

My Mom Supports My Teaching: One Mathematician's Journey in Learning to Teach

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In this contributed report, I tell a story surrounding one mathematician's learning to teach mathematics content courses designed for prospective elementary teachers. Namely, I describe the mathematician's background and the series of events that pushed this newer mathematics instructor to develop productive dispositions towards their students, leverage support from their mom, a former elementary teacher, and navigate challenging student questions in the classroom. This report draws on results from my dissertation study, a narrative inquiry of one mathematics instructor, involving a semester-long collection and analysis of classroom observations, observations of instructor meetings, weekly instructor reflection journal entries, three instructor interviews, and instructor-written mathematics teaching and learning autobiographies. A key implication is that mathematics instructors may benefit from early experiences developing productive mindsets towards teachers and teaching, and need access to individuals who value teachers and teaching and who avoid deficit discourses around teachers or students.

Keywords: narrative inquiry, post-secondary mathematics instructors, mathematics content courses, prospective elementary teachers, support for teaching

Introduction

Bruce was a prospective elementary teacher (elementary PT) in a mathematics content course designed for elementary PTs in a large midwestern university. During the second class of the semester, Bruce asked their instructor, Rowan, "in what grade would number lines be attainable?" Rowan responded:

I'm not sure. I think counting numbers are Kindergarten and 1st grade. I think it would be attainable for 2nd or 3rd graders, but it would depend on the curriculum in the district.

I'm not really the best person to ask because I know more about math--being from the math department--but if I was from the teaching department I might know more.

Bruce's question posed a challenge to Rowan, in part, because Rowan was teaching elementary PTs for the first time but also because Rowan did not have K-12 teaching experience. So how did Rowan learn to navigate challenging questions from their students, especially those that went beyond mathematics content and into intersections of mathematics content and knowledge/experience of K-6 students' mathematical thinking and/or K-6 schools?

As Bruce's question shows, learning to teach mathematics content courses designed for prospective elementary teachers (PTs) can be challenging. Mathematics content instructors must be prepared to not only teach mathematics content, but engage PTs in understanding children's mathematical thinking strategies, learning trajectories, and misconceptions (Carpenter et al., 1996; Carpenter & Moser, 1982; I et al., 2020). When considering how instructors might best be prepared and supported, however, one must recognize that there is significant variation in the backgrounds and expertise of mathematics content instructors (Masingila et al., 2012; Yow et al., 2016) and little is known about the preparation, knowledge, and experiences of mathematics content instructors (Even, 2008; Goos, 2009; Masingila et al., 2012; Oesterle, 2011; Zaslavsky & Leikin, 2004). Furthermore, most instructors who are newer to teaching PTs do not feel prepared and additionally report an absence of training, resources, and support at their institutions (Goodwin et al., 2014; Masingila et al., 2012; Quaisley, 2023; Yow et al., 2016). Mathematics

content instructors, especially those newer to teaching PTs, need preparation and support that account for their background and teaching context.

In this contributed report, I draw on the findings of my dissertation study, a narrative inquiry connecting the background, preparation, and support of one instructor (Rowan) to their learning to teach mathematics content for PTs (Quaisley, 2023). Specifically, I detail the series of events that pushed Rowan to develop productive dispositions towards their students, leverage support from their mom, a former elementary teacher, and navigate challenging student questions, like Bruce's, in the classroom.

Literature Review

Not much research has been done with specific attention to newer mathematics content instructors' preparation and learning to teach PTs (Quaisley, 2023). What studies do exist typically focus on a few small slices of the knowledge or skills that may be important for instructors to develop (e.g., Masingila et al., 2018; Zopf, 2010) or discuss support structures that may benefit instructors (e.g., Castro Superfine & Li, 2014; Jackson et al., 2020; Shaughnessy et al., 2016; Suppa et al., 2020) but are not necessarily *about* the instructor and how they navigate this work outside of researcher intervention. Oesterle's (2011) summary of literature on post-secondary mathematics instructors holds relevance today:

although the research is intended *for* instructors (or for course/program designers), there is very little research *about* the instructors... in this context there is a lack of documented research about what happens in ordinary mathematics content courses for preservice teachers, ones that are not undergoing studies for particular interventions. (Oesterle, p. 39, emphasis original)

