BRIDGING BELIEFS, VALUES AND PAST EXPERINCES WITH INSTRUCTIONAL PRACTICE

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Research has established the challenges that novice math teachers face as they move from teacher preparation programs into their first year of teaching (Drake, 2006; Gainsburg, 2012; Millsaps, 2000; Thompson, 1992). Specifically, math teachers are found to have problems with implementing instructional practices that promote conceptual understanding. This research places direct emphasis on understanding in detail the connections between teachers' mathematical life stories and specific instructional sense making. More specifically, how do preservice teachers inform the development and implementation of their instructional practice over the course of their credential year and into the first two years of practice? What are the factors that influence this informing and what combinations of factors attribute to their development and implementation of instructional practice?

Keywords: Teacher Education-Preservice, Teacher Beliefs, Instructional Practice

Introduction

Prospective teachers come to formal teacher preparation programs with ideas and ways of thinking that influence what they learn from courses and experiences (Ball, 1988; Silva & Roddick, 2001). During teacher preparatory programs, preservice teachers face the challenge of balancing their prior mathematical experiences, what they believe mathematics learning environments should be, with what they are taught about teaching mathematics (Gainsburg, 2012; Lampert, 1988; Thompson, 1984). Scholars have been analyzing the connection between teacher belief and practice for years (Thompson, 1992) and researchers continue to find that teacher's beliefs are reflective of the nature of the instruction the teacher provides to students. While prior research centered on the topic of preservice mathematics teachers' belief structures (Ball, 1988; Cooney, Shealy, & Arvold, 1998; Harkness, D'ambrosio & Morrone, 2007; Drake, 2006; Millsaps, 2000), little of this research places direct emphasis on understanding in detail the connections between teachers' mathematics life stories and specific instructional sense making. Furthermore, while the need to study the mental processes of teachers has increased over the past decade, research in this area has largely concentrated on what teacher candidates understand about mathematics as they enter teacher preparatory programs (Ball, 1990; Thompson, 1984, 1992). This research aims to understand why new teachers do or don't use the practices emphasized during their credential programs by examining their instructional practices in light of their prior mathematical experiences. The following questions are guiding this research: How do preservice teachers inform the development and implementation of their instructional practice over the course of their credential year and into the first two years of practice? What are the factors that influence this informing and what combinations of factors attribute to their development and implementation of instructional practice?

Theoretical Framework

Ricoeur's (1992) concept of narrative identity, which is based on one's understandings of oneself across time that are accomplished by organizing and clarifying one's experience through narrative and Sfard and Prusak's (2005) definition of identity: collections of stories

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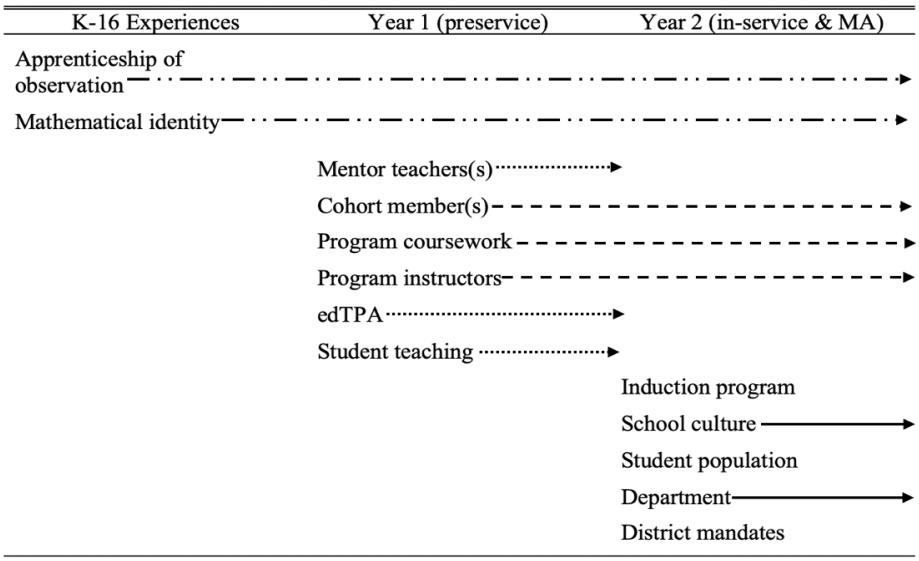
individuals hear and tell about themselves, frame this study. Autobiographies, whether written or verbal, provide individuals the opportunity to see influences and experiences that have affected their view at different points in time. Narratives provide individuals space to express to not only themselves, but others, who they are now, how they came to be, and where they think their lives may be going in the future. Rather than looking for conflicts between belief and practice, this work focuses on uncovering the interplay between community, belief/identity and practice. This research will focus on the key factors provided in Table 1, which have been associated with belief, mathematical identity and instructional practice in some manner. The aspects of what builds the foundational knowledge of instructional practice for preservice and in-service educators are rooted in their K-16 mathematics apprenticeship of observation and their mathematical identity. During the first year of a teacher preparatory program additional factors are added on: cohort mentor teacher(s), cohort member(s), program coursework, program instructors, edTPA and student teaching. All of these factors inform preservice teachers' instructional practice in varying ways. Results presented in this paper focus solely on the various relationships, connections and changes related to instructional practice upon entrance into teacher preparation through the preservice year.

