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Exploring the Factors Influencing the Maintenance and Decline of High-Level Cognitive Demand Tasks in Classroom Implementation

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Abstract

This study aims to examine what aspects influence novice mathematics teachers' maintenance or decline of cognitive demands during the classroom implementation of high-level mathematical tasks. Based on the factors by Stein et al. (2006), the study provides an analysis of task implementation, identifying how and why shifts occur in practice. The participant is a mathematics teacher with 2 years of experience. In an ongoing project on the mathematical coaching of novice teachers, data are collected through classroom observations and interviews. In the first task on fractions, students reached conclusions using standard algorithms rather than making estimations. This led the teacher to provide direct explanation instead of fostering conceptual understanding. Since the task did not match students' prior knowledge, her intervention prevented students from linking operations to underlying meanings. This instance aligns with the declining factor of "problematic aspects of the task becoming routinized", as the teacher's actions reduced the task's cognitive level. In the second task on patterns, students focused on developing mathematical understanding rather than reaching an exact answer. As the teacher was prepared for possible student responses, she could ask 'why' and 'how' questions purposefully to elicit students' thinking and reasoning. This instance aligns with the maintenance factor of "sustained press for justification, explanation, and meaning through teacher questioning, comments, or feedback," as the teacher maintained the cognitive demand of the high-level task. The findings indicate several aspects influence the maintenance and decline of cognitive demand in tasks. Therefore, teachers must consider students' readiness and anticipate student responses.

Keywords: **classroom implementation; cognitive demand; mathematical task; middle school mathematics; novice teachers**