What literature *about* instructors of PTs of mathematics do exist typically involve one experienced instructor reflecting on their experiences (e.g., Chauvot, 2009; Nicol, 1997; Tzur, 2001), or involve less than a handful of newer instructors (e.g., Oesterle, 2011; Van Zoest, 2006). Additionally, of the studies about newer instructors, most focus on mathematics *methods* instructors with experience teaching high school mathematics (e.g., Chauvot; Nicol, 1997; Tzur, 2001; Van Zoest, 2006). Hence, more perspectives need to be examined to thoroughly understand the complexities of learning to teach elementary PTs, specifically perspectives from mathematics content instructors who are not only newer to teaching elementary PTs, but newer to teaching more generally.

Studies about newer instructors of PTs of mathematics are important because of the opportunities they provide for insight into instructors' dilemmas, tensions, and challenges and to hypothesize about the connections among an instructor's background, teaching context and experiences. For instance, Nicol (1997) and Van Zoest (2006) both involved mathematics methods instructors with prior experience teaching high school mathematics and both studies revealed common tensions around teaching PTs to think critically about teaching. More studies that center instructor experience may reveal further commonalities among instructors with particular backgrounds and in particular teaching contexts. Such studies may also highlight key differences among instructors with similar backgrounds and teaching contexts, as well as previously undocumented challenges for those instructors.

Purpose Statement and Research Question

My research puzzle (Clandinin, 2013) was this: how might the backgrounds and teaching contexts of newer mathematics content instructors shape their experiences around learning to teach PTs? Chauvot's (2009) study calls for this kind of exploration: "different kinds of

knowledge is needed to serve different roles” (Chauvot, p. 369). Connections between instructors’ contexts and their learning to teach PTs do not appear to be well understood in the research literature yet are critical to making progress in understanding newer instructors’ learning and growth, the challenges and successes they experience, the expertise they need to develop, and the support structures that might benefit them. Hence, the purpose of my study was to obtain a more nuanced understanding of a newer mathematics content instructor’s experiences around learning to teach elementary PTs in their respective teaching context.

The central question that guided my study was: “How might a newer mathematics content instructor’s background and preparation relate to the challenges and successes they experience around teaching and learning to teach mathematics content for elementary PTs?”

Theoretical Framing: Narrative Inquiry and 3-D Framework

To address my research question, I engaged in a narrative inquiry (Clandinin & Connelly, 2000) of one beginning instructor’s experiences learning to teach mathematics for elementary PTs. Narrative inquiry centers on experience, both as the phenomenon being studied and the method used to understand experience (Creswell & Poth, 2018). I drew on Clandinin and Connelly’s (2000) three-dimensional (interactional, temporal, and contextual) inquiry space to understand experience. First, the *interactional* dimension refers to both personal interactions, such as “an individual’s feelings, hopes, reactions, and dispositions” (Creswell & Guetterman, 2019, p. 522), as well as social interactions and perspectives of other people. Second, the *temporal* dimension refers to time—past, present, and future—and means that one does not just consider the on-going experiences of the present, but also considers past events, anticipated future events, and how those might be relevant to someone’s understanding of current events. Third, the *contextual* dimension refers to “the context, time, and place within a physical setting, with boundaries and characters’ intentions, purposes, and different points of view” (Creswell & Guetterman, 2019, p. 522). When considered altogether, these three dimensions allow for a continuous and storied understanding of experience—not as an isolated event, but as a thread connected to the larger storyline of who someone was, is, and wants to become.

