

PROSPECTIVE TEACHERS' PERCEPTIONS, BELIEFS, AND DISPOSITIONS TOWARD STUDENTS' FAMILY, COMMUNITY, AND CULTURE

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Research has repeatedly documented that teachers are underprepared to teach mathematics effectively in diverse classrooms. We believe critical aspect of learning to be an effective mathematics teacher for diverse learners is developing knowledge, dispositions, and practices that support capitalizing on children's cultural, linguistic, and community-based knowledge and experiences in mathematics instruction. This study examined beginning perceptions, beliefs, and dispositions of prospective teachers (PSTs) toward students' family, community, and culture. Results indicate that PSTs hold a range of beliefs based on how they see the resources and supports available to students in the home and community, how they compare and contrast themselves with their students and the students with each other, and how they see the nature of the relationships that can and should be formed by teachers with students and families.

Keywords: Equity and Diversity; Teacher Beliefs; Teacher Education—Preservice

Research has repeatedly documented that teachers are underprepared to teach mathematics effectively in diverse classrooms (Kitchen, 2005; Sleeter, 2001). While there is significant research related to preparing teachers to work in diverse classrooms, little of it addresses the specific challenges and resources of learning to teach *mathematics* to diverse learners (for exceptions see Aguirre, 2009; Foote, 2009; Kitchen, 2005; Moschkovich & Nelson-Barber, 2009). One component of learning to be an effective mathematics teacher for diverse learners is developing *knowledge, dispositions, and practices* that support capitalizing on children's cultural, linguistic, and community-based knowledge and experiences. Also relevant are dispositions and practices that support eliciting and incorporating this knowledge into mathematics instruction (e.g., Civil, 2007; Ladson-Billings, 1994; Leonard, 2008). Research documents that historically underrepresented groups benefit from instruction that draws upon their diverse cultural, linguistic, home, and community-based knowledge (Ladson-Billings, 1994; Lipka et al., 2005; Silver & Stein, 1996). This research has argued that teachers need to understand how children's *funds of knowledge*—the knowledge, skills, and experiences found in children's homes and communities—can support children's mathematical learning (Civil, 2002; González, Andrade, Civil, & Moll, 2001). And yet there exists a gap in lived experiences between the largely White middle-class teachers and their ever more diverse students (Howard, 1999; Wiggins & Follo, 1999) that may influence their ability to do just that.

This study is part of a larger research project entitled Teachers Empowered to Advance CHange in Mathematics (TEACH MATH). The overall goal of this project is to transform preK–8 mathematics teacher preparation so that new generations of teachers will be equipped with powerful tools and strategies to increase mathematics learning and achievement in our nation's increasingly diverse public schools. In this paper we examine the beliefs, perceptions, and dispositions that prospective teachers (PSTs) bring to the mathematics methods class. In preparing PSTs, it is important for mathematics teacher educators (MTEs) to understand the range of PSTs' beliefs, perceptions, and dispositions so that MTEs can support PSTs in valuing what students bring to school rather than looking at homes and communities from a deficit perspective. Insights from this paper may serve to shape how MTEs interact with PSTs around issues of supporting the development of effective mathematics instruction (Ball & Tyson, 2011).

In previous work (Turner et al., 2012) we presented a hypothetical trajectory for PST learning. Drawing on Mason (2008), one phase of this trajectory includes a focus on initial practices of *attention* and *awareness*. *Attention* refers to *what* teachers attend to, including what they notice (as well as what they fail

to notice), and the depth and detail of their attention. Mason argued that a key role of teacher educators is to direct PSTs' attention to relevant practices, theories, and ideas that can guide their decisions and actions when teaching. One particular form of attending to specifics Mason refers to as *discerning details*. In cases we will discuss in this paper, PSTs are discerning details when they attend to the specifics of children's home and community contexts.

