)M education has been well-documented in research communities, practical classroom implementations have not been widely adopted worldwide. National and global perspectives on the STE(A)M experiences of historically marginalized students reveal significant inequities (Hammerness et al., 2024). These students often have fewer in-class and out-of-school STE(A)M opportunities, reducing their likelihood of pursuing related majors. This opportunity gap creates additional challenges in achieving a more equitable and diverse workforce and well-being for all (Fry et al, 2021). Not only do marginalized students face challenges, but STE(A)M education as a whole encounters obstacles. Many STE(A)M curricula fail to resonate with all students due to cultural disconnects between the curriculum content and students' lived experiences (Ludwig et al., 2024). Additionally, the effectiveness of STE(A)M education is hindered by inadequate professional development and teacher preparation (Thomas & Larwin, 2023).

This Topic Study Group 10 seeks contribution on these urgent needs. We welcome research related to integrated mathematics teaching and learning in connections with science, technology, engineering, and/or art. Submissions of proposals should address research, theoretical perspectives, methodical lenses, systemic reviews, innovative tools, and/or teaching practices related to STE(A)M education. These can include:

- **Innovative and Inclusive Approaches to STE(A)M Education** – studies on mathematical modeling, project-based learning, ethnomathematics, critical mathematics that integrate STE(A)M subjects

- **Efforts to Address Opportunities Gaps in STE(A)M Education** – teaching and learning of STE(A)M that integrate equity and social justice issues

- **Interdisciplinary Collaboration in STE(A)M Education** – Studies on how teachers and institutions facilitate collaboration across STE(A)M disciplines

- **Cognitive and Socio-Emotional Development in STE(A)M Learning** – Research on how STE(A)M education impacts students' cognitive development and socio-emotional skills, including creativity, resilience, and critical thinking

- **STE(A)M Education in Non-Formal or Informal Learning Environments** – Exploration of how STE(A)M concepts are taught outside traditional classrooms, such as in museums, science centers, afterschool programs, and community workshops

- **Teacher Professional Development and Training Programs in STE(A)M** – Studies or evaluations of effective professional development and teacher preparation programs that support teachers in learning about and implementing integrated STE(A)M curricula

- **Digital Transformation and Technology-Enhanced Learning in STE(A)M** – Investigating how digital tools, AI, or immersive technologies (VR/AR) are reshaping STE(A)M education

- **STE(A)M Education Policies** – Examination of local, national, or international policies around STE(A)M and their impact on practices

- **Assessment Practices in Integrated STE(A)M Learning** – Innovative approaches to assessing student progress and competencies within interdisciplinary STE(A)M projects

- **Parental and Community Engagement in STE(A)M Learning** – Research on family or community involvement in STE(A)M education

We welcome any of these topics that contribute to innovative and inclusive research directions in STE(A)M education.

References

Fry, R., Kennedy, B., & Funk, C. (2021, April 1). *STEM jobs see uneven progress in increasing gender, racial and ethnic diversity*. Pew Research Center. https://www.pewresearch.org/science/2021/04/01/stem-jobs-see-uneven-progress-in-increasing-gender-racial-and-ethnic-diversity/

Hammerness, K., Gupta, P., Chaffee, R., Bjorklund Jr, P., MacPherson, A., Abouelkheir, M., Lagodich, L., Podkul, T., Princiotta, D., Anderson, K., Adams, J. D. & Daly, A. J. (2024). From opportunity gap to opportunity yield: The benefits of out-of-school authentic mentored research for youth from historically marginalized communities in STEM. *Journal of Applied Developmental Psychology*, *94*, 101694. https://doi.org/10.1016/j.appdev.2024.101694

Ludwig, C.M., Howsmon, R.A., & Stromholt, S. *et al.* (2024). Consequential insights for advancing informal STEM learning and outcomes for students from historically marginalized communities. *Humanities and Social Sciences Communations, 11*(351). https://doi.org/10.1057/s41599-024-02797-w

Thomas, D.R., & Larwin, K.H. (2023). A meta-analytic investigation of the impact of middle school STEM education: where are all the students of color?. *International Journal of STEM Education*, *10*(43). https://doi.org/10.1186/s40594-023-00425-8

Timeline

- TSG full paper submission: February 1, 2025
- Notification of acceptance & Feedback to authors: March 31, 2025
- Revision deadline: April 30, 2025

How to make a submission to this Topic Study Group

- Topic Study Groups should be no more than 4 pages.
- All abstracts or papers should use ***the template*** for EARCOME 9.

Please visit the conference website, which provides ***the template*** and additional guidance on the steps for submission: https://www.earcome9.org/abstract/01.html?sMenu=01

For more information about the conference, please visit https://www.earcome9.org.

For any questions about this TSG, please contact the chair or co-chair using the email address provided below.

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