Living Within the Tensions: The Impact of Competing Visions of Equity-Oriented Mathematics Teaching on Teacher Learning

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Abstract: Though much has been written about the disconnect between the vision of teaching offered in teacher preparation programs and typical practice in K-12 schools, there is little research about the lived experiences of teachers as they attempt to reconcile the contradictions they encounter across these spaces. This paper reports on one case from a design-based study aimed at supporting beginning elementary school teachers toward ambitious and equitable mathematics teaching. I investigate the experience of Marie as she attempted to enact her commitments to building an asset-based classroom math community while immersed in a school context focused on identifying and fixing students' individual mathematical deficits. Findings indicate that though Marie remained committed to this vision, her learning was heavily constrained by her school activity system, resulting in a steep personal cost for Marie. This case has implications for the analysis and design of equity-oriented teacher learning across the transition into teaching.

Introduction

Supporting pre-service mathematics teacher learning entails connecting what teacher candidates learn in their preparation programs with what they observe and experience in schools. However, common discourse and practice in K-12 schools often differ substantially from the vision of teaching and learning preservice teachers work toward during their preparation (e.g. Mehta, Theisen-Homer, Braslow, & Lopatin, 2015). For example, teacher preparation programs often provide grounding in sociocultural views of learning and in asset-based approaches to mathematics teaching, yet individual conceptions of learning and narrow views of mathematics tend to be prevalent in schools (Gutierrez & Vossoughi, 2010; Jilk, 2016). Related to these individual views of learning and narrow ideas about mathematics, one common conception of working toward equity in schools is of "closing the achievement gap" by finding and fixing student deficits in mathematical knowledge and skills. In contrast, in teacher preparation programs that emphasize sociocultural views of learning and asset-based approaches to working with communities, equity may be conceived of in much different terms such as creating more humanizing learning communities that build from the diverse mathematical resources each student brings to the classroom. As beginning teachers move between the worlds of their preparation programs and their experiences in K-12 schools, they often experience tensions as they encounter contradictory conceptions of mathematical learning and of equity (Ward, Nolen, & Horn, 2011).

Adding to this challenge, the support offered to beginning teachers tends to be geared toward generic teaching topics rather than toward an ambitious vision of teaching and learning (Ingersoll & Strong, 2011). Thus, new teachers are often left on their own to figure out how to navigate the ethical dilemmas that arise when they attempt to counter individual views of learning and deficit thinking about students that are common in systems of schooling. This can lead some teachers to either give up on their commitments or to give up on teaching (DeAngelis, Wall, & Che, 2013). Though there is ample research on these challenges, there is relatively little scholarship about the lived experiences of teachers as they attempt to navigate these contradictions across the transition into teaching or the impact these experiences have on teacher learning.

In this paper, I investigate the experience of one beginning teacher, Marie, across her teacher preparation program and first year of teaching as she attempted to enact her commitment to ambitious and equitable mathematics teaching. For Marie, the tension of being caught between worlds was particularly intense, given the high degree of contradiction between her school context and her preparation program and early career support. Marie voluntarily participated in a learning community of colleagues from her teacher preparation cohort (the author acted as facilitator of this learning community) intended to support beginning teachers to enact their commitment to ambitious and equitable math teaching. In the case presented here, I explore the lived experience of attempting to reconcile contradictory visions of math learning and of equity and examine the impact of these experiences on teacher learning. This case has methodological and practical implications for how we organize, study, and support equity-oriented teacher learning across the transition into teaching.

Theoretical and methodological approach

In this section I describe the vision for mathematics teaching and learning that formed the foundation of Marie's teacher preparation program and early career support. I then explain how research on social design and learning informed the approach I take to analyzing Marie's lived experience and her learning.

Ambitious and equitable mathematics teaching

Marie's preparation program and early career support focused on creating classroom math communities that are both ambitious and equitable. I join other scholars in using the term "ambitious" to refer to math teaching that provides students with opportunities to engage in cognitively demanding math tasks and considers the ways students make sense of these tasks to be central to instruction (Jackson & Cobb, 2010; Kazemi, Franke, & Lampert, 2009). Further, I use the phrase "ambitious and equitable" mathematics teaching to point to a particular conception of equity underlying the vision of math teaching that Marie was learning toward. Drawing on scholarship that interrogates the ways that our educational system continues to perpetuate disparate outcomes for different populations of students, I consider equity in mathematics teaching to entail disrupting dominant hierarchies of power and privilege to provide robust learning experiences for each student (R. Gutiérrez, 2008, 2013; Gutstein, 2003; Leonard & Martin, 2013; Martin, 2003). The math methods course Marie took during preparation and the learning community she was part of during her first year of teaching were founded on this vision of creating ambitious and equitable classroom mathematics communities that build from the diverse resources each student brings to learning mathematics.