Awareness refers to understandings, insights, knowledge, and beliefs about teaching and learning mathematics. While attention refers to *what* teachers notice, awareness refers to *how* teachers interpret what they notice (Mason, 2008). Mason described the role of the teacher educator as one of educating awareness, both so teachers are more cognizant of their own knowledge and beliefs and to help teachers develop core types of awareness that support effective mathematics teaching. What PSTs attend to and how they interpret or assign meaning is influenced by the beliefs and dispositions they bring to observing and working with students.

We are attempting to support PSTs in developing a positive stance toward students and their families and communities. We hope that in accessing PSTs' notions, we can confront deficit thinking in the mathematics methods classroom so that PSTs are indeed better prepared to teach the diverse students they will meet. We nonetheless have seen (Turner et al., 2012) that PSTs' awareness is often inconsistent with a positive stance. Mason (2008) referred to such inconsistencies as *fragmented awareness*. As the findings from Turner and colleagues demonstrated, fragmented awareness was often evident in PSTs' comments about the role that families and communities play in supporting children's mathematics learning. Although PSTs spoke about families as capable of encouraging children's learning and supporting the development of mathematics skills (i.e., families as resources), at the same time, they framed certain characteristics of some families and communities as deterministic and detrimental to children's learning, particularly a lack of English proficiency and a low socioeconomic status (i.e., deficit-based view of families/communities). In this paper, we examine more specifically both early positive and deficit notions of children's families and communities. One research question for the larger project is: What is the nature of PSTs' knowledge and beliefs related to integrating children's mathematical thinking and children's cultural, linguistic and community-based funds of knowledge in mathematics instruction? In this study we are focusing on PSTs' initial self-positioning by asking: What is the nature of PSTs' knowledge and beliefs with regard to children's family, culture, and community?

Methods

This study draws on interview data from 17 participants interviewed either at the beginning or the end of the semester (or in some cases at both junctures) [9 pre and post; 4 each pre or post] while they were enrolled in an elementary or middle school mathematics methods course. Participants were selected from a group of approximately 200 elementary and middle school PSTs enrolled in mathematics methods courses at six university sites that represent a diverse range of teaching contexts (i.e., urban; a mixture of urban, suburban, and rural; suburban; and borderlands). These PSTs participated both in pre- and post-course surveys. The surveys included 18 Likert-type items, six short answer responses, and between two and four instructional scenarios (pre-survey only). Follow-up interviews to the survey were conducted with 17 PSTs at three of the universities (one on the east coast, one in the western region, and one in a borderlands region in the southwest). During the interview PSTs were asked to clarify and expand on their answers to a number of the survey items. The interviews were audio-recorded and transcribed for analysis. These interviews serve as the data source for this paper.

Three pairs of researchers worked on the initial coding of data, using a set of codes that emerged from the research question. These codes included such things as PSTs themselves as teachers, students as learners, and the role of language and culture in the learning of mathematics. HyperResearcher, a coding software, was used in the coding process. Each interview was coded twice by pairs of researchers. These pairs then met to discuss discrepancies in coding until there was agreement on the coding of each interview passage. We define a passage to be a number of lines of interview text that addressed one of the ideas we were examining. Codes were then collapsed and refined, and the data were reorganized by these new categories. Different pairs of researchers began work on subsections of the data. One of these subsections

included data that had been coded in the first round with codes that pertained to family, culture, and community both generally and as they pertained to the teaching and learning of mathematics. This subsection of data is the one that was analyzed for this study. These data were then coded using an open-coding scheme (Bogdan & Biklen, 2006). After an initial pass through this subset of data, codes were collapsed under three themes - all from a perspective of learning mathematics. Coding of passages with more than one of the three themes was allowed.

Results

The three themes that emerged from the data were: resources and influences of home and community, sameness versus difference, and relationships between teacher and student/parent. In the sections that follow, we discuss the results in relation to each of these themes in detail.