Table 1: Factors guiding data coding that influence instructional practice for preservice and in-service educators over time.



Research Design

This small-scale study is taking place at a university in Northern California and began fall of 2016, with data collection anticipated to conclude spring of 2020. Currently, I have data from eight participants, three males and five females. Five of the participants have completed the first year of a two-year master's in education credential program and are teaching full time as the teacher of record in secondary mathematics classrooms. The remaining three participants are in the middle of the first year of the same master's in education credential program and are completing coursework and student teaching. My intent is to follow participants for three years, beginning with the teacher preparatory program and through their second year of teaching. I collected and analyzed four main categories of data for this study: a screener survey, observations of participants during methods class, coursework and interviews.

Data Analysis

Data were analyzed in a number of ways. First, each individual interview was transcribed and then coded according to constructs identified in the literature and natural emerging themes. These codes were then applied across the multiple data sources and finally a comparison across multiple participants was completed. The following excerpts are from one participant's data that was collected during year one of the teacher preparatory program.

Ophelia is currently teaching eighth grade math and she is on track to earning her Master of Art in education spring 2018. The different data sources include preliminary thematic analysis that begin to illuminate the connection between the factors of influence on Ophelia's instructional practice.

At the start of the program, Ophelia was asked to write a mathematics autobiography, which was shortly followed by a second paper on the topic of how Ophelia thought students learn math and how she defines math. In these papers, Ophelia shares her own personal struggles with learning mathematics and how these experiences have shaped her mathematical identity.

> The only aspect I didn't like about learning math was when the only way to solve a problem was by using an equation and the teacher wouldn't provide any explanation beyond just plugging the numbers into an equation. I would feel frustrated in not understanding why that worked or where the equation came from. Luckily, not all my teachers were like that, many would find a way to give us an explanation as to why we could use a certain equation.

Ophelia's apprenticeship of observation consisted of educators that created learning environments where students were able to approach problems in a variety of ways, as well as very didactic and teacher centered environments. The frustration expressed in the previous excerpt, is tied to Ophelia's mathematical understanding and how she viewed and situated herself as a mathematics learner different types of learning environments. In a later assignment, Ophelia re-emphasizes the struggles she faced learning mathematics during her adolescence. Learning environments where knowledge production was rooted in procedural understanding and memorization over those that focused on developing conceptual understanding did not provide her the opportunities she needed to achieve the mathematical understanding and confidence she desired.

> I was a student that used memorizing as my primary tool until I discovered I couldn't do that anymore for certain topics. I then had to find new ways to learn and deepen my understanding. I do believe new knowledge is constructed based on past knowledge that we have acquired.

During the interview Ophelia shared a variety of mathematical experiences, starting when she was a little girl practicing flash cards with her sister, up through college where she completed coursework and earned a Bachelor of Science in mathematics. When asked to share a positive experience about mathematics Ophelia shared stories centered around one specific teacher. When probed further about why this was such an important memory she elaborated:

> I think it was the topic and the teacher. He made it really exciting to learn. We would do a lot of neat projects, that we would do learning on our own and then bring it back to the class to share. And I think that was the first time I started struggling with math specifically, but I also, I was ok with the struggle – my teacher made that, something you didn't necessarily

> have to get the answer as long as you started working on the process that is what he was looking for and so I think that gave me a really good foundation and I realized it was ok to be wrong and struggle with math.

Ophelia then dives even deeper and provides additional evidence of the connection between mathematical identity, apprenticeship of observation and instructional practice. The following is from one of her weekly reflections:

> I am working on taking different approaches with them [students] and finding ways to improve. I noticed how if a student gave an incorrect answer, I wouldn't respond as well as I would have liked. I am still trying to find the balance of how to do it. I have tried supporting the student to try the problem again and I have said how the student's answer was an interesting answer and opened the question back up to the class to see if anyone got anything different. Each week I find a way to push myself more. I think I will see if my [mentor] teacher would be up for changing the warm-up format to not be as traditional and rather elicit students' prior knowledge.

As Ophelia discusses and reflects upon the struggles her and her students faced, she draws upon her apprenticeship of observation when indicating the type of instruction, she wants to enact in her classroom. Her mathematical identity is tightly linked to this apprenticeship, as she was exposed to learning environments where mathematical mistakes were not only valued but encouraged and utilized. Ophelia recognizes the danger of teaching students just procedural understanding and fact memorization. Her instructional practice is heavily influenced by her prior experiences. While Ophelia is trying to apply various ideas learned during her methods coursework, at this stage of the program Ophelia's mathematical identity, and apprenticeship of observation have greater influence on her instructional practice.

Conclusion

Preservice teachers need to reflect upon their past math experiences while active in the teacher preparatory program in order to make connections between how their experiences have shaped their conceptions of math and teaching. This research on the role of prior beliefs and experiences with mathematics and teaching might produce indicators for which candidates align with the underlying principles and educational philosophies of the program they are applying for. Knowing more about the mathematical history of credential candidates could inform teacher educators about the potential hurdles their preservice teachers might face when learning how to become effective teachers that are grounded in practices that foster high levels of conceptual understandings and promote equitable access to mathematical knowledge for their students.

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