

Bilingual Pre-Service Teachers Grapple with the Academic and Social Role of Language in Mathematics Discussions

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Effectively engaging students in mathematics discourse is challenging, especially in a language other than the one in which you learned mathematics. Teachers must manage the academic as well as social function of language. In Spanish-English bilingual classrooms in the US, changing the language of instruction to Spanish may not be enough to disrupt entrenched patterns of mathematics participation, resulting in continued marginalization of Latino students. In this article, I describe what our bilingual pre-service teachers (BPST) learned through a mathematics methods class taught in a fifth-grade classroom of a local, urban, bilingual immersion elementary school. I reflect on my experience as a bilingual mathematics teacher educator and analyze BPST reflections on their successes and challenges as they learned to lead mathematics discussions in Spanish while developing attention to power dynamics among their students. Through the field experience, BPST became more comfortable with academic vocabulary in mathematics and using techniques to involve many students in the discussion. Yet they struggled with explicitly positioning Latino bilingual students as important mathematical thinkers in a classroom in which White, English-dominant students tended to participate most in mathematics discussions. Implications for bilingual teacher

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education include the need to support bilingual teachers in developing academic Spanish for mathematics as well supporting BPSTs to notice and manage power issues related to language, race, and mathematical competence during mathematics discussions.

Language, Privilege, and Mathematics

Organizing and leading mathematics discussions is multi-faceted, complex work (Stein, Engle, Smith, & Hughes, 2008). Mathematics discussions must serve as *instructional dialogues* (Leinhardt & Steele, 2005) in which student thinking is elicited and refined. In the midst of discussion the teacher must manage student interactions, social and academic positioning of the students, while also moving the students towards a mathematical goal (Lampert & Cobb, 2003; Lampert, 2001). Scholars in mathematics teacher learning have documented how difficult it is for pre-service teachers (PSTs) to learn the skills necessary to lead mathematics discussions that have a mathematical goal, but also how it is possible to create experiences in mathematics methods courses that support the development of these skills (Ghousseini, 2009; Tyminski, Zambak, Drake, & Land, 2013). In addition, PSTs must learn how to engage students with different *social and academic statuses* in the discussion (Featherstone, Crespo, Jilk, Oslund, Parks, & Wood, 2011), which requires attention to who is accessing the academic language but also how students are positioned in relation to each other as mathematical thinkers. These challenges are compounded for bilingual pre-service teachers (BPST) in the U.S., who are often learning to teach mathematics in a language in which they themselves did not learn it.

When BPSTs have not had the chance to do mathematics in the language they will be teaching it, they may struggle with the academic language (Guerrero, 1997). To further complicate matters, the rich variety of Spanish-speaking communities leads to a variety of Spanish languages in the United States (Lipski, 2008), resulting in no one single academic language in multi-lingual classrooms (Bunch, 2014; Valdez, 2004). Also English is positioned as the correct language in which to learn academic subjects, described by some as the hegemony of English (Macedo, 1997). The hegemony of English can lead students at times to reject a teachers' attempt to engage them in mathematics in Spanish (see for example Vomvoridi-Ivanovic, 2012), and can help relegate Spanish to a second-class language in the classroom despite research that shows students' first-language is a resource for learning mathematics (Gutierrez, 2002; Moschkovich, 2007).

Such language issues are compounded in the context of Spanish im-

mersion bilingual education, where ostensibly Latino Spanish-speaking students should have a cognitive advantage through which to access learning. But Latino students may not participate more just because mathematics is taught in Spanish if other support structures are not put in place. This is because a change in the language of instruction may not be enough to challenge entrenched patterns of Latino under-achievement in mathematics. What this means for teachers in bilingual classrooms is that we have to recognize how different privileges and power dynamics play out in our classrooms, especially when it comes to participating in the academic discussions of a high-stakes subject like mathematics. We have to attend to whether Latino students are able to take advantage of the language of instruction supporting their linguistic identities in ways that support their academic development, and whether they are able to be positioned (by teachers or students) as good mathematical thinkers.

The dual function of language in the mathematics classroom as having an academic role in learning mathematics and having a social role of serving to include or exclude students from participating is important to help BPSTs understand. Bilingual PSTs need to be supported to have a multi-layered mindset about the function of language, and to attend to how linguistic competencies are functioning both to help students learn the mathematics and to positioning students as competent resources for everyone's learning.