Cultural-Historical Activity Theory and teacher learning

To investigate Marie's experience moving between the worlds of teacher preparation and systems of schooling, I draw on cultural-historical activity theory (CHAT). CHAT gives explicit attention to the role of contradictions and tensions in learning, particularly as participants move across different spaces (Engeström, 2011; Gutiérrez & Jurow, 2016; Gutiérrez & Vossoughi, 2010). In CHAT, human activity is the central focus of analysis, with examination of the different aspects of activity such as tools and resources, norms, and roles as they mediate learning toward a shared goal or object. By focusing on activity, CHAT provides a theoretical framing that accounts for the ways that aspects of systems afford and constrain learning as participants learn in different contexts. In taking the activity system as the unit of analysis, I conceptualize teacher learning as changes in participation in teaching activities over time (Rogoff, 1994). I consider "teaching" to include classroom teaching with students as well as the planning, reasoning, and reflection that shape what happens in classrooms. I draw on the idea of a figured world as a "socially and culturally constructed realm of interpretation" to conceptualize the ways activity systems afford and constrain the roles, practices, and meanings available to teachers (Holland, Lachicotte, Skinner, & Cain, 1998). For example, in the world of schooling, color-coded assessment reports are commonplace artifacts that communicate to teachers the importance of measuring and ranking individual student performance to identify who is "struggling" and to find and fix what students do not know. In the world of teacher preparation, artifacts such as classroom videos of collaborative math learning communicate a contrasting view of learning as a collective activity of heterogeneous meaning-making.

In this paper, I analyze Marie's lived experience by examining the ways Marie grappled with competing visions of mathematical learning and of equity and investigating the impact these visions had on her learning. I find that though Marie maintained her commitment to ambitious and equitable math teaching, over time she increasingly took up a more individual and deficit-focused view of mathematical learning in her discourse and practice that was closely aligned with the vision at her school site. I argue that her learning can be understood as a sensible response to trying to reconcile the irreconcilable while maintaining her position at her school site.

Methods

Marie's case is part of a social design-based research project investigating teacher learning across preparation and the first year of teaching toward creating ambitious and equitable classroom math communities (Author, 2019). For this study, I invited six beginning teachers from the same preparation cohort to join me in creating a teacher learning community (named Math Crew by participants) to provide support during the first year of teaching. I selected these participants because they had each expressed commitment to equity-oriented math teaching during their math methods course (of which I was instructor) and would be teaching in local K-5 classrooms during the 2016-2017 school year. For this proposal, I focus on the case of Marie because of the high degree of contradiction between the visions of mathematics teaching and learning espoused at her school site and the vision of Math Crew. I first provide some background about Marie's school context and then provide a brief description of the design of Math Crew to ground the analyses that follow.

Marie's school context

Marie taught first grade at Rise Up Charter School in a large urban city, which was also where she completed a full year of student teaching during her preparation program. The school reported the demographics of their student population as 95% Hispanic or Latino, 80% students who qualify for free or reduced lunch, and 60% designated English Language Learners. I provide this demographic information as it was invoked frequently by Rise Up staff and administrators as related to the school's mission to serve students who they did not think were being well served by the public school system. Marie had the most structured and frequent oversight of the teachers in Math Crew. She received instructional coaching from an on-site induction mentor and a literacy coach, as well as from her principal, all of whom visited her classroom regularly and gave her feedback on her teaching. Rise Up had recently received a large grant to be used for "personalized learning." With this grant, computer-based leveled programs and organizing the instructional block into small group rotations became regular parts of math instruction. In addition, Rise Up placed a heavy emphasis on "data-driven instruction", requiring teachers to administer frequent school-mandated assessments and holding discussions about assessment data during professional development meetings.

