Collaborative Approaches for Developing Teaching, Learning, and Stewardship

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The research in undergraduate mathematics education (RUME) community has amassed insights into features of high-quality learning opportunities for students and what instructors need to know and do to create such opportunities. What does it look like if we leverage what is known from that literature to consider the question: How do we use RUME findings to design and study development of those who sustain and connect professional learning across roles, contexts, and time? Such leaders function as *Stewards* of a discipline, not just expert researchers; they are guardians, teachers, and innovators who ensure that the discipline thrives and remains meaningful for future generations (Bass, 2006).

Powerful classroom-level practices include student collaboration on group-worthy, authentic tasks. RUME has examined ways instructors build the knowledge, skills, and dispositions to support such teaching and learning of mathematics. RUME has also explored how those who are Providers of teaching-focused professional learning create opportunities for instructional growth through purposeful design (e.g., Akin et al., 2023; Braley et al., 2023; Deshler, et al., 2015; Smith et al., 2021; Yee et al., 2023). Together these contributions reveal interconnected layers of subsystems in learning and teaching.

Math-Students-Instructor interactions occur in Instruction. Instruction is a subsystem, an object of study, in Teaching-focused Professional Development (TPD). TPD, as an object of study, includes interactions among Providers and Instructors as they work on Instruction. TPD is, in turn, a component in an even broader system of Leadership Development where leaders facilitate learning by Providers to offer TPD. Human interactions include:

- Students engaging in learning mathematics via collaboration, guided by an Instructor,
- Instructors learning to teach mathematics, guided by a Provider,
- Providers learning to teach about teaching mathematics, guided by a Facilitator.

In this exploration of theory, we utilize prior work (Hauk & Speer, 2023; 2024) to expand on the model. We offer and extend a visual representation of the above. The aim is to capture the work Stewards do as they draw on broad and deep knowledge to guide efforts across (sub) systems across time. We explore the use of authentic group-worthy tasks for professional learning (i.e., tasks relevant to the work of teaching and leadership) and what is necessary for those who orchestrate such learning to know and do. Outcomes will inform designs for learning across multiple layers of the system and leverage the robust base of literature on authentic tasks, collaborative groupwork, and scaffolded learning in mathematics.

Theoretical contributions are two-fold: (1) synthesizing work across several fields to inform the nascent theory-building about leader and Steward development, and (2) exploring how practices used by instructors can be beneficial both for undergraduate student success in the learning of mathematics and in supporting the learning of stewardship. Poster-side conversations will focus on gathering stories about Provider, Facilitator, and Steward development to stress-test the model. Just as the mathematics community has benefited from both theory- and practice-focused research on students and their instructors in the context of learning mathematics, we contend that analogous work focusing on Stewards offers valuable insight into leadership development in post-secondary mathematics education.

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