The Thinking Project: Supporting Metacognitive Growth in Calculus Students

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Despite extensive efforts to improve undergraduate mathematics instruction, many students continue to struggle, not only with mathematical content but also with the metacognitive skills necessary to monitor, regulate, and direct their own learning. Metacognition refers to individuals' awareness and control of their own cognitive processes (Flavell, 1979). Incorporating metacognitive strategies in mathematics classrooms can help students become more deliberate in planning, monitoring, and evaluating their learning, which can in turn positively influence affective outcomes such as confidence and anxiety (Roick & Ringeisen, 2018). Research consistently shows that students with higher metacognitive awareness tend to perform better in mathematics and problem-solving tasks than their less-aware peers (Schneider, 2010).

In this poster session, we will present *The Thinking Project* (TTP), a metacognitive support initiative implemented in multiple sections of an Applied Calculus course at a large R1 university. The project is designed to foster students' metacognitive awareness through structured, ongoing activities embedded throughout the course. These web-based activities promote self-reflection and help students become more aware of their understanding of course content, academic progress, and learning goals, while making the activities easily accessible and straightforward to complete. The activities were adapted from an educational intervention in which students identified self-reflective components as some of the most valuable aspects to their learning. Moreover, students who participated in that intervention had significantly lower mathematics anxiety and higher self-efficacy (Guy, 2024). TTP was first piloted in Summer 2025 in a single Applied Calculus course and expanded to additional sections in Fall 2025. The pilot highlighted the need to improve the technology used to administer the activities and to optimize the instructor feedback process.

The Metacognitive Awareness Inventory (MAI) was administered at both the beginning and end of the term to assess changes in students' metacognitive awareness (Schraw & Dennison, 1994). Additionally, qualitative feedback was collected at the end of the semester to further explore students' perceptions of the activities. During the poster session, we will share how the project was designed and facilitated, along with a QR code linking to the activity materials for instructors interested in adopting or adapting them. Preliminary findings will be presented, and we will discuss implications for future research and instructional practices.

This session highlights a practical, research-informed approach to fostering metacognition in undergraduate mathematics courses, an area that remains challenging for many students. By presenting TTP, participants will explore how structured, course-embedded activities can support students' self-reflection, awareness of their learning processes, and strategic engagement with mathematics content. This poster emphasizes both the instructional design and the theoretical rationale, offering educators and researchers a model for promoting metacognitive growth across diverse mathematics learning contexts while also showcasing the ongoing mixed methods study to investigate the project's effectiveness.

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