Math Crew design

During her first year of teaching, Marie voluntarily participated in the Math Crew learning community with five other members of her teacher preparation cohort. Math Crew was grounded in two structures: monthly community meetings and classroom visits (4-6 over the course of the year) from me as group facilitator. Participants were actively involved in co-designing Math Crew and thus activities during monthly meetings and classroom visits evolved over time to be responsive to the needs of the community. Different routines developed over the course of the year, including sharing success stories and dilemmas from the classroom, doing math together to support deep thinking about specific content, choosing and discussing focal students, and looking for strengths in student work and discussing how to build on them. During the first two Math Crew meetings, we worked together to formulate our shared vision for ambitious and equitable math teaching. Out of these discussions, the group decided to articulate our shared commitment as "building a classroom community where every student meaningfully contributes to the mathematical work of the classroom."

Data collection

Data sources include written reflections from the math methods course, video recordings of monthly Math Crew meetings, ethnographic field notes from classroom visits, audio-recordings of conversations with teachers during classroom visits, and audio-recordings of individual closing interviews with each participant. For the purposes of this paper, written reflections and audio recordings of conversations and interviews serve as the primary data source, with field notes and video of community meetings serving as supporting data sources.

Analytic methods

To analyze learning in Math Crew, I created detailed activity logs of community meetings, interviews, and conversations during classroom visits. These logs were segmented into 3 to 5-minute episodes containing notes about the content of the episode and observer comments about emerging patterns. The conversations were then transcribed and coded using an open coding process to capture different forms of teacher participation. To investigate Marie's case, I focused on her contributions in community meetings and interviews, the reflection paper she wrote about math teaching at the end of her math methods course, and field notes from my visits to her classroom. Across these data sources, I identified moments when Marie spoke about navigating conflicting visions of students' mathematical learning to analyze how she experienced these tensions and to look for shifts over time in the ways she talked about students, mathematics, and learning.

Findings

During teacher preparation and her first year of teaching, Marie consistently voiced a commitment to ambitious and equitable mathematics teaching and she tried to find ways to enact this commitment in her classroom. She also repeatedly described the ways she felt pulled between competing and contradictory visions of mathematics teaching and learning. In this section, I analyze how Marie wrote and spoke about her experience attempting to straddle these competing visions and the ways her talk about students and mathematical learning changed over time. I conclude by considering why her learning might have been sensible given specific features of her school context.

Grappling with tensions

In her final reflection paper for her math methods course, completed in May of 2016, Marie wrote about her vision for mathematics teaching, writing in part:

> It is too easy to fall into a deficit mindset with students; our assessments and teacher dialogues are often about identifying "gaps" in knowledge and being able to "track" and fit children into "types" in the name of differentiation and "closing the achievement gap." [….] I have learned to push against this kind of thinking, and encourage children to work together in ways that utilize and build off of each other's strengths – "We are smarter together" will be in big bold letters in my classroom somewhere, and children will know what it means.

In this excerpt, Marie's use of quotation marks around "gaps", "track", "types", and "closing the achievement gap" indicate that she questioned the premises of this common discourse about students and mathematics which emphasize hierarchical and deficit-focused sorting of students. She described herself as pushing against this type of thinking and articulated her commitment to taking a strengths-based approach to mathematics teaching with her students. Later in her paper, she described her worries about how she would be able to enact her commitments:

> At [Rise Up], we are moving into a multi-age model of learning mathematics. This means that students will most likely be assessed and grouped across grades 1-3 according to their "instructional needs" in mathematics. There is a part of me that is excited about multi-age math, but there is another part of me that is worried that this kind of math instruction model will turn into a procedural-fluency heavy curriculum, in which students rarely get to truly "dig in" to big ideas via more open exploration and discussion with their peers.

Here Marie explicitly named the concerns she had about the Rise Up model and the impact it might have on students' mathematical learning, particularly whether students would have a chance to "dig in" to mathematics together. In her paper she offered a specific plan for how she might incorporate more opportunities for mathematical reasoning and collaboration within the rotations plan, but then followed up her plan with the comment, "It just feels too rushed and formulaic, though, even as I am organizing and reasoning all of this in my mind. I know I need to build in flexibility so that I can be responsive to student needs, so I'm not really sure how to make a rotational model work *well* for students." This experience of tension and confusion while trying to balance conflicting views of mathematics, students, and learning in ways that were best for students was a theme Marie brought up throughout the year.

