

Writing Explanations: Provoking Different Knowledge Bases by Context

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Recent research shows the promise of using tasks that situate mathematics in a pedagogical context for secondary teachers, including tasks where teachers are asked to explain a solution to a mathematical task. We use a theory of positionality (Aaron, 2011; Herbst & Chazan, 2003, 2011) to make sense of why explanations might differ when the solver is positioned as a secondary teacher as compared to positioned as a university mathematics student.

Keywords: positionality, mathematical knowledge for teaching

In this poster, we examine the research question: When positioned as a teacher as opposed to positioned as a university mathematics student, what differences in knowledge bases emerge when solving mathematics tasks? To address this question, we interviewed 17 practicing secondary teachers. They wrote explanations to two versions of a task adapted from Biza, Nardi, and Zachariades (2007), first in the context of a university course and second in the context of high school teaching. Using the results of three teachers whose solutions were mathematically valid, we make the argument that positioning as a teacher can elicit the development of mathematical knowledge for teaching (MKT: Ball, Thames, & Phelps, 2008; Silverman & Thompson, 2008) in ways that are not activated when positioned as a university mathematics student. We contribute an illustration of this phenomenon and extend the results of Biza et al. (2007). Figure 1 shows the tasks and positioning as presented to participants.

Positioning as university student	Positioning as secondary teacher
Your mathematics professor assigns this problem during a unit on mathematical justification. <i>Explain why the equation $x + x + 1 = 0$ has no solutions.</i> Write a solution that you would hand in to the professor of this course.	You plan to assign this problem to your high school student during a unit on mathematical justification. <i>Explain why the equation $x + x + 1 = 0$ has no solutions.</i> Write a solution that you would share with students this course.

Figure 1. Absolute Value Task, adapted from Biza et al. (2007)

The explanations differed based on context, as exemplified by the quotes in Figure 2. In the university context, these participants primarily summarized their deductive reasoning. When positioned as a teacher, they used more representations and attended explicitly to student thinking and instructional moves to guide student thinking. They discussed how to help students generate conviction that the statement is true, but none discussed motivating this idea in the university context. Thus, in the position of secondary teacher, but not university student, participants engaged in all of Silverman and Thompson's (2008) practices for developing MKT.

Positioning as university student	Positioning as secondary teacher
This task "requires you to know a lot about what it means to justify it. ... that it works for all the cases, is important... understand how absolute values work and how to prove things surrounding them."	"I think [students' knowledge about absolute value is] a good place to start because if they have that knowledge, then they can play with it and make drawings and use number lines and see what's happening and from there convince them self and justify whatever they're saying."

Figure 2. Differences in explanations by context

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