In this article I explore how BPST learned to attend to the academic and social function of language through experiences leading mathematics discussions with fifth graders in an urban, dual-immersion Spanish-English school with live support from teacher educators. Though I focus on the cases of bilingual Spanish-English teachers it should be noted that Cantonese-English, Korean-English and other bilingual certification contexts may be important to explore for similar situated language and power issues. The case of Spanish dual language immersion is important to focus on because of the large and growing population of students in the US whose home language is Spanish (Brown & Patten, 2014), creating a high demand of Spanish speaking teachers, and in the context of our teacher preparation program based in California. In addition, the immersion contexts, in which both English and Spanish are used to teach academic subjects, bring language issues to the forefront of concerns for many bilingual teachers.

Supporting Attention to Academic and Social Positioning of Spanish with Bilingual Pre-Service Teachers

For the past two years, I have partnered with Miguel,¹ a fifth grade

teacher in a dual language immersion school, to teach some sessions of my math methods course for bilingual Spanish-English pre-service teachers in his classroom. Mediated field-experiences in which a university-based educator partners with a classroom teacher to instruct methods courses are useful ways to bridge the theory-practice divide ubiquitous to teacher education programs (Bier et al, 2012; Zeichner, 2010). In mathematics methods courses, researchers have found that taking on manageable pieces of instruction with small groups of children has benefits for pre-service teachers that include helping them attend to equity-oriented teacher practices and dealing in real-time with teaching dilemmas (Bier et al, 2012; Campbell, Cunard, Dunleavy, Kazemi, & Zavala, 2011; Ghouseini, 2009). However the research on mediated field experiences and approximations of practice have been in classrooms where instruction is in English. The benefits for BPST in bilingual settings requires research. This study helps fill that gap.

We began this course because of my interest in a field-based methods course and Miguel's commitments to fostering the next generation of teachers. He had been part of a multi-year district-wide initiative supporting fourth and fifth grade teachers to teach through mathematical problem solving and deepen teacher content knowledge. Through that program, Miguel had restructured much of his mathematics teaching to include open-ended problem solving tasks and routine mathematical discussions like *number talks* (Parrish, 2010). For example, Miguel might start his students off in a typical math lesson with a mental math problem, then lead students through a discussion in which they shared strategies, discussed each other's strategies, and then tried applying different strategies to a new problem. The lesson would then continue with seat work related to the number talk. He was seen as "the math guy" at his school. He and the other fifth grade teacher split the fifth grade by subject, with Miguel teaching mathematics and social studies twice a day. When we met, it was apparent that we defined effective mathematics teaching similarly.

We began our partnership with me proposing activities and a structure for the field-based days and Miguel reshaping based on goals he had for his students. Though I was in charge of the BPST while they planned, together we managed these field-based sessions like live professional development: student teachers tried out and planned the activities at the university campus with me, then we went to the elementary school and they taught in small groups in Miguel's classroom. Often they video recorded their teaching using smartphones or tablets so that they could review it during the debrief. Finally, the fifth grade students left for the day and we stayed and debriefed for another hour. The focus of our time in

Miguel's classroom was how to lead math discussions. One day we started with Miguel modeling how he leads a number talk; on another day we started with the teachers launching a word problem, and then finished with a discussion based on the student work. For the sake of time I selected the activities, but student teachers have a lot of freedom to adjust the problems and decide on their approach to how they will teach them.

Miguel's classroom provided an important context for BPST to practice attending to the many aspects of leading mathematics discussions. The year from which the data are drawn, 2013-2014, the fifth grade student population was almost fifty-fifty split between white and Latino (with one African American student) and economically diverse. As with the larger school community, more of the white students came from socioeconomically advantaged backgrounds than the Latino students, but the socioeconomic division did not strictly follow racial lines. Miguel described this year as particularly challenging for him as a teacher because of the unusually wide range of mathematics abilities and general academic preparation of the children. Miguel described to me how the large academic discrepancies between the students often lead to limited participation from just a few eager students when leading mathematics activities. However, Miguel was committed to every student participating in a positive way in mathematics. That is one of the many reasons why I brought my pre-service teachers to his classroom.

Our first goal with the field experience was to help pre-service teachers gain confidence in using academic language by leading mathematics discussions in Spanish. This year, about half of our twelve student teachers (5) were native speakers in the sense that they grew up speaking Spanish at home like Miguel, and another third were heritage speakers (4) like myself who heard a lot of Spanish and spoke some in the home, but learned it formally through coursework often targeted at heritage speakers, and now spoke Spanish as opportunities came up in everyday life. The rest of our student teachers (3) were White and had a specific connection to a Spanish-speaking country or communities that helped them define their commitments to bilingual education. Across all populations there was an immediate concern that because they did not learn mathematics in Spanish they lacked the academic vocabulary to teach it effectively.

