# Examining My Window and Mirror: A Pedagogical Reflection from a White Mathematics Teacher Educator about Her Experiences with Immigrant Latina Pre-service Teachers

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## Abstract

In this pedagogical reflection, a White mathematics teacher educator describes what she learned from three Latina pre-service teachers who were recent immigrants from Mexico while they completed an elementary mathematics methods course. Using Rochelle Gutierrez's (2012) metaphor of a window and mirror, the author interrogates her own identity and experiences as a mathematics student and teacher in order to learn more about her students who came from a different background than herself. The reflection concludes with implications for teacher education.

## Introduction

As classrooms become more culturally and linguistically diverse, particularly with an influx of immigrant children from Mexico (Passel & Cohn, 2008), teachers and teacher education programs need to be more responsive to the diverse learning needs of all students (Hollins, 2011). Although we have mathematics teaching strategies that promote equity for all students, such as culturally responsive mathematics teaching (Bonner & Adams, 2012; Gay, 2002) and Complex Instruction (Cohen, Lotan, Scarloss, & Arellano, 1999), there are still some students who face limited opportunities to learn mathematics (Gutierrez & Irving, 2012). Furthermore, many of these children who face limited opportunities to learn come from non-White backgrounds, speak a native language other than English, and/or are typically unsuccessful in traditional classrooms.

To address this need, research has begun to closely examine the backgrounds of Latin@[7] teachers and pre-service teachers (PSTs) as one way of rethinking how we prepare new teachers for the changing student demographic (Achinstein & Aguirre, 2008; Cavazos, 2009; Gomez, Rodriguez, & Agosto, 2008; Hernandez-Sheets, 2004; Tellez, 1999; Vomvoridi-Ivanovic, 2012). The specific resources that new teachers from Latin@ backgrounds bring to their teacher preparation programs can prove useful when thinking about helping more PSTs adopt mathematical practices that promote equity for all students. Therefore, it follows that mathematics teacher educators should model similar practices with all of their PSTs, especially those PSTs who reflect the cultural and linguistic diversity of their own students. But before teacher educators learn about and honor the specific knowledge and experiences of their PSTs, we might consider how teacher educators turn the lens back upon themselves and first examine their *own* prior experiences (Aguirre, 2009) and assumptions about mathematics with respect to preparing new PSTs for the diverse classroom.

The purpose of this pedagogical reflection is an opportunity for me to share what I learned from my study of three bilingual, immigrant Latina PSTs who were learning to teach mathematics to students from primarily Latin@ backgrounds. I briefly review what we know about preparing new teachers for classrooms with Latin@ students (and in particular, Latin@ teachers) and will provide an overview of the framework for my reflection. After I describe my positionality, I will discuss what I learned about myself and about the three Latina PSTs when they shared their experiences of learning mathematics in Mexico and in the United States. The purpose of this reflection is to consider how we might learn more about *ourselves* and about *our PSTs* if we first reflect upon the assumptions we had about teaching and learning mathematics and about recognizing the knowledge and

7. I have adopted the signifier of "Latin@" to honor those persons who do not identify with traditional male and female gender-specific roles (Gutiérrez, 2013).

experiences our students bring to the classroom. I conclude with some implications for my future practice as a mathematics teacher educator.

## Existing Literature

Few mathematics teachers would disagree that all students should feel successful when learning mathematics. Yet, some students still do not experience equitable opportunities to succeed in learning mathematics, and many of these students come from non-White backgrounds, speak a native language other than English (Civil & Planas, 2004; Gutierrez & Irving, 2012), and/or are in traditional, decontextualized classrooms where typically feel disconnected from their mathematics learning (Silver & Stein, 1996). Unless teachers adopt systematic changes to their practice, the cycle of inequitable learning opportunities may be reproduced for future students. As such, teacher education programs need to help PSTs and in-service teachers adopt pedagogies that honor the knowledge, experiences, and language of all students, especially in the field of mathematics (Aguirre et al., 2013; Gay, 2002; Ladson-Billings, 1995; Leonard, Napp, & Adeleke, 2009).

