

FAILURE TO TEACH/LEARN MATHEMATICS: CONCEPTUAL, DIAGNOSTIC, AND TECHNOLOGICAL PERSPECTIVES

Einat Heyd-Metzuyanim, Anna Baccaglini-Frank, Brent Davis, Mellony Graven,
Esther Levenson, & Michal Tabach

Technion – Israel Institute of Technology, Pisa University, University of Calgary,
Rhodes University, Tel-Aviv University.

Failure to Teach/Learn Mathematics (FTLM) is a persistent challenge spanning cognitive, affective, and social-institutional dimensions. This Working Group (WG) aims to advance the theorization of FTLM by integrating perspectives from commognition, complexity theory, and technology-based interventions. We will explore nested failure systems and how technology can support productive engagement in mathematics learning. The WG will engage PME participants through empirical data, theoretical conceptualizations, and collaborative discussions.

Failure to Teach/Learn Mathematics (FTLM) is a complex phenomenon that spans multiple dimensions—cognitive, affective, interactional and social-institutional. Traditional perspectives on mathematics learning difficulties often focus on the individual, cognitive domain (e.g. Geary, 2011), yet recent research highlights the necessity of integrating broader frameworks that consider cognitive, emotional and social dimensions as functioning within nested complex dynamic systems (Heyd-Metzuyanim, accepted). This WG aims to advance the theorization of FTLM by integrating perspectives from commognition (Sfard, 2008), complexity theory (Davis & Sumara, 2006), and technology-based interventions (Baccaglini-Frank, 2021).

A key focus will be on understanding FTLM as a multi-layered phenomenon, operating within nested systems of failure that include the individual, classroom practices, and broader institutional and socio-cultural structures. We will explore:

1. How different theoretical perspectives conceptualize FTLM and its development over time.
2. The role of diagnostic tools in identifying FTLM and the extent to which they capture its complexity.
3. How technology-mediated interventions can address FTLM and support shifts towards more productive engagement with mathematics.

FORMAT AND STRUCTURE

Session 1: Conceptualizing Failure to Learn Mathematics

Introduction (20-30 min): Overview of theoretical perspectives: individual, affective and social aspects of FTLM. Introducing complexity theory and commognition as

means for conceptualizing FTLM as a complex dynamic system, drawing on several case studies.

Data Engagement (40 min): Participants will analyze video excerpts and transcripts from at least two research groups and discuss instances of FTLM from different theoretical perspectives.

Discussion (20-30 min): Comparison of interpretations across groups and reflections on how different theoretical lenses highlight distinct aspects of FTLM.

Session 2: Diagnostics and Interventions

Introduction (25 min): The role of technology in addressing FTLM at different levels of nested failure systems. Presentation of diagnostic tools and intervention strategies, linking them to empirical data.

Data Engagement (40 min): Participants will work in self-selected sub-groups to analyze diagnostic tools and intervention strategies applied to different cases. They will be invited to share personal research insights around diagnostical tools and interventions targeting FTLM. The WG leaders will facilitate discussions, ensuring that contributions are aligned with the overall goals.

Discussion (25 min): Discussion of findings and potential for methodological advancements. Consideration of implications of the various theoretical viewpoints presented for designing more effective interventions. The sessions will conclude with a synthesis of insights and suggestions for continued collaboration beyond PME.

EXPECTED OUTCOMES

This WG will refine theoretical perspectives on FTLM, identify limitations in current approaches, and propose directions for future research. Participants will gain insights into integrating technology and theory to better address FTLM. Discussions will foster collaborations among researchers interested in mathematical learning difficulties, marginalization of students and technology-assisted interventions.

ACKNOWLEDGMENTS

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