These field-based experiences supported the development of their academic language not only through trying out leading a discussion but as they planned their lessons as well. As they planned in small groups of two or three, BPST had to build consensus of the best way to say something, such as the best way to ask a question like, "What patterns do you see when we count by 12s?" They could decide if a direct translation communicated the same intent in Spanish and English, and

whether the word pattern, *patrón* in Spanish, is still the right word to use, or if a word like *repeticiones* (repetitions) is better, or even if the question is totally different in Spanish, something more like “What do you notice about the numbers when we count by 12? / *Qué notan entre los números cuando contamos por 12?*” They could even debate the correct preposition (is it *entre o en o acerca de?*). Though native speakers who learned mathematics in Spanish may have specific answers to how to express mathematical ideas based on their schooling experience, these pre-service teachers were constructing how mathematics should sound in Spanish in the context of a U.S. bilingual classroom, where no particular region’s Spanish dominated. These discussions helped remind them that there are always decisions to make about the language we choose to use to express our mathematical ideas.

The second goal of the field experience was to attend to power and privilege in the mathematics classroom. As part of their teacher preparation program, our pre-service teachers read and discussed theory and techniques for culturally responsive teaching. Our BPST had opportunities to develop an understanding of what status and positioning are through course readings, such as Turner, Dominguez, Maldonado & Empson’s (2012) article on discursively positioning English learners by attending to multiple ways to use *revoicing*, among other techniques. In this field experience we used live-coaching and reflective processes to support pre-service teachers to attend to power and privilege as they lead discussions.

Understanding the social function of language is a large part of our second goal. This is because an important aspect of this goal is to help the pre-service teachers develop a personal understanding of how students’ multiple identities, such as racial, linguistic, gendered, and economic privilege (to name just a few) also influence participation in learning mathematics (Gutierrez, 2002; Nasir & Shah, 2012; Zavala, 2014; Zevenbergen, 2000, Esmonde, Brodie, Dookie, & Takeuchi, 2009). This is a challenging goal for even veteran teachers, however novice teachers also need to begin to understand how these ideas function in the classroom in order to keep getting better and how they teach given the need to attend to students’ multiple identities. BPST need to understand that there are multiple factors influencing students’ participation closely linked to who they are as individuals, and that language is situated within these layers. But also that as a teacher they have power to influence the way those social identities are seen as strengths through discursive positioning (Davies & Harre, 1990; Turner, Domingez, Maldonado, & Empson, 2012). Miguel’s classroom created an opportunity for the pre-service teachers to practice teaching mathematics and to attend

to an important dimension of equitable participation—the engagement of bilingual Latino students in mathematics discussions.

Lessons Learned in the Classroom: Building Confidence, Developing Competence

In this section I present findings from analysis of my notes and reflections from the lessons BPST taught to Miguel's students. By analyzing these two data sources I found that the planning sessions were useful to the BPST to develop their confidence in using the academic language of mathematics in Spanish, but could also lead them to talk at the students more than elicit mathematical ideas from them. I also found that the live-coaching interactions created opportunities to develop the BPSTs recognition of moments where they could explicitly position Latino students as good mathematical thinkers. Finally, I also found that their reflections showed they wanted a broad cross-section of students to participate in the discussions, but were not yet attending to differences in the mathematical value of participation between Latino and other students.

Portrait of a Live-Coached Teacher Learning Moment

As the pre-service teachers lead mathematics discussions with students, it was encouraging to see how they took up practices we had discussed as a class. To support participation from students with a range of ability levels the pre-service teachers focused on particular moves teachers can make in math discussions which are well documented in the mathematics education literature, such as *revoicing* (O'Connor & Michaels, 1993; Turner, Dominguez, Maldonado, & Empson, 2012) in which a teacher restates a students' idea, often elaborating or keeping the discussion focused on the idea, and often with the intention of positioning a student as competent. Many pre-service teachers also used *repeating* (Chapin, O'Connor, & Anderson, 2009), asking students to listen closely to each other and repeat each other's ideas. And finally, most pre-service teachers used the technique of *intentional selection* of a student's work to highlight an important idea and involve that student in the discussion (Stein, Engle, Smith & Hughes, 2008; Turner, Dominguez, Maldonado, & Empson, 2012).