In October, I met with Marie before my classroom visit to talk about how math was going and to see if I could do anything to support her. During this conversation, Marie raised this sense of tension again:

> Marie: And the other question that's always in my head is that I feel like I'm not really getting any time to like work in a small group to do even more targeted, um, instruction. But, I'm conflicted about all of that too because, um, I feel like opposing recommendations. You need to like figure out where the (*uses different register and air quotes) '*gaps in student learning' are and provide targeted instruction when they're in small groups, and then, you know where, you—(*gestures toward facilitator*), the other half is, okay, we're focusing on student strengths and students should be talking with each other and I should be purposefully putting students together in groups where strengths are balanced, and that feels like…
>
> Facilitator: A tension for sure! (*laughs*)
>
> Marie: (*laughs*) So I'm like, Aaaah. Right now I feel like I'm not really doing either.

After more discussion about Marie's math curriculum and math instruction, the conversation returned to this issue, and Marie concluded, "It's really hard because it feels like a deficit conversation and a strengths conversation and I can understand both, but it's really hard to know, like how to actually make sense of both of those conversations in a way that's best for kids and their learning."

In this conversation, Marie described the ways that she felt pulled between "opposing recommendations", named that she can "understand both", and then voiced her confusion about what to do. Marie's comments about her struggles to make sense of the contradictions she was seeing "in a way that's best for kids and their learning" highlight one of the reasons these contradictions were so troubling for Marie. The contrasting views of learning and of children that she was hearing (what Marie named as a "deficit conversation and a strengths conversation") were intertwined with differing conceptions of equity. At her school site, equity was conceived of as closing the achievement gap by fixing student deficits, whereas in Math Crew equity was conceived of as creating new

possibilities for students by building classroom communities that leverage the diverse mathematical resources each student brings to learning. Each conception of equity makes an implicit claim about what is "best" for students. It is evident in her talk that Marie cared about supporting student learning and was grappling with how to make sense of these competing claims. Marie consistently reported that the messages she received at her school site were oriented toward finding and fixing student deficits and that the only place she heard any alternatives was in Math Crew.

In February, Marie brought up her feelings of tension again during a focus group interview with an interviewer not affiliated with the project. During this part of the interview, teachers began speaking about the pressures they experienced at their school sites. Marie spoke about feeling pressured with respect to student achievement:

Marie:	I feel this incredible sense of urgency from admin, and I feel it too. I mean I know that my kids are well below grade level, most of them. And so having that pressure to get your kids up to grade level, improve your data, does make it difficult.
Interviewer:	Your kids are well below grade level in first grade?
Marie:	Yeah (*turns palms up and puts hands out, raises eyebrows*). But I feel like with [the facilitator's] support and guidance and permission, I've almost like flipped to the other side where I'm like fuck this assessment. I don't care how you perform on this assessment to be honest. I want you to feel good about what you're doing and I want your math identity to be growing from wherever you're at right now. Like I seriously do not care how you perform on this assessment. So I almost feel like this (*puts hands in front of her, palms facing out and pretends to push out*), I just want to resist, resist, the more that this sense of urgency and this pressure is coming down on me. I'm just like whatever, I want my kids to be happy. I want them to love math. Okay, 'we're going to do this test. I want you to work on your own, so that, I can have an idea of how you're doing, but whatever. How you feel is more important.'

Here, Marie spoke about what it felt like to receive messages of "urgency" from her administrators and about the pressure that she felt "coming down" on her. She also talked about wanting to resist, but her forms of resistance were more highly constrained than in her reflection paper and during the conversation in October. In her reflection paper, Marie used quotation marks around "gaps", implying that she questioned the premise of this way of thinking about mathematical learning. In October, she used a different tonal register and air quotes to refer to "gaps in student learning" to indicate her skepticism about this framing. However, during the focus group interview, Marie described her first graders as "well below grade level" without air quotes or any other indicators that she questioned this deficit framing of her students. Even when the interviewer pressed her on this, she raised her eyebrows but responded, "yeah." What she chose to resist was not whether her students took the assessments or whether these assessments were a meaningful measure of student learning. Her resistance was constrained to not caring how students performed on the assessment; she was no longer questioning the underlying premise of these assessments and the ways they cast her students as deficient.