Context of the Study

The setting for my inquiry was Cardinal University (a pseudonym), a large mid-western university. Operations & Number Systems (O&NS; a pseudonym), the mathematics content course of interest for this study, is taken during the STEM semester, an integrated effort to connect the contents and pedagogies of mathematics, science, and technology. O&NS aims to develop elementary PTs’ understanding of some of the earliest grades’ mathematics content, such as the base-10 number system, the operations of addition, subtraction, multiplication, and division, fractions, and the properties of arithmetic. Because O&NS is taken alongside Elementary Mathematics Methods (EMM), as well as a practicum that meets at elementary schools for a full day twice a week, the hope is that elementary PTs will be able to see the value in what they are learning and apply it to teaching elementary mathematics.

I recruited one instructor, Rowan (she/they), at Cardinal University who was teaching O&NS and who identified as both a newer instructor of PTs and a newer instructor more generally. I am especially grateful to Rowan for giving me the precious gift of their time, energy, and thoughts, so that I could share their experiences. Other participants in my study included Rowan’s students (18 total), as well as the other O&NS instructors (2 total) and EMM instructors (3 total).

Data Collection and Analysis

In spring 2022, I observed all of Rowan's classes and meetings with other instructors, conducted three interviews with Rowan (on their preparation, support, and overall learning), and collected Rowan's teaching and learning autobiographies, Rowan's weekly reflection journal responses, and Rowan's teaching and DEI statement. During each of my observations of Rowan's O&NS classes and instructor meetings, I composed detailed fieldnotes on what I saw and heard, as well as my interpretations. Following nearly every observation of a class or instructor meeting, I wrote descriptive and reflexive memos to assist me in interpreting situations and writing rich descriptions of themes (Emerson et al., 2011; Spradley, 2016) with specific attention to each dimension of Clandinin and Connelly's 3-D framework.

My goal for data analysis was to utilize the various data sources I collected to support me in restorying—a process of analyzing and reorganizing—Rowan's experiences. I analyzed my fieldnotes, along with the early (on preparation), mid-semester (on support), and end of semester interview (on overall learning) transcripts, Rowan's reflection journal entries, Rowan's mathematics learning and mathematics teaching autobiographies, and Rowan's teaching and DEI statement using cycles of open-coding (Saldaña, 2016) based on broad categories related to my research questions: (a) challenges, (b) successes, and (c) prior experiences, preparation, and support. As I re-read each and every piece of data and coded ideas, excerpts, or interactions within the above categories, I organized ideas and interactions from classroom fieldnotes and memos, instructor meeting fieldnotes and memos, and reflection journal responses into tables based on these categories chronologically and contextually. I also wrote analytic memos as I collected data, which provided a crucial support to me in hypothesizing about themes or narrative threads.

Results: Rowan's Learning to Navigate Challenging Student Questions

In Quaisley (2023), I described numerous concurrent challenges Rowan experienced in learning to teach mathematics content courses for elementary PTs, such as time constraints as a graduating Ph.D. candidate, the burden of unfinished grading assignments, and an overall sense of feeling "uneasy" and "unsteady," often with respect to learning "different" and "hard" content. At the same time, Rowan experienced successes around developing positive beliefs about PTs and teaching O&NS, navigating challenging student questions, learning to seek external support for teaching (and in general), having students pass exams, and surviving the semester without any "catastrophic failures." For this report, I detail the interconnected nature of Rowan's successes in developing productive dispositions towards their students, leveraging external support for teaching, and navigating challenging student questions in the classroom.

Rowan's Background & Prior Experiences

At the time of the study, Rowan (she/they) was a mathematics graduate student instructor in their fifth and final year in a mathematics Ph.D. program at Cardinal University (a pseudonym). Throughout those five years, Rowan taught calculus recitations and lecture and Intermediate Algebra, as well as assisted teaching a mathematics content course for practicing teachers during a two-week summer session (Math for Teachers). In some semesters, Rowan also taught these courses from the position of associate course convenor—a role involving additional responsibilities such as creating common exams and observing instructors' classes. In the semester in which this study occurred, Rowan was teaching O&NS for the first time.

An influential person in Rowan's story is their mom, a former elementary teacher, who made a significant impact on both Rowan's desire to teach and their perceptions of teaching.

