

Prospective Secondary Mathematics Teachers Integrating Reasoning and Proving in their Teaching

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Keywords: Reasoning and Proof, Secondary Teachers, Beginning Teachers, Teacher Education

Transitioning from teacher preparation programs to teaching in school is fraught with challenges (Smagorinsky et al., 2004; Thompson et al., 2013). Specifically, beginning teachers struggle to implement reasoning and proving in real classrooms and recontextualize what they learned in their teacher preparation programs (Gomez Marchant et al., 2021; Stylianides et al., 2013). In this study, we investigate how prospective secondary mathematics teachers (PSTs) who participated in a capstone course *Mathematical Reasoning and Proving for Secondary Teachers* (Buchbinder & McCrone, 2020), envision and enact what they learned in the course in their student teaching experience and first year of teaching their own class.

We followed two PSTs, Olive and Diane, through the course, student teaching, and first year of teaching. Data included, for each teacher, six video-recorded lessons and six post-lesson interviews, which invited reflection on integrating reasoning and proof in the lesson. Data were analyzed through open coding (Patton, 2002) inspired by activity theory (Ellis et al., 2019; Engeström, 1987) with attention toward aspects that enable or inhibit enactment of reasoning and proof, such as their cooperating teacher, the school and classroom norms, and set curriculum.

As PSTs, Olive and Diane developed knowledge and skills for teaching reasoning and proof in secondary classrooms. As student teachers, they expressed a deep desire to integrate reasoning and proof into their teaching but encountered challenges which hindered their enactment of this vision. They felt obliged to conform to the norms of teaching established by their cooperating teachers; mostly notetaking and computational practice. Nevertheless, as student teachers working with a cooperating teacher, they still found ways to engage students with reasoning and proof by pushing for student explanations and designing short proof-related activities. As time progressed, they stepped into teaching their own classrooms. They embraced their independence and carved out unique paths to engage students with reasoning and proof. They devoted class time to group work, exploration-based activities, and invited reasoning and justifying.

This inquiry aims to provide an increased understanding of prospective teacher education with respect to mathematical reasoning and proof and how PSTs' knowledge and practices continue to develop during their cooperative and independent early-career teaching experiences. Notably, the proof-related practices learned in the course reemerged as the PSTs taught their own classes, despite facing pressures to teach in more traditional ways during student teaching. Our study contributes to a better understanding of the PSTs' development as mathematics teachers in their university programs and beyond.

Acknowledgments

This research was supported by the National Science Foundation, Award No. 1941720. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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