Resources and Influences

There were 90 passages that were coded with the resources and influences code, making this theme the most prominent of the four themes with slightly more passages being coded with this theme than with the other three combined. This theme encompassed responses that pertained to how students' backgrounds, families, and communities serve as resources or influence the teaching and learning of mathematics. The discussion of resources and influences was not always positively oriented and this collection of passages also included instances discussing a lack of resources or negative influences on students. There were two orientations that we noticed in examining these passages. In one orientation, PSTs positioned mathematics as a school activity, and in the other they discussed how teachers need to understand, value, access, and search for ways to build on the knowledge that children bring to school from their homes and communities.

Mathematics as a school activity. Within this orientation toward school mathematics, PSTs (a) indicated reasons why children may not be receiving support at home, (b) characterized the resources available in the home and/or community as those that can or should be mustered in the service of supporting the teaching of mathematics in school, or (c) discussed ways in which the school needs to take responsibility for supporting children who they characterize as not receiving support at home. About half of the passages expressed an orientation toward mathematics as a school activity.

In discussing reasons why they believe children may not be being supported at home, PSTs often in some way indicted the home environment. PSTs indicated that there may be no one at home who can help the student. Sometimes a deeper understanding of the situation was evident as some PSTs also said that this could be due to parents working multiple jobs. "If the parents are working two jobs and aren't home when the students come home [they won't be able to] reinforce that the students should really spend time doing [homework] and learning from school."

PSTs put significant emphasis on the importance of the home in mathematics learning and often explicitly named practices that SHOULD be going on in the home in order to support the learning of school mathematics, saying such things as, "Being successful in [math] depends even further on what's going on at home." "If they're not getting anything [i.e., help with homework] at home and they're just getting it at school it's going to be harder for them." PSTs also suggested that parents should take responsibility for relating activities that occur in the home or community to mathematics. "They could go to the grocery store and have their child work on math. They could have their kid sit next to them while they're doing their bills."

In discussing the importance of home support for school learning, PSTs mentioned that some homes have fewer material resources for parents to draw on, and therefore may be less able to help. "In a very poor community, then you might not have all of the availability that others from say a better socio-economic class would really have." In the following passage, the PST did not talk about deficits in the home, but rather mentioned that the help and support at home might be inconsistent with school mathematics teaching and thus contribute to underperformance.

If the student doesn't understand math most of the time they go to their parents for help. And if their

parents are teaching them a different way than what the teachers are teaching . . . the teachers need to understand that.

One final focus within this orientation was raised only a few times and so represents the view of a minority of participants. In these passages, PSTs mentioned what schools should do in order to support students whose families are not able to provide support at home. Within these passages, although there is an inherent belief that the home is not providing support, the focus is shifted from merely recounting these failings to elaborating on what the school should do to make up for this perceived lack of support. For example, one PST said,

Some children don't have the time they need at home with their parents to help them and what not, so in the classroom you may need to give the student more time or give them work. . . . I guess it's more taking into consideration the individual child's home environment, how to mesh what you do in the classroom with what goes on at home.

Teachers need to build on knowledge students bring from home. The second orientation within the category of resources and influences focused on the need for teachers to understand, value, access, and search for ways to build on the knowledge that children bring to school from their homes and communities. About half of the passages were coded as reflecting this more positive orientation toward families. Within these passages PSTs indicated understanding that all children have experiences at home that may be leveraged in the mathematics classroom if the teacher accesses them. PSTs said such things as, “the ideas for what your context of your problem would be based on family issues or community issues,” and “I think [mathematics] is going to be more meaningful if they investigate things that are happening in their lives or their community.” PSTs also indicated that it is the responsibility of the teacher to access these practices. One PST noted,

I think teachers, let's say after they do the family conferences, could find something that all students have in common, or that the families have in common, and implement that into the curriculum. And I think they should let students kind of draw on that to solve mathematics.

PSTs mentioned specific activities that might serve this purpose. “They cook with their grandmother, and they calculate measurements and then things like that they can use that to do math problems in the classroom.”

In addition, this code was used to capture the few times in which PSTs discussed how school mathematics could influence what was happening at home, suggesting that the link between home and school is bi-directional, with home practices being available for use in school and school mathematics practices being available for use at home. One PST suggested that while studying measurement, families could support children in applying measurement concepts and skills at home by engaging in a “home improvement project.”

