

Holding on to Reasoning and Proving While Navigating Professional Obligations: Secondary Teachers' Transition from University to Schools

Sophia Brisard Rebecca Butler Orly Buchbinder
University of New Hampshire University of New Hampshire University of New Hampshire

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

Transitioning between university teacher preparation programs and secondary schools is a complex process, fraught with many challenges for beginning mathematics teachers (Klein, 1932/2016). During this transition, many of the ambitious teaching practices experienced in teacher preparation programs may be absent (e.g., Stokking et al., 2003), but some may reemerge later (Grossman et al., 2000). Herbst and Chazan's (2003) theory of *practical rationality* allows for conceptualizing this transitioning process as the socialization of beginning teachers into the profession, as they adopt a decision-making framework rooted in norms and four professional obligations. These obligations are to the *discipline* of mathematics, to students as *individuals* with unique needs, *interpersonal* obligations to the entire class, and obligations to follow the *institutional* policies, curricula, and practices of schools.

To explore how beginning teachers negotiate between their formal education and the realities of classroom practice, specifically, how they integrate reasoning and proving into their teaching, we followed three beginning teachers: Nancy, Olive, and Diane for three years. First, as PSTs in the capstone course *Mathematical Reasoning and Proving for Secondary Teachers* (Buchbinder & McCrone, 2020), then as interns (INTs), and then as novice teachers (NTs) in their own classrooms. For each teacher, we collected observations, lesson plans, and interviews (3-4 in each setting) and analyzed them in terms of four professional obligations (Chazan et al., 2016) and personal beliefs. Here, we report in aggregate the observed percentages of coded utterances.

As INTs, the participants' discourse was dominated by *institutional* obligation (39%) evident in the expressed need to adhere to the school rules, curriculum, and the cooperating teacher's traditional practices (e.g., "she [the CT] has a system that tends to work for her. So that's what I've been doing"). *Disciplinary* obligation is only expressed in visionary terms – a wish to have students do more explorations. As INTs gained more experience their focus on *institutional* obligation decreased to 17.7% in favor of exposing students to *disciplinary* practices (percent increase of 19) like exploring, conjecturing, and justifying. Having their own classrooms as NTs was characterized by renewed increased *interpersonal* obligation for the classroom (percent increase of 21.5). Despite the added responsibilities, the NTs continued to incorporate reasoning and proof, for example, by including discovery activities. By the end of year 1 the *disciplinary* and *individual* obligations were most prominent, about 30% each. These findings shed light on the process of reconciling various professional obligations while maintaining some focus on reasoning and proof. The findings have implications for those who work to support beginning teachers in their effort to create more reasoning and proof-oriented classrooms.

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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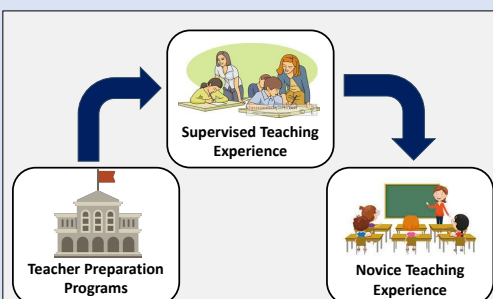
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Background



- Transitioning between university teacher preparation programs and secondary schools is a *complex process*, fraught with many challenges for beginning mathematics teachers (Klein, 1932/2016; Smagorinsky et al., 2004).
- Challenges emerge in *balancing commitments* to the university, the cooperating teacher, while developing one's own teaching identity (Bieda et al., 2015).
- The process of socializing in teaching profession involves developing a decision-making framework that takes into account four professional *obligations*: to the discipline of mathematics, to individual students, to students as a class and to the institution of schooling (Herbst & Chazan, 2003).

Goal: To explore how beginning teachers negotiate the four professional obligations as they transition from university to classroom practice; specifically, how they uphold disciplinary obligation by integrating reasoning and proving into their teaching.

The Study

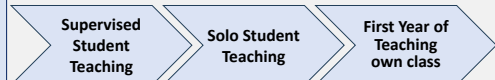
Participants: Three beginning teachers: Olive, Nancy, & Diane

Setting: The study is part of a *longitudinal* project that investigates beginning teachers' expertise to teach mathematics via reasoning and proving.

- Each participant took a capstone course *Mathematical Reasoning and Proving for Secondary Teachers* (Buchbinder & McCrone, 2020) in their teacher preparation program.

Data sources for each participant:

- Lesson plans and observations
- Lesson debrief interviews (3-4 for each participant).



Data analysis:

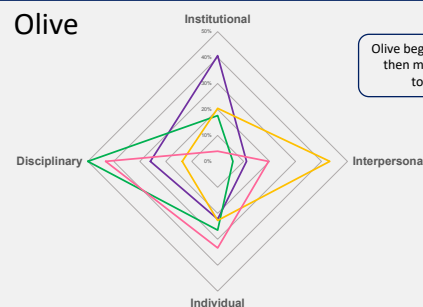
- Transcribed interviews were coded by three researchers for instances of the four professional obligations.
- For each participant and for each lesson, we aggregated the codes into a single score on each obligation.
- Percentages were calculated to identify trends across lessons and participants.

Theoretical Framework



Results

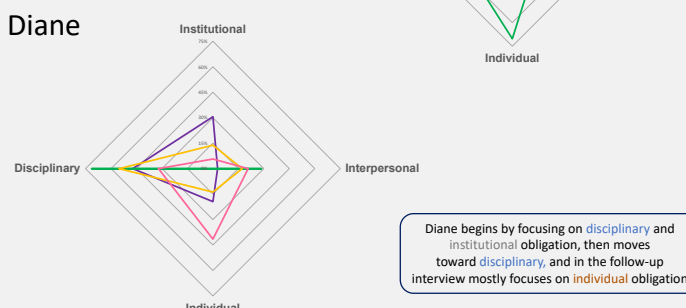
Olive



Nancy



Diane



Lesson Key

Intern Lesson 1

Intern Solo Week

Novice Teacher Lesson 1

Year 1 Follow-up

Conclusions

As interns, the participant's discourse was dominated by *institutional* obligation evident in the expressed need to adhere to the school rules, curriculum, and the cooperating teachers' traditional practices. The interns have a desire to implement more exploratory activities.

In my head, [students] are doing explorations all the time.

[The CT] has a system that tends to work for her. So that's what I've been doing.

With more experience, the interns started to focus less on *institutional* obligations and more on *disciplinary* obligations (exploring, conjecturing, and justifying).

I pushed to do an [exploration activity] because in the original lesson plan that [CT] had written like for years prior the idea of flipping the inequality sign is not really explored at all...I wanted [students] to see it for themselves and to understand why that was the case.

As novice teachers, they concentrated more on their *interpersonal* obligation to the classroom while still having a strong desire to implement reasoning and proof activities.

Classroom management pieces were overwhelming in the beginning...But [students] have been really patient with me.

I want to do more like group activities in the class, and less like direct instruction...and I'd like to do more exploratory stuff

By the end of their first year of teaching, the *disciplinary* and *individual* obligations were more prominent.

The advanced group of kids, I like to confuse them because I like for them to unconfuse themselves because I find that's when they really understand something.

The set of notes I had was this long, dreary like list of properties. So, I'm going to let them do this [exploration] activity instead.

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