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**Instructional reasoning about interpretations of student thinking that supports responsive teaching in secondary mathematics.**

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Summary: Basing instruction on the substance of student thinking, or responsive teaching, is a critical strategy for supporting student learning. Previous research has documented responsive teaching by identifying observable teaching practices in a broad range of disciplines and classrooms. However, this research has not provided access to the teacher thinking that is at play leading to these responsive practices. In this study, we use an innovative methodology to explore the cognitive dimensions of responsive teaching as they take place during the moments of instruction. Data include 17 point-of-view observations in which two high school mathematics teachers saved video of important moments in real time and discussed the moments during an interview immediately following instruction. Both teachers were observed to use sophisticated responsive teaching practices, providing a window into consequential teacher thinking around student thinking. An open coding of teachers' comments about the moments they selected to capture during instruction was used to identify three types of instructional reasoning about interpretations of student thinking used by the teachers: (a) making connections between multiple specific moments of student thinking, (b) considering the relation between the mathematics of student thinking and the structure of a mathematical task, and (c) developing tests of student thinking. We provide contextualized examples of each of the types of instructional reasoning and discuss how these findings relate to current theory on responsive teaching. We conclude by considering the implications of this study for the necessary mathematical and pedagogical expertise required to engage in responsive teaching, and consider how this instructional reasoning can be supported through professional development.

*Classification:* C39 C70 D40

*Keywords:* responsive teaching; teacher cognition; teacher noticing; teacher learning

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