To help teachers adopt mathematics pedagogies that encourage equity for all students, research has explored the knowledge, experiences, and resources that teachers bring to the classroom. With the majority of our PSTs coming from a fairly homogeneous background and little experience with students who represent a cultural and linguistic diversity (Hollins & Guzman, 2005), we are learning more about providing all PSTs with worthwhile experiences for teaching children who do not represent their own backgrounds (Sleeter, 2001; Turner et al., 2012). We are learning even more about the knowledge, experiences, and resources of Latin@ teachers and those teachers whose native language is not English to see how they take up pedagogies that promote equity (Achinstein & Aguirre, 2008; Cavazos, 2009; Gomez et al., 2008; Tellez, 1999; Villegas & Lucas, 2002; Vomvoridi-Ivanovic, 2012). For example, Cavazos (2009) recognized how her experiences as a bilingual Latina immigrant helped her as a new teacher to specifically identify and address the low expectations for success her colleagues placed on many of their immigrant Latin@ students. Specifically, Cavazos reflects that "many Latina/o students are labeled as regular or at-risk, and they do not need another label (i.e., Non-College Material) as they endure their educational journey" (p. 77). Similarly to Tellez's (1999) study of the Latina PSTs who leveraged knowledge of Latin@ students in the mathematics classroom, teachers bring knowledge and experiences to their practice that can serve as a resource for teaching students from similar backgrounds (Flores, Keehn, & Perez, 2002).

Although we should never assume that teachers who share the background of their students will successfully provide all students with an opportunity to learn (Achinstein & Aguirre, 2008), we still have much to learn about the particular experiences of our Latin@ teachers and PSTs. However, the question remains as to why should we know more about our Latin@ PSTs and students? As a teacher educator in San Antonio, Texas where many of our schools have large populations of Latin@ students and non-native English speakers, I want to learn about how my new teachers might leverage their diverse backgrounds when learning to teach students with diverse needs. If my PSTs are expected to learn about the diverse needs of their students so that all students have an opportunity to be successful in mathematics, then I need to engage in a similar process in my university classroom. Ultimately, I hope that by modeling this exploration in class, more of my PSTs will take up similar practices with their own students. In the next sections, I describe how I came to know Miria, Maricela, and Sara[8] as well as my positionality as a mathematics teacher educator.

## The Setting and Reflection Framework

In the fall of 2010, I began my dissertation on the experiences of four PSTs in a particular elementary mathematics methods course within a teacher preparation program at a large university in an urban city in the Southwestern United States. This course was part of a larger research project, TEACh Math (Teachers Empowered for Advancing Change in Mathematics) (Bartell et al. 2010), and the instructor was one of six

8. All names have been changed to maintain the confidentiality of the participants.

principal investigators on the TEACh Math project. This methods course was designed to explore how PSTs incorporate children's mathematical thinking (Carpenter, Fennema, & Franke, 1996) and children's funds of knowledge (González, Moll, & Amanti, 2005), into their practice.

The PSTs were concurrently completing their coursework in science, social studies, and literacy, and as a part of their coursework, they were placed in classrooms with children who were mainly from Latin@ communities and/or from low socioeconomic homes. For my dissertation, I recruited PSTs who self-identified on an optional demographic survey question as a cultural group other than White and/or spoke a native language other than English. From 27 students in the course, four agreed to participate in my dissertation, and of those four, Miria, Maricela, and Sara were three bilingual, recent immigrants from Mexico. For the focus of this pedagogical reflective essay, I will focus on these three PSTs because of their similar backgrounds.

For my dissertation, I conducted individual and focus group interviews and observations of the PSTs in the field as well as retrieved their assignment reflections[9]. I also recorded their small and whole group methods discussions. But for the purpose of this particular self-reflection, I focus on only the interview transcripts, their assignment reflection papers, and belief surveys because in this set of data, the PSTs shared their specific prior mathematical knowledge and experiences as a student. Future publications about the PSTs' experiences across the semester and the entire data set will focus on issues of status (Berger, Cohen, & Zelditch, 1972; Cohen, Lotan, & Catanzarite, 1988) in the classroom as it relates to their particular cultural and linguistic knowledge and experiences as immigrants.

In this reflection, I relied on Rochelle Gutierrez's (2012) and Botelho and Rudman's (2009) notion of "the window and the mirror" to help me see commonalities and differences among myself, my focal PSTs, and the students they might eventually teach. Gutierrez states: "I had introduced to them [PSTs] the notion of quality curricula including a window and a mirror —a mirror in the sense of offering students a chance to see oneself; a window in the sense of being able to see a different view onto the world" (2012, p. 44). As I reflected on my dissertation, I noticed the similarities and differences of my prior experiences as a mathematics student with those of my PSTs. Therefore, this mirror/window perspective enabled me to learn more about my PSTs who came from different backgrounds than my own, to find commonalities among our prior experiences, and to challenge my own misconceptions about teaching and learning mathematics. This reflective essay is the result of that introspective work. I hope this exploration will facilitate a discussion among both my fellow teachers and teacher educators about how we can model similar practices for our new teachers while honoring the resources they bring to the classroom.