Sameness and Difference

A second theme that emerged from participants' responses is one of sameness and difference. Within this theme participants compared and/or contrasted such things as culture, race and ethnicity, home and family life and resources, communities, and mathematical skills, abilities, and performance. The comparisons/contrasts made by the PSTs were of two orientations: (a) those that made comparisons among various groups of students and their families, and (b) those that made comparisons between PSTs and the students and families about whom they were speaking. There were 50 passages that were coded with the sameness/difference code.

Comparisons among students and families. Within this orientation, PSTs compared students and/or their families and family-community circumstances in one or more of the following ways: (a) differences in support or differences in circumstances that students have at home, or (b) differences in the knowledge bases that students brought to the classroom.

In some cases the differences in home circumstances were looked on positively by the PSTs. For example, one PST noted, “It doesn't really matter whether or not the parents are educated or not, and know the information themselves. . . . They can help the student find the information they need with the resources in the community.” In other cases, PSTs focused on situations where family resources were limited or family circumstances did not support family involvement in schooling. In these cases some of the PSTs saw these situations as negatively impacting success in mathematics as with the PST who said, “If they're not getting anything at home and they're just getting it at school it's going to be harder for them.” Other PSTs, on the other hand, saw them as instances in which the school needed to be more involved. “I think that, where students may not get it at home, it is important for teachers to bring it in.”

In most instances PSTs saw the different knowledge that students brought to the classroom as something that teachers could learn about, and should be aware of. In addition, some explicitly discussed how they might build on this knowledge in instruction. In a couple of instances PSTs discussed differences in computational or problem solving strategies that parents might employ when helping children compared to what they might be learning in school. In discussing how she would react to a student who brought to the classroom a division algorithm learned at home, one PST said she would put the example on the board and ask, “Has anybody else seen this before? And go from there. That could be your starting point.”

Comparisons between PSTs and students. PSTs at times made some type of comparison between themselves and their circumstances and the circumstances of the students they worked with. One major focus was the significance of help and support for the learning of mathematics. PSTs presented the view that their families had helped them with homework and emphasized how important it was for families to be supportive in this way in order for children to be successful with mathematics learning. A small number of PSTs shared that for different reasons they had not had help with mathematics at home, suggesting by contrast that if students don't have help at home it isn't necessarily something that interferes with academic success.

Other PSTs discussed their own experiences interacting with parents or university teachers around non-school type mathematics. They suggested that these informal encounters with mathematics were likely to be available to all students. “Doing fractions and I would think a lot about cooking because I like to bake with my mom and so I can draw on my baking experience to help me with math because then I can visualize what's a fourth or what's four ounces.”

Relationships

A third theme that emerged from participants' responses was how they have, intend to, and/or need to build knowledge about and/or relationships with students, their families, communities, and culture. There were 25 passages that were coded with the relationships code. There were three major orientations from which PSTs discussed these relationships: (a) specific ways in which teachers could be involved with parents or make connections to the family or community of the students, (b) relationships with students and their families/communities in terms of a general orientation that they had toward parents, and (c) challenges involved in getting to know the communities to which students belonged as well as difficulties incorporating community knowledge into mathematics teaching.

How teachers can connect with families. The most prevalent views on relationships with families and communities fell into this category, with some PSTs having more than one idea as to how to forge these connections. One idea presented by several PSTs related to drawing on home/community knowledge in instruction. Another idea discussed by others was communicating with parents in specific ways. Some of these included home visits, student interviews, email or phone communication with parents, questionnaires sent home, and family conferences where families are invited to share information with the teacher. (This stands in contrast to parent-teacher conferences where the parents come to learn from the teacher how their child is performing in the school setting.) One PST suggested that school-based events were sometimes difficult especially for parents from non-dominant groups, and mentioned that she would like to organize a fun family activity: “I would see myself planning, like, a family picnic and having all the students come with whoever they want, their parents, brothers and sisters.”