While the BPSTs taught, Miguel and I circulated, observed, and occasionally jumped in to offer guidance. We wanted to provide support but not undermine the authority of BPST, who had only a short time to establish rapport and trust with the students. The most frequent coaching step we took was to take the BPST aside as the students turned and

talked and do a quick conference about what had just transpired and where they were going next. For example, here is a recreated exchange between myself and Irina, a native Spanish speaker who had relatively stronger academic Spanish compared to her peers and years of experience as a substitute teacher before beginning her teacher education program. I had just watched her lead students through a discussion about a word problem that the students were now going to solve. A detailed discussion before solving the problem is called *launching* (Jackson, Shahan, Gibbons, & Cobb, 2012). On the wall was a poster paper with the math problem written out, however the actual question was covered up. She had just asked her students to turn and talk to each other about what they thought the question should be based on the problem situation. We quickly and quietly conferenced while her students talked with their partners. Our live-coaching exchange went something like this:

Maria: Are you satisfied that they know what is going on in the problem?

Irina: Yes, I got most of them to talk about the problem and I heard from enough of them that I think they will know what to do. I'm only worried about those two (*points to a pair of Latina students*).

Maria: Okay, so what do you want to do?

Irina: I think I will check in with them first when it's time to work on the problem.

Maria: That's a good idea. Also, if you are thinking they may hold lower academic status right now, you could also check in with them right now, listen to how they are thinking about the problem, and have them share their idea with the group. Just be ready to support them.

Irina: Okay I'll try that.

Maria: That way you do some public repositioning of them, do you know what I mean?

Irina: Yes, I think so. Like they get to share their thinking in front of everyone.

Maria: Exactly. And you support them and show how they have something important to offer to the group, even if it's something other students are already thinking. I would take this time to go listen to them, and come out of the turn and talk by saying you hear something interesting from them.

Irina: Okay great.

Maria: And then watch your time—you'll only have about ten minutes for them to work on the problem.

Irina: Yikes! Okay!

In this exchange, which lasted about 60 seconds, Irina and I communicated about multiple aspects of her lesson, though my comments focused her attention on the positioning of two Latino students of whom Irina expressed some concern. Although I could have suggested any of many teaching choices at this juncture, I focused her attention on language and social positioning of two Latina students, in line with our second goal of the field experience. By highlighting for her how an opportunity was coming up to practice using techniques to address status and positioning, she was able to capitalize on the opportunity and gain experience with recognizing such opportunities.

From reviewing my notes and reflections, I found that I focused most of my guidance in the moment on pacing, types of questions BPST were asking the students, and calling attention to moments where BPST could explicitly involve students who seemed to hold lower academic status relative to their peers in the discussion (as in the example above). I observed Miguel supporting the BPST mostly through helping them address classroom management issues, which was valuable since they did not often get feedback from a classroom teaching about how they were handling classroom management.

I also noticed that I did not address academic language use during the live coaching sessions as much as I had expected to. The explanation seems to be that a focus on language in the planning sessions led to less misuse of academic vocabulary and raised BPSTs' confidence in how to phrase questions and ideas. Yet perhaps paradoxically some of the difficulties that some BPSTs encountered was around talking too much—they had prepared detailed descriptions, almost scripted out for themselves, that they spent too much time *talking at the students about mathematics* and less time *asking students to talk about the mathematics*. The issues of whether a teacher is eliciting student thinking versus telling students what to think is one mainstream novice teachers face as well. However, I observed this issue compounded for the BPST, who felt less comfortable processing student thinking in Spanish and who therefore preferred to hold on to the control of the discourse by explaining their well-rehearsed ideas.

The live-coaching intervention I offered when I witnessed a BPST explaining too much was to jump into the discussion with my own question, so as not to take away control of the discussion from the practicing BPST. "*Maestra, tengo una pregunta!* Teacher, I have a question," I would say, "*¿Hay alguien quién me puede explicar esa idea de otra manera?* Is there someone who can explain this idea another way?" Or sometimes,

“Maestra, yo estoy pensando en si hay otra manera de hacer división. ¿Puede preguntar a los estudiantes si hay otra estrategia? / Teacher, I am wondering if there is another way to do division. Could you ask the students if there is another strategy?” Only in one case did I interrupt the BPST because she was focused so intently on the board and had not looked at the students in a full minute, and in this case I used a disguised direct request: *“Quizas uno de los estudiantes puede describir como usar el algoritmo. ¿Les puede preguntar, maestra? / Maybe the students could tell you how that algorithm works. Could you ask them, teacher?”*

Overall analysis of my reflections showed that in the moment I was able to support the BPST towards our goals using a variety of strategies across the planning sessions and the live-coaching sessions. The analysis also showed that live-coaching was useful to draw BPSTs attention to the social dynamics around language and mathematical competence, and that many BPSTs had some success with using explicit strategies from mainstream mathematics education research to involve students in mathematics discussions in this bilingual setting. My analysis also showed that while time to prepare was essential for the BPSTs to feel like they had a good grasp on the academic language to use in their mathematics discussions, that too much focus on their own words could cause them to talk too much and not involve students as much in the discourse.

