Design Principles for Teacher Discourse: Developing Adaptive Reasoning in Mathematics Classrooms

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Supporting students' capacity to reason mathematically is widely recognised as an important focus of mathematics education, yet research continues to show that students often struggle to explain, justify, and reflect on their mathematical work (e.g., Putri & Warmi, 2024). These capabilities are captured in the construct of adaptive reasoning which is a component of mathematical proficiencies (Kilpatrick et al., 2001). They defined adaptive reasoning as the capacity for logical thought, reflection, explanation, and justification in mathematical activity. Reasoning becomes adaptive when learners revise their thinking, justify their ideas, or adjust their strategies in response to new problems, feedback, or alternative perspectives (Jeannotte & Kieran, 2017). In this sense, adaptiveness lies not merely in the presence of reasoning processes, but in how these processes are flexibly mobilised and revised across mathematical situations, especially in the classroom.

Despite its importance, students' adaptive reasoning remains underdeveloped, particularly among average- and low-achieving learners. Currently, instructional approaches rarely focus explicitly on cultivating this aspect of mathematical proficiency. At the same time, a growing body of research highlights the potential of discourse-rich mathematics classrooms to support students' reasoning. Through classroom discourse, students articulate their thinking, justify strategies, critique arguments, and revise their ideas. Because adaptive reasoning involves explaining, justifying, and reflecting, it is often made visible during classroom discourse as learners respond to and build on one another's reasoning. However, while prior studies highlight the role of discourse, less is known about the specific teacher discourse strategies that actively elicit students' adaptive reasoning during mathematical activity.

In the presentation, we will describe and exemplify strategies for eliciting adaptive reasoning, informed by both the Teacher Moves for Supporting Student Reasoning framework (Ellis et al., 2019) and our initial empirical analysis of four lesson transcripts from previous professional work with teachers. The design principles for teacher-orchestrated discourse that emerge from this synthesis will be used to craft intervention modules intended specifically for average- and low-achieving learners in secondary schools in the Philippines. Ultimately, these modules will inform the design and implementation of a teaching experiment, which is the next stage of our work.

References

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