My mom impacts just my teaching generally, not even in relation to this course, because my mom was a grade-school teacher and then was an administrator of preschool. And she, she loved it. My mother loved teaching. And I think that that really has impacted the entire trajectory of my life... So, definitely my mom has had a big influence on like wanting to teach, and I think a lot of that comes from her passion for it, and also all the discussions we had as I was growing up about like what teaching is. (Rowan, Final Interview)

These early experiences with their mom further supported Rowan in developing an asset-oriented mindset towards practicing teachers in the Math for Teachers course.

The students were a treat though. Since they teach, they have an empathetic understanding of the complexities of teaching. Several of the students also reminded me of my mom—my mother was a grade-school teacher, and they had similar spirits and mentalities around teaching and learning... we ended up having a lot of really productive conversations where I would give them advice on mathematics, and they would give me advice on teaching. (Rowan, Autobiography)

Specifically, Rowan positioned practicing teachers as knowledgeable experts, who not only know how to teach elementary students but have valuable knowledge relevant to an instructor of undergraduate mathematics courses.

Developing Positive Dispositions

Rowan began the semester excited to teach and voiced optimistic opinions about their O&NS students in their early reflection journals. For instance, Rowan wrote in their week one journal: “I think the students will be fun and easy to work with. Since they want to be teachers, they’ll have an appreciation and understanding for both the teaching methods I use and the teaching methods for mathematics they’re learning” (Week 1 Reflection Journal). By the end of the semester, some of Rowan’s early semester beliefs about prospective teachers still resonated with Rowan. Rowan explained how their thinking was influenced by their mom and their previous experiences teaching Math for Teachers:

[Rowan] says that it’s really easy for them to think about what it’s like to be a PT just because their mom was a grade-school teacher, and she shared with [Rowan] what it was like learning to teach. [Rowan] says, although that was 35 years ago, and things are different now. [Rowan] says that they also taught teachers when they were assisting with [Math for Teachers] and that was the greatest experience they ever had. [Rowan] says that the teachers were really great. (Researcher Fieldnotes, Week 15 Classroom Debrief)

Navigating Challenging Student Questions

From the beginning of the semester, one of the classroom events that Rowan came to rely on as “business-as-usual” was their students regularly asking Rowan questions not just about mathematics content, but questions at the intersection of mathematics content and knowledge of K-6 students’ mathematical thinking and/or K-6 schools. Early on, Rowan found these questions especially challenging. Recall from the introduction that right from the second class at the beginning of week two, Bruce asked Rowan, “in what grade number lines would be attainable?” Bruce’s question challenged Rowan to reflect on their ability to support their O&NS students’ inquiries about K-6 students’ mathematical thinking early on:

I wish I had a better sense of the timeline on which elementary students would learn this material. A [O&NS] student asked when a [K-6] student would learn about or be able to conceptualize the idea of decimals in base-ten notation and I wasn’t able to provide

anything useful, but I think it would help the [O&NS] students to be able to consider the age of their [K-6] students while they learn the material. (Week 2 Reflection Journal)

During the preparation interview (also in the second week), Rowan additionally reflected on the extent to which they “have the authority” to anticipate K-6 student thinking and worried about missing important ideas behind student thinking. Perhaps addressing questions involving knowledge of or experience with K-6 students’ mathematical thinking might not have presented itself as a challenge for Rowan if they were asked these questions infrequently. However, Rowan was asked such questions in front of the whole class almost every week starting from the second week of the semester through at least week ten of the semester.

Why Not Seek Internal Support?

So how would Rowan navigate challenging questions from their O&NS students? One way in which Rowan might have chosen to navigate these questions is by seeking support internal to their institution. Rowan valued the knowledge and expertise of those with K-12 teaching experience, and as a result, they wrote about wishing to connect with practicing elementary teachers as a desired support in their reflection journals and considered reaching out to EMM instructors (all three of whom had K-12 teaching experience) as a support they did have access to. An unfortunate experience at the third and final joint O&NS-EMM instructor meeting influenced Rowan to not exercise this possibility, however. One of the EMM instructors who was looked upon to lead the meetings joined the Zoom call for the meeting and then promptly left after a few minutes. Rowan recounted feeling that O&NS instructors were “not worth their (EMM instructors’) time” during the mid-semester interview about their support, and lost faith in the STEM semester as a collaborative experience between O&NS and EMM instructors.