BPSTs Reflections Highlight Multiple Layers of Learning to Lead Mathematics Discussions

The BPSTs reflected on a number of successes and challenges overall in our field experience. In their reflections, they wrote about how hard it was to lead a discussion when you are trying to make sure you understand what the student is saying at the same time that you are trying to ensure other students are hearing what is being said. Many wrote about how hard it is to make decisions in the moment about what to ask of students, and whether to move on in the discussion or not if many students are giving you a confused look. This issue was further complicated for many of them by also trying to think about mathematics academically in Spanish on-demand while leading the discussion.

Some BPSTs wrote that through leading the discussions they were surprised at the level of discourse the students were capable of—they could get really deep in their explanations of why something was true. In this way, for some pre-service teachers, myths about whether students were even capable of having a productive discussion about mathematics were dispelled.

Many BPSTs connected their experience teaching mathematics through discussions with their experience as a learner. I was especially

struck by the BPSTs who wrote about the experience as something that transformed their relationships with mathematics. One Latina pre-service teacher, in her mid twenties and highly proficient in Spanish, reflected on a lesson in which she was the designated observer in her three-person group:

Being able to be witness a math lesson was empowering as I was able to see how students became involved in their own learning during a number talk. This made me reflect on my own education, specifically in mathematics, and how I would have loved opportunities in which I thought critically about a mathematical problem and have conversations with my peers in order figure it out. ...I feel relieved that the way that students learn mathematics now is different in a sense that they are integrated in the learning process and are guided to understand math by being able to reason.

And finally, one Latina heritage-speaker BPST reflected on how the experience helped her think about how through participating in mathematical discussions students can lessen their anxiety around mathematics, but only if teachers provide support and help students value mathematical thinking over right answers:

While working with the students, I think it's important that as a teacher one is sensitive to the anxiety that math can provoke for many students. It is important for students to realize that these feelings are normal even among us teachers and that obtaining the right answer is only part of the process....One of our students (in Miguel's class), who struggled with the word problem, started out with a good diagram but was unable to come to a complete solution. When having a dialogue about the different strategies being employed, she was surprised to be chosen to share her work. I think that the fact that we are being trained to look beyond just looking for the right answer will help us improve the feelings that students have about math.

This BPSTs reflection has elements that get to the heart of the second goal of the field experience, namely on how language can be used to position students. This BPST noticed that she holds power as the teacher to reposition a student academically through a mathematics discussion, and that over time moments like those influence the kind of mathematician a student can be, in this case taking away some of the anxiety around doing mathematics. Unfortunately, this level of reflection was the exception among the BPST and not the norm.

The most significant lessons pre-service teachers took away from this experience was that students can be successful participants in mathematics discussions, and that they themselves had tools to involve students more in mathematics discussions. The fact that many reflected

on how they were surprised at the level of discourse speaks to how useful this experience is to challenge their own thinking about the role of discussions in teaching mathematics in classrooms with a mix of Latino and white students.

Aside from the pre-service teachers' reflections, Miguel and I observed that the different ways that the fifth graders contributed during mathematics discussions fell into a predictable pattern: most of the time, White students explained *how a strategy worked* and *why it worked*, and Latino students did more *repeating someone's idea* or being asked to *agree or disagree with an idea* as prompted by the teacher. This should not be seen as indicative of differences between what white and Latino students are capable of, rather this is indicative of how BPSTs and students together worked to co-construct discussions in which these patterns emerged. BPSTs had the potential to disrupt these patterns using the discussion techniques they were practicing. The persistence of this pattern even with a group of pre-service teachers who are learning to be culturally responsive educators suggests that they are still developing explicit attention to forms of academic privilege in the mathematics classroom. While the specific tools for more equitable talk were used by the BPST, they were not necessarily used with the intention of eliciting qualitatively different contributions from different populations of students. In their reflections, BPST wrote about students as a general population, and were not yet parsing out how students' linguistic, racial, gendered and class identities influenced the teaching decisions they made or student participation. In other words, BPST treated all contributions from students as equally valuable when in reality white students tended to contribute the ideas that were more mathematically significant.

Miguel and I look at this pattern as indicating a need to continue supporting our BPSTs to develop attention to how Latino students are positioned as authors of mathematical ideas versus repeating someone else's thinking, or evaluating ideas. Repeating and evaluating are important forms of participation that indicate you are able to understand and reason through someone else's thinking, but should be accompanied by opportunities to be the originator of mathematical ideas to help balance out status issues. We discuss this pattern, the findings here, and implications for teacher education in the next section.

