

BEYOND PROCEDURAL SKILLS: AFFORDANCES OF TYPICAL PROBLEMS FOR THE TEACHING OF MATHEMATICS

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In his model for pedagogical reasoning and action Shulman (1987) stated that prior to instruction, there are two important stages that the teacher sequentially goes through. First, the teacher has to comprehend the content related to the topic to be taught and second, he or she needs to transform that comprehension to delineate individual concepts and skills and to package these into suitable *tasks* for students to demonstrate their learning. Mathematical tasks are central to students' learning because "tasks convey messages about what mathematics is and what doing mathematics entails" (NCTM, 1991, p. 24). Accordingly, one of the daily concerns of mathematics teachers is whether to use existing tasks, create new tasks or reformulate existing tasks for use in their day-to-day practice. Amongst others, we have several types of tasks highlighted in the literature: worthwhile mathematical tasks (NCTM, 1991), challenging tasks (Sullivan et al., 2014), high-level tasks (Henninsen & Stein, 1997), open-ended tasks (Zaslavsky, 1995), rich mathematical tasks (Grootenboer, 2009). While acknowledging the benefits of using such tasks, research has also surfaced some shortcomings. These high-level tasks are often more complex and take longer for implementation and may even evolve into less demanding forms of cognitive activity (see Henninsen & Stein, 1997). Such tasks are generally not meant for developing procedural skills but rather to enhance conceptual understanding. Are there ways in which teachers can engage students in mathematical tasks for developing their procedural skills as well as their conceptual fluency while using simple day-to-day tasks? The type of tasks that are readily available to all teachers are *typical problems*, which include regular textbook problems and examination-type questions. Do typical problems have *affordances* (see Gibson, 1986) for developing conceptual fluency besides the expected development of procedural skills? In this lecture, I will focus on how teachers can use *typical problems* to develop both conceptual fluency besides developing procedural skills (see Choy & Dindyal, 2017a; Choy & Dindyal, 2017b; Choy & Dindyal, 2018; Choy & Dindyal, 2021). With limited time at their disposal, teachers have to be strategic in optimally using time for selecting and using relevant tasks for their lessons. Whether teachers select, modify or create tasks for use in class, they have to see and make sense of the mathematics and the pedagogical considerations in the implementation of these tasks. I will use some examples from a recently completed research project in Singapore, which investigated the idea of *teacher noticing* (Mason, 2002; van Es & Sherin, 2002; Jacobs et al., 2010), during the orchestration of learning experiences in mathematics.

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