Seeking External Support from Mom

As Rowan did not have access to practicing K-6 teachers or believe that EMM instructors could be relied upon for support, a crucial way in which Rowan navigated challenging questions from their O&NS students throughout the semester was by regularly relying on support from their mom. Following each class, Rowan would debrief with me, then call their mom and debrief with their mom on their drive home. Conversations with their mom supported Rowan in reflecting on their own K-6 mathematics learning experiences, as well as some of their mom’s experiences teaching K-6 mathematics. These conversations also built Rowan’s confidence:

But definitely was impactful was thinking about, thinking about and being able to talk through what I had done (as a K-6 student) in comparison to what I am teaching. And it also helped because then I could more confidently tell my (O&NS) students, 'Oh, like, when I learned it, and possibly when you learned it, because you’re only, like, a little bit younger than I am. Like, this is. I remember this being a thing'. My mom said that this was a thing. And I think that connection is useful to me. I wish I had more of it, but it would be so hard to track down because, like, I don’t fully remember my experience, right? I did have to talk it through with my mom, and my mom was very involved in my schooling, which is why she remembers. (Rowan, Final Interview)

A Conversation with Kenny

An important way in which Rowan’s positive dispositions towards students and their conversations with their mom may have supported their navigation of challenging questions was that Rowan demonstrated empathy for multiple perspectives, rather than asserting a superior

perspective. Consider the following conversation¹ between Rowan and one of their O&NS students, Kenny, during week ten of the semester, in which Rowan offered a possible rationale for the actions of Kenny's cooperating teacher and directed the conversation away from judging those actions as right or wrong. Instead, Rowan discussed the cooperating teacher's actions as a possible approach to supporting students' learning:

Kenny: What is the most common way we do this today? My understanding is that [City] public school is moving towards partial products method. I've noticed that some students skip carrying a step, and that you say thirteen tens rather than a hundred and thirty. Does that make sense?

Rowan: That makes sense. I know from the outset that the 2 is in the tens place and allowing that mindfulness of place from the outset... [Rowan works an example with Kenny's input.]

Kenny: I understand it, but I want to know what's right for the process for kids to understand... [Rowan does another example with 38×6 and writes 228.] I think I understand why my cooperating teacher emphasizes it, but I also don't quite understand...

Rowan: Yeah, I think the partial products just emphasizes more of the steps. Have you ever seen kids who want to add up all the numbers from left to right and end up with too many digits? The partial products method is trying to prevent that. [Kenny nods their head up and down as Rowan explains.]

Kenny: Yeah, I think that makes sense. Sorry for taking up the time. [Rowan reassures Kenny that it's fine and then asks if there are more questions.]

Discussion and Implications

Even though Rowan did not feel they initially had the preparation or the authority to address questions around K-6 students' experiences and mathematical thinking, their offering of mathematical perspectives through an empathetic lens in their conversation with Kenny provides one reason to view Rowan's navigation of this challenge as a success. Navigating students' questions and maintaining a classroom environment of openness, curiosity, and mutual respect for mathematical perspectives, but especially teaching and teachers, is not a given. Rather, this may be a skill Rowan developed through reflective practice and their desire to build productive dispositions towards teachers and teaching.

Rowan's experiences suggest that mathematics instructors may benefit from early experiences developing productive mindsets towards teachers and teaching. For professional developers, an explicit introduction to and discussion of asset-based frameworks or mindsets early in mathematics instructors' preparation for teaching may support instructors in fostering more productive beliefs in the long-run. Furthermore, not all mathematics instructors have significant relationships with individuals who value teachers and teaching and who avoid deficit discourses around teachers or students. Thus, it is important for departments to carefully consider the resources, including people, that instructors have access to in learning to teach mathematics content courses for PTs.

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¹ Conversation is shortened and approximated from my fieldnotes—close to participants' words, but not verbatim.

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