Steps for Bilingual Teacher Education for Equitable Participation in the Mathematics Classroom

I set out in this article to understand how BPST develop competencies in attending to the academic role of language as well as social role

of language in mathematics discussions through a live-coached field experience in which they planned, enacted, and reflected on leading mathematics discussion in Spanish. The findings suggest that the planning sessions were an important space to develop confidence in academic language, and that BPST then felt confident to use the academic language as they led discussions. BPST were also able to attend to how the language of instruction and their discursive teacher moves could position students as good mathematical thinkers, and the important social role of language. But findings also suggest that BPST may need even more explicit support to parse out how students' participation is qualitatively different, and how they as teachers can facilitate students' to contribute in mathematically significant ways using talk moves. These talk moves may also include targeted conversations with Latino students during work time so that they know these students have something to share. But also that they need to look for what is productive mathematically in the work of students who may not be seen by the rest of the class as mathematically capable. Understanding how qualitatively different patterns of participation are historically linked to different student populations in mathematics, and how the teacher has power to influence those patterns of participation is a next step for these BPST, and part of their development as culturally responsive educators.

In terms of academic language development, the findings suggest that setting aside time and space for BPST to discuss academic language usage as part of planning to teach was fruitful for helping them develop confidence in using academic vocabulary for mathematics in Spanish. This analysis stops short of examining to what extent they were successfully able to teach academic language to students, but the fact that they engaged in academic discussions with students is some evidence of how they supported students to use the academic register. In her research with BPST in an after-school setting, Vomvoridi-Ivanovic (2012) found that a lack of academic language in Spanish for mathematics was a primary reason why BPST would switch to speaking English in a setting in which every student spoke Spanish and English. The BPST preference for English was not only because of their comfort level, but also Vomvoridi-Ivanovic argued, because of cultural frames for teaching that the BPST held in which the "correct" way to engage in mathematics was English. It is not known to what extent the BPST in my study are influenced by ideas of which language is correct for school, but there are certainly similarities between their confidence and past experience learning mathematics in English. Similarly to what she found in her study, my study also suggests BPST need more time to do mathematics in Spanish in order to feel confident and competent. Without the confidence and competence

to engage in mathematics in Spanish, BPSTs will have a much harder time working towards the ambitious goals of the CCSSM.

In terms of the social function of language, I conclude that our student teachers are not yet looking at patterns of participation linked to social identities like racial or linguistic identity, but they are on the right path by making decisions in the moment on how to get students with different academic status involved in the discussion. This finding adds to the existing research on how PST can learn to make teaching decisions in the moment related to managing equitable participation through enactment of teaching practices and reflection (Ghousseini, 2009; Lampert, Beasley, Ghousseini, Kazemi, & Franke, 2010), though none of the prior research cited here was conducted in bilingual contexts. The BPST in the present study demonstrated they were making progress attending to how students participated in a goal-oriented mathematical discussion, but were learning to articulate how students' multiple social identities influenced equitable participation. For example, the BPST who described focusing on an unlikely student's work did not mention that this particular student was a Spanish bilingual Latina who had only participated passively the prior two days, and so on the third day the group was looking for a way to involve her more. The pre-service teacher used her insights on equitable participation to give this student one public success, one of maybe many that would help to shape how this student sees herself as a mathematician, and how her group members see her too. Yet in the student teacher's reflection, rather than situate the significance of this moment as an important step towards more equitable participation of Latina students in math discussions, she focused in general on how you can lessen student anxiety by having them participate successfully over time. She makes an important point, but stops shy of situating her point within a larger pattern of moving towards equitable participation of Latinas in mathematics or situating her reflection in connection with the students' position as a bilingual Latina in the classroom.

Though these findings raise questions about what BPSTs are developmentally prepared to handle in the course of a few short semesters of teacher preparation, I argue that BPST still need to be challenged to attend to these power dynamics because of their impact on children. I have argued elsewhere with my coauthors that preparation of elementary mathematics teachers needs to include attention to language, race, and power and that such topics should not be seen as an afterthought, but given equal weight to pedagogical content knowledge (Aguirre & Zavala, 2013; Aguirre, Zavala, & Katayoutanant, 2012). When mathematics teachers develop understanding of how their students' linguistic, racial, and

gendered identities influence their participation, they can more carefully tailor their instruction to their students (Aguirre, Mayfield-Ingram, & Martin, 2013; Zavala, 2014). This is especially true for BPST, who are already managing the power differences between Spanish-English or English-Other language dynamics in their classrooms, and so the linguistic identities of their students exert a more salient influence over how they manage mathematics discussions. Perhaps their approach in the midst of learning multiple aspects of managing a mathematics discussion are not perfect, but they have the opportunity to reflect and grow and have been supported to start to think about these ideas.

