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EDITED AND REVIEWED BY  
Lianghuo Fan,  
University of Macau, Macao SAR, China

\*CORRESPONDENCE  
Carola Manolino  
✉ carola.manolino@unito.it

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# Editorial: Global lesson study policy, practice, and research for advancing teacher and student learning in STEM

Karie Brown<sup>1</sup>, Roberto Capone<sup>2</sup>, Sharon Dotger<sup>3</sup>,  
Carola Manolino<sup>4\*</sup> and Micaela Martins<sup>5</sup>

<sup>1</sup>Early Childhood and Elementary Education, Georgia State University, Atlanta, GA, United States, <sup>2</sup>Department of Mathematics, University of Bari Aldo Moro, Bari, Italy, <sup>3</sup>School of Education, Syracuse University, Syracuse, NY, United States, <sup>4</sup>Department of Social and Human Science, Università della Valle d'Aosta, Aosta, Italy, <sup>5</sup>Institute of Education, University of Lisbon, Lisboa, Portugal

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## Editorial on the Research Topic

[Global lesson study policy, practice, and research for advancing teacher and student learning in STEM](#)

Last year, we celebrated the 25th anniversary of *The Teaching Gap* (Stigler and Hiebert, 1999). In this Research Topic, we reflect on the global impact of Lesson Study as a professional development approach for teacher learning. Over the past decades, Lesson Study has expanded beyond its origins in Japan and has been adopted in diverse educational settings worldwide. This Research Topic of *Frontiers in Education (STEM Education)* brings together cutting-edge research that examines the policy, practice, and research dimensions of Lesson Study, with a particular emphasis on STEM education.

Lesson Study fosters collaborative and reflective teaching practices centered on student learning. After 25 years, it remains a vital method to support pre-service teacher education (e.g., Gomes et al., 2022; Helgevd and Wilkins, 2019), in-service teacher professional development (e.g., Andriano and Manolino, 2023; Dotger and Burgess, 2022), and team collaboration of teacher learning with mixed teaching experiences (Coenders and Verhoef, 2019). While numerous studies have explored Lesson and Learning Study in STEM education across the globe (e.g., Arzarello et al., 2022; Brown-Tess, 2021; Clivaz and Miyakawa, 2020; Groves et al., 2016; Huang and Shimizu, 2016), the adoption of this professional development process differs from the ways it is experienced in Japan. Despite its widespread use, variations in implementation have prompted discussions on its fidelity and efficacy across cultural and institutional contexts (Brown, 2024; Fujii, 2018; Capone et al., 2024; Ponte et al., 2018). A critical aspect is how Lesson Study interacts with diverse educational cultures. Research highlights the crucial role of cultural influences in shaping teacher reflection and instructional change, underscoring their significance in mathematics teacher education (Manolino, 2024). This perspective reinforces the need to contextualize Lesson Study within specific educational traditions to ensure its meaningful and sustainable application. This Research Topic presents a collection of high-quality studies that contribute to the discourse on Lesson Study, emphasizing its impact on teacher professional development, student learning outcomes, and pedagogical innovation in STEM education.

## Contributions to the Research Topic

This Research Topic features eight peer-reviewed articles, each addressing critical aspects of Lesson Study in STEM education. The studies span diverse geographical contexts and methodological approaches, offering valuable insights into how Lesson Study is shaping teaching and learning worldwide.

- **Intercultural perspectives in lesson study:** Bianco and Di Paola explore the adaptation of Lesson Study in a multicultural and multilingual context within Italian schools. Their study introduces a preliminary phase—Lesson Plan Design—as an essential step in online Lesson Study cycles, demonstrating how cultural considerations influence the structure and content of lesson plans.
- **Gender and equity in STEM education:** The action-research study “*Am I prepared for calculus?*” by Waheed et al. examines the self-evaluations of female students in Saudi Arabia. The findings underscore the impact of prior experiences and attitudes toward mathematics on current performance, informing instructional strategies to better support STEM female students.
- **Online vs. in-person capstone projects:** The study “*Evolving engineering education: online vs. in-person capstone projects compared (EEE-OIPC)*” by Znidi et al. assesses the effectiveness of different instructional modalities in STEM education. Findings suggest that while online settings facilitate mentorship, face-to-face environments enhance teamwork and collaboration, pointing toward hybrid models for optimal student learning outcomes.
- **The role of teacher beliefs in lesson study:** The study conducted in Chile by Caballero et al. “*The impact of observers’ beliefs on the perceived contribution of a research lesson*” investigates how teachers’ beliefs influence their perceptions of Lesson Study’s impact on instructional strategies and student assessment. The findings highlight the need for differentiated Lesson Study models tailored to teachers with varying pedagogical orientations.
- **Maker mindsets and lesson study:** Another contribution “*Unveiling maker mindsets: a journey of formation and transformation through design thinking-making pedagogy within a lesson study context*” by Li et al. examines the integration of Maker Education with Design Thinking-making pedagogy within a Lesson Study cycle. The research identifies key factors—individual, social, and pedagogical—that influence the development of students’ Maker Mindsets, emphasizing the role of structured and authentic learning experiences.
- **Teacher community development through lesson study:** The study “*From beginning to mature investigating the development of teacher community through Lesson Study*” by Ni Shuilleabhain et al., investigates how multiple Lesson Study cycles contribute to the evolution of professional teacher communities. Findings suggest that Lesson Study fosters communal responsibility and enhances collaborative reflection, with implications for facilitators aiming to strengthen teacher networks.

- **Reflective competence and lesson study:** the study from Argentina “*Advancing teacher reflective competence: integrating lesson study and didactic suitability criteria in training*” by Hummes and Seckel, explores how integrating Lesson Study with Didactic Suitability Criteria enhances teachers’ reflective skills. The research demonstrates significant improvements in instructional reflection, supporting the case for embedding Lesson Study in teacher training programs.
- **Problem-solving pedagogies in mathematics:** The study “*Using lesson study to help mathematics teachers enhance students’ problem-solving skills with teaching through problem solving*” by Roorda et al., investigates the Teaching Through Problem-Solving (TTP) approach within a Lesson Study framework. The findings reveal that Lesson Study provides teachers with effective tools for integrating problem-solving into mathematics instruction, although additional support is needed for certain pedagogical challenges.

## Implications for future research and practice

The studies presented in this Research Topic collectively underscore the transformative potential of Lesson Study in STEM education. Key themes emerge, including the role of cultural contexts in shaping Lesson Study practices, the impact of teacher beliefs and professional communities, and the integration of digital and interdisciplinary approaches.

Future research should continue exploring how Lesson Study can be adapted to various educational settings while maintaining its core principles of collaborative inquiry and student-centered learning. Additionally, further investigation into the long-term impact of Lesson Study on teacher professional development and student outcomes is warranted. The integration of emerging technologies and online collaboration tools also presents new opportunities for scaling Lesson Study in global education contexts.

As the field moves forward, it is essential to maintain a dialogue between researchers, educators, and policymakers to ensure that Lesson Study continues to evolve as an effective, evidence-based approach to advancing STEM education. We hope that this Research Topic provides valuable insights and inspires further innovations in teaching and learning through Lesson Study.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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