## Positionality

I identify myself as a White, female mathematics teacher educator. My first language is English and I know very basic Spanish and German. As a military child and later as a military spouse, I moved extensively and needed to quickly learn about my new surroundings and those around me. When I was in Germany in 2004 as an adult, I found myself in unfamiliar, foreign surroundings again. Yet, in many instances, I realized that I did not necessarily need to be fluent in German in order to successfully navigate my neighborhood.

When I began teaching in Germany, I held fast to the misconception that mathematics was a universal language. Yet when my German friends described their experiences learning mathematics, I reexamined these beliefs because there were striking differences between our experiences as mathematics students (e.g., symbolic notation, orchestrating conversations). Because of this reexamination and more, I became interested in the lives, culture, language, and experiences of immigrants in my home country and how teachers can help educate immigrants who are new to the United States. If I were to expect my PSTs to honor the culture and language of students from backgrounds different than their own, then I needed to replicate this experience with my own PSTs. As a result, I would learn more about myself.

In the following sections, I briefly address two misconceptions that I held early in my teaching career about mathematics and how Miria, Maricela, and Sara challenged my misconceptions about mathematics as a universal language: a) Students needed to develop fluency in English before they developed their mathematical

9. Many of these assignments were part of the learning modules developed by TEACH Math (Bartell et al., 2010).

mastery and b) mathematical strategies and algorithms are universal. Specifically, I discuss the opportunities to see commonalities (mirror) and insightful differences (window) between the PSTs and myself with respect to teaching and learning mathematics.

## Misconceptions behind the Notion that "Mathematics is a Universal Language"

The argument that "mathematics is a universal language" rests in the beliefs that those who use mathematics should also use similar practices, symbols, algorithms, and problem solving strategies (White, 1992). The Trends in International Mathematics and Science Study (TIMSS) (National Center for Education Statistics & National Science Foundation, 1996) refuted this claim by providing research-based evidence that teaching and learning mathematics is a varied and culturally-specific activity. For example, children and teachers in various parts of the world use different mathematical symbolic notations, learn different "standard algorithms" for operating on a number system (Perkins & Flores, 2002; Philipp, 1996), and work under a particular set of sociocultural norms (Zevenbergen, 2000). Some of these norms may also encourage children to communicate their mathematical thinking in a language other than the dominant language of instruction. Teachers can support their students by mapping their mathematical thinking to their native and second languages (Abedi & Lord, 2001; Gutierrez, 2002; Moschkovich, 1999). Based on this research, I will describe how Miria, Maricela, and Sara challenged my first misconception that students should develop fluency in English before they develop their mathematical mastery.

## Developing English Fluency before Mathematical Mastery

At the beginning of their semester, the PSTs completed a mathematics autobiography in which they described their prior experiences as mathematics students (e.g., What do they remember about learning mathematics in school? How did they use mathematics outside of school?). Miria, Maricela, and Sara had very similar stories regarding their prior learning experiences in both Mexico and the United States. The following are excerpts from their autobiographies on August 25, 2010:

**Miria:** Even though I said that math is a very important subject, for me it is very hard to begin a new math class [feeling] positive and without feeling fear, especially since I moved to live here. I said this because my first two years in high school were really hard, since I was in the process of learning English. I remember that the first year I had a teacher named Mr. John, and during the lesson, he [would] begin and ended (sic) the class by only explaining different problem[s] on the board and asking questions about who understood [the problems] and who didn't. We never did any hands-on activities. I also remember one time I went to him because I was having problems understanding one of the questions [and] when I got there, I couldn't explain to him what was my problem, and he didn't do anything to help me. I got out of his classroom feeling really miserable. *That day I understood that if I couldn't communicate in my new language, I was never going to be good at math, and it also made me start hating math* [emphasis added].

**Maricela:** I received mathematics instruction in Spanish all my life, and coming to the United States was not an easy step. I already knew the language when I came here, so it was not that bad, but it was still frustrating sometimes—especially in math class because all [of] my math knowledge was in Spanish. I never took a math class in