

Orchestrating Learning Experiences Using Typical Problems in Mathematics Classrooms

Portraits of Teacher Noticing During Orchestration of Learning Experiences in the Mathematics Classrooms

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KEY IMPLICATIONS

- Teachers and researchers should tap the affordances of both typical problems (textbook and examination-type questions) and mathematically rich tasks to enhance students' learning experiences.
- Teachers should explore how to orchestrate productive discussions around typical problems to develop both procedural skills and conceptual understanding.
- It is critical for teachers to see the forest and the trees; they should hold the curriculum's big ideas in mind while attending to the specifics of the mathematics content. To this effect, teachers should be supported to zoom in and out of the curriculum by seeing connections between tasks such as typical problems, lessons and units.

BACKGROUND

Learning experiences were included in the mathematics syllabus to influence the ways teachers teach and students learn. Although the descriptions of learning experiences are given, teachers have the autonomy to design,

select, adapt and implement tasks in their classrooms. This is deliberate work, and while teachers were supported to make sense of their learning experiences, how they can orchestrate learning experiences to teach mathematics remains largely unexplored. Moreover, what teachers notice—how they attend to, interpret and respond to students' reasoning (Sherin, Jacobs & Philipp, 2011)—during the implementation of tasks is critical. It is therefore crucial to investigate what teachers notice when orchestrating these learning experiences.

FOCUS OF STUDY

This project investigated how experienced mathematics teachers orchestrate learning experiences for students in secondary school classrooms. This project had two main objectives. First, we developed a local theory to describe what and how exemplary teachers noticed when they orchestrated learning experiences through mathematical tasks in their classrooms. Second, we designed a toolkit (MATHLET) that could be used by teachers to orchestrate mathematical learning experiences.

KEY FINDINGS

1. Our teacher participants noticed the affordances of typical problems and used their tasks to enhance students' learning experiences. In particular, we refer to the affordances of typical problems in developing both procedural fluency and conceptual understanding (Choy & Dindyal, 2017).
2. Our findings challenged the current view of orchestrating mathematically productive discussions around a single rich task. In particular, we observed our teacher-participants orchestrating discussions around a sequence of carefully selected or constructed typical problems (Choy & Dindyal, 2018).
3. We noted that our teacher participants perceived the embeddedness of the connections between tasks in a lesson, between lessons in a unit and between different units within the mathematics curriculum.

SIGNIFICANCE OF FINDINGS

Our findings suggest a re-balancing of the use of typical problems with rich tasks can potentially make mathematically rich learning experiences more pervasive. This opens up possibilities in professional development around harnessing the potential of typical problems, orchestrating discussions around typical problems and facilitating professional discussions around typical problems.

PARTICIPANTS

Four experienced teachers from 3 secondary schools in Singapore were involved in the study. Three of the 4 teachers were Senior Teachers in their respective schools.

RESEARCH DESIGN

A qualitative design-based research approach was used with four teachers. Video-recordings of 11 lessons, voice recordings of 20 lesson design sessions and interviews, lesson materials and student artefacts were analysed using thematic analysis.

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