A detailed analysis of Marie's classroom teaching is beyond the scope of this paper. However, to provide further evidence of Marie's learning over time, I offer a brief summary of the ways her discourse aligned with shifts in her classroom teaching. Over the course of the year, Marie learned to implement a model of small group rotations that was heavily encouraged at her school site. In October, she began splitting her 24 first graders into two groups for two 25-minute rotations. One group worked on a lesson with Marie while the other group worked through a leveled math program on computers. By January, at the urging of her coaches and administrator, Marie had begun splitting her 24 students into 3 groups, a structure she kept for the rest of the year. During each math period, the groups moved through three different 12-minute rotations: meeting with Marie on the carpet for a lesson, working independently on an online leveled math program, and playing math games with a partner. During my observations, the remainder of class time was spent giving instructions for how to rotate through the stations and facilitating a short (5-7 minute) whole class math activity. Marie learned a lot about how to implement and monitor small group rotations with first-graders over the course of the year. She got better at managing this practice over time, spending less time on directions, and using her time more efficiently with her small group. Students learned how to move through these rotations independently. During my observations, it was evident that they knew where to go at what time and they knew what they were supposed to do during each rotation. As Marie

moved toward this model, students had fewer and fewer opportunities to collaborate and to discuss their mathematical ideas, or in Marie's words, to "truly 'dig in' to big ideas via more open exploration and discussion with their peers." This shift in her teaching aligned with the vision at Rise Up of working toward equity by closely monitoring individual student progress through use of the online leveled math program and small group instruction during rotations.

Learning within activity systems

To understand these shifts in Marie's discourse and in her classroom teaching, despite her commitment to ambitious and equitable mathematics teaching, it is necessary to consider Marie's experience at her school site. As described in the methods section, Marie had more site-based new teacher support than other Math Crew participants. She was observed frequently by her induction coach, her literacy coach, and her principal. Though these were intended as a form of support, during interviews, Marie suggested that she did not experience it that way, commenting "This year has been really hard for me, particularly because I've had to do a lot of different types of interactions with coaches, and principals, and other teachers, and I tend to do a lot of reflection anyway. And for me, I guess, having to do a lot of shared reflections and talking with so many different people about what I was thinking about before the lesson, what happened during the lesson, what happened after, what I want to work on, um, I don't know, I don't want to sound ungrateful, but it's been a lot for me." In addition to the exhaustion of the reflection and feedback, the constant oversight meant that Marie's teaching choices were monitored quite closely and that she had frequent conversations in which individual, deficit-focused views of students' mathematical learning were reinforced.

During this time, Marie also participated in Math Crew. However, her participation in Math Crew decreased over the course of the school year. She attended 4 of the 5 community meetings during the first half of the year, and only 1 of the 4 meetings in the second half of the year. In her closing interview Marie spoke about this choice, commenting, "I wanted to, like in my heart, opt in to Math Crew. But it felt like, all of my other obligations related to school were mandatory, even if they weren't and even if I really wasn't getting that much out of it. And even if it was like one of those 'grin and bear it' for the next two hours." Marie's use of "in my heart" provides evidence that Marie's commitment to ambitious and equitable math teaching continued to matter to her but that she did not feel able to act on it in the ways she hoped.

The combination of the intense oversight of her teaching practice at her school site and her decreased participation in Math Crew over time meant that Marie was increasingly immersed in her school activity system, with little to balance or counteract the messages she was receiving about students, about mathematical learning, and about what it means to work toward equity. In addition, Math Crew was a voluntary commitment, whereas the support she received at her school site was directly tied to her employment, and thus were in no way equal in weight or importance. Given these realities, it is not at all surprising that what Marie learned aligned much more closely with her school activity system than it aligned with her enduring commitment to ambitious and equitable mathematics teaching.

Conclusions and implications

Marie learned what she had to learn to survive in her teaching position. However, this learning was in conflict with Marie's own commitments, and exacted a steep personal toll. Two years after the conclusion of the study, I learned that Marie left Rise Up after her second year, had not returned to the teaching profession, and was not sure whether she would ever teach again. Marie's case points to the need for us as researchers and as teacher educators to take seriously the political and ethical dilemmas of teaching within systems of schooling and the impact these dilemmas have on teachers. As teacher preparation programs increasingly prepare teachers toward a vision of more humanizing classroom communities that build from the assets all students bring to learning, the types of tensions and contradictions Marie experienced will likely become more common and pronounced. If we hope to transform deficit-focused systems of schooling, we must provide beginning teachers with much more robust community-based support to navigate the dilemmas of working toward a vision that diverges from dominant discourse and practice in schools. By investigating the lived experiences and learning of teachers as they attempt to reconcile deeply contradictory visions of teaching and learning, we can begin to re-imagine how we might support the transition into teaching to create new possibilities for learning.

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