A general orientation toward parents. PSTs also discussed in general terms their orientations toward families and their expectations or plans for connecting with them. These included such ideas as “keep[ing] in contact,” “talk[ing] to parents as much as possible,” and “know[ing] our students.” Some PSTs understood that there were things that they could learn from parents. One said, “I think as much communication as possible [is important], and also as much listening. Parents are going to have ideas; they’re going to know their kid way better than you are.” Some of these passages, however, indicated a deficit orientation toward families or a lack of faith that all families are prepared to support student success. One PST, for example, said, “[Parents] play a big role. It just depends on whether it is a positive one, or a negative one.”

Challenges in developing relationships with parents. A few PSTs discussed challenges they might face or difficulties they might confront in interacting with or drawing on community resources. The lack of familiarity with and understanding of students’ home and community contexts due to having grown up in a different environment or being new to the school community was one challenge that was articulated.

Discussion and Implications

PSTs bring beliefs and dispositions to the methods class that inform (a) what they attend to, and (b) the awareness they bring to the interpretation of that attending. In the above results we see PSTs struggling with multiple perspectives on students’ family, culture, and community. While we see considerable positive thinking about the resources families and communities offer children, we also see considerable deficit thinking from PSTs. These negative views can be hidden and subtle—but it’s important for MTEs to recognize that, as our data indicate, many PSTs hold these negative views. We see that these views are based on how PSTs are attending to and interpreting evidence they gather from working with and talking to children and cooperating teachers.

Some of the deficit thinking may be due to the fact that PSTs have a limited perspective on the role of parents. Some of it is because PSTs hold a deterministic view of parents and families, thinking that a non-English home language or a lower socio-economic status means that children necessarily lack resources in their homes and communities. MTEs need to support PSTs in broadening their perspectives to see that parents can educate their children in other ways than helping with homework. For example, instead of “feeling sorry” for the child who helps her mother pay bills because her mother doesn’t read English, we can support the PST to consider that this child has an opportunity to apply mathematics in a real-world context.

At the same time, we are encouraged by the number of PSTs who saw families and communities as full of resources that the teacher could draw on in the classroom. This indicates that at least some PSTs have adopted a cultural affirmation approach to difference (Brenner, 1998). Not only did some PSTs recognize the resources present in children’s lives, they also articulated how they could bring this knowledge into the classroom. These are instances in which PSTs are discerning details about children’s lives outside of school when they attend to the specifics of those children’s experiences (Mason, 2008).

A prevalent idea held by PSTs is that responsibility for success in mathematics rests in the home as opposed to the notion that the responsibility rests in the school. PSTs need support in seeing that they can be active agents of change, supporting students’ academic growth and taking responsibility for their learning, instead of assigning that responsibility to parents. PSTs can be supported to see that drawing on resources children bring to school will assist them in this effort. Drawing on those resources involves becoming a culture broker (Gay, 2010). This involves getting to know students and their circumstances, competencies, experiences, and interests. It also involves making connections with parents and families to tap into the vast and useful knowledge they have of their child. From the Relationships findings, it seems clear that many PSTs are not only attending to the need to establish these kinds of connections, but also considering practices that might help them in meeting this need. However, the tendency of PSTs to think in terms of Sameness and Difference tends to construct children and their families in ways that limit the kinds of connections and relationships PSTs can build. Here, again, we see the fragile and often conflicting ways

in which PSTs are making sense of the roles of teachers, children, families, and schools in teaching and learning mathematics.

The results of this study can shape how MTEs approach PSTs and the views they bring to the methods classroom. It is important to be aware of the views that PSTs bring to their mathematics teacher preparation and to be aware that in the early stages of this preparation, the awareness of many is fragmented (Mason, 2008) and includes deficit thinking. An encouraging note is that many PSTs do bring positive views of families and communities that provide a balance for the negative views and moreover can serve as an entry point to challenging those negative views.

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