As teacher educators, we need to strive towards helping our pre-service teachers develop the ability to focus on the math content and equitable participation of students from different racial and linguistic backgrounds simultaneously, and give them tools to do so. Every time we do this field-based course with our pre-service teachers is an opportunity to get better at supporting their development as culturally responsive educators. As I evolve in my understanding of how to support our pre-service and in-service bilingual math teachers, I have come to the following 3 key conclusions about practical steps to take with teachers learning to lead mathematics discussions effectively:

(1) *Be explicit about how instruction in Spanish itself does not lead to equitable participation for Latino students.* Bilingual teachers need to be aware that changing the language of instruction is only part of shifting the dynamics in the classroom towards supporting Latino students to be the competent mathematical people that we know they are capable of being. There are larger entrenched equity issues that impact the participation of students.

(2) *Not all participation is equal—help teachers parse out the relative value of different kinds of participation.* In Spanish bilingual contexts, it is especially important that teachers position Latino students as authors of important mathematical ideas so as not to re-create inequities experienced in English-dominant math classrooms. Teachers can do this by recognizing the important mathematical ideas in student work, supporting students to fully articulate their ideas before sharing, and creating space for other students to listen to the ideas of Latino students.

(3) *Provide planning tools to help pre-service teachers prepare for facilitating differential participation with a purpose.* In culturally responsive teaching, we tend to focus on the mathematical content and relevant word problem contexts while not

adequately preparing for differential participation that takes into account social identities such as racial, linguistic, gendered, and socio-economic status identities. Practicing leading mathematics discussions in dual-language contexts is a fruitful place for teachers to prepare for and try out explicit tools to support learners with various social identities to participate in equitable ways in mathematics discussions.

Learning to attend to the academic and social role of language in a mathematics classroom takes time, but is essential in Spanish bilingual classrooms in which the language of instruction is not enough to overcome the power imbalances of students from different backgrounds. In bilingual classrooms, we have the duty and responsibility to do all we can to ensure equitable participation in mathematics discussions and use the opportunity provided by a different language of instruction to support positive educational outcomes for Latino and other multilingual students in the classroom.

Note

¹ All names are pseudonyms.

References

- Aguirre, J. A., Mayfield-Ingram, K., & Martin, D. B. (2013). *The impact of identity in K–8 mathematics: Rethinking equity-based practices*. Reston, VA: National Council of Teachers of Mathematics.
- Aguirre, J. M., Zavala, M., & Katanyoutanant, T. (2012). Developing robust forms of pre-service teachers' pedagogical content knowledge through culturally responsive mathematics teaching analysis. *Mathematics Teacher Education and Development, 14*(2), 113-136
- Aguirre, J. M., & Zavala, M. (2013). Making culturally responsive mathematics teaching explicit: An innovative lesson analysis tool. *Pedagogies: An International Journal*. DOI: 10.1080/1554480X.2013.768518
- Bier, M. L., Horn, I., Campbell, S. S., Kazemi, E., Hintz, A., Kelley-Peterson, M., Stevens, R., Saxena, A., & Peck, C. (2012). Designs for Simultaneous renewal in university-public school partnerships: Hitting the "sweet spot." *Teacher Education Quarterly, 39*(3), 127-141
- Brown, A., & Patten, E. (2014). *Statistical portrait of Hispanics in the US, 2012*. Retrieved from <http://www.pewhispanic.org/2014/04/29/statistical-portrait-of-hispanics-in-the-united-states-2012/> January 2, 2015
- Bunch, G. C. (2014). The language of ideas and the language of display: Reconceptualizing "academic language" in linguistically diverse classrooms. *International Multilingual Research Journal, 8*(1).
- Campbell, S., Cunard, A., Dunleavy, T., Kazemi, E., & Zavala, M. (2011). *Learn-*

- ing there together: Mediated field experiences in teacher education*. Paper Presented at the Annual Meeting of the Association of Mathematics Teacher Educators. Irvine, CA.
- Chapin, S. H., O'Connor, C., & Anderson, N. C. (2013). *Classroom discussions in math: A teacher's guide for using talk moves to support the common core and more, grades k-6*. Sausalito, CA: Math Solutions.
- Esmonde, I., Brodie, K., Dookie, L., & Takeuchi, M. (2009). Social identities and opportunities to learn: Student perspectives on group work in an urban mathematics classroom. *Journal of Urban Mathematics Education*, 2(2), 18–45.
- Featherson, H., Crespo, S., Jilk, L., Oslund, J. A., Parks, A. N., & Wood, M. B. (2011). *Smarter together!: Collaboration and equity in the elementary math classroom*. Reston, VA: National Council of Teachers of Mathematics.
- Guerrero, M. D. (1997). Spanish academic language proficiency: The case of bilingual education teachers in the U.S. *Bilingual Research Journal: The Journal of the National Association for Bilingual Education*, 21(1), 65-84
- Ghousseini, H. (2009). Designing opportunities to learn to lead classroom mathematics discussions in pre-service teacher education: Focusing on enactment. *Scholarly Practices and Inquiry in the Preparation of Mathematics Teachers*, 203–218
- Gutierrez, R. (2002). Beyond essentialism: The complexity of language in teaching mathematics to Latina/o students. *American Educational Research Journal*, 39(4), 1047-1088.
- Lampert, M. (2001). *Teaching problems and the problems of teaching*. New Haven, CT: Yale University Press.
- Lampert, M., & Cobb, P. (2003). Communication and learning in the mathematics classroom. In J. Kilpatrick & D. Schifter (Eds.). *Research companion to the NCTM Standards* (pp. 237-249). Reston, VA.: National Council of Teachers of Mathematics.
- Leinhardt, G., & Steel, M. D. (2003). Seeing the complexity of standing to the side: Instructional dialogues. *Cognition & Instruction*, 23(1), 87-163
- Lipski, J. M. (2008). *Varieties of Spanish in the United States*. Washington DC: Georgetown University Press.
- Jackson, K. J., Shahan, E. C., Gibbons, L. K., & Cobb, P. A. (2012). Launching complex tasks. *Mathematics Teaching in the Middle School*, 18(1), 24-29
- Macedo, D. (1997). English only: The tongue-tying of America. In A. Darder, R. D. Torres, & H. Gutierrez (Eds.), *Latinos and education: A critical reader* (pp. 269-278). New York, NY: Routledge.
- Moschkovich, J. (2007) Using two languages when learning mathematics. *Educational Studies in Mathematics*, 64(2), 121-144
- Nasir, N. S., & Shah, N. (2011). On defense: African-American males making sense of racialized narratives in mathematics education. *Journal of African American Males in Education*, 2(1), pp 24-45
- O'Connor, M. C., & Michaels, S. (1993). Aligning academic task and participation status through revoicing: Analysis of a classroom discourse strategy. *Anthropology & Education Quarterly*, 24(4), 318–335.
- Parrish, S. (2010). *Number talks: Helping children build mental math and computation strategies*. Sausalito, CA: Math Solutions

- Schoenfeld, A. (2014). What makes for powerful classrooms, and how can we support teachers in creating them? A story of research and practice, productively intertwined. *Educational Researcher*, 43(8), 404-412
- Stein, M. K., Engle, R. A., Smith, M. S., & Hughes, E. K. (2008). Orchestrating productive mathematical discussions: Five practices for helping teachers move beyond show and tell. *Mathematical Thinking and Learning*, 10(4), 313-340.
- Tyminski, A. M., Zambak, V. S., Drake, C. & Land, T. J. (2013) Using representations, decompositions, and approximations of practice to support prospective elementary mathematics teachers' practice of organizing discussions. *Journal of Mathematics Teacher Education*, 17(5), 463-487
- Turner, E., Dominguez, H., Maldonado, L., & Empson, S. (2012). English learners' participation in mathematical discussion: Shifting positions and dynamic identities. *Journal for Research in Mathematics Education*, 44(1), 199-234.
- Valdez, G. (2004). Between support and marginalisation: The development of academic language in linguistic minority children. *International Journal of Bilingual Education and Bilingualism*, 7(2-3).
- Vomvoridi-Ivanovic, E. (2012). "Estoy acostumbrada hablar ingles": Latin@ pre-service teachers' struggles to use Spanish in a bilingual afterschool mathematics program. *Journal of Urban Mathematics Education*, 5(2), 87-111.
- Zavala, M. (2014). Latina/o youth's perspectives on race, language, and learning mathematics. *Journal for Urban Mathematics Education*, 7(1), 55-87
- Zeichner, K. (2010). Rethinking the connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education*, 61(1-2), 89-99.
- Zevenbergen, R. (2000). "Cracking the code" of mathematics classrooms: School success as a function of linguistic, social, and cultural background. In J. Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp. 201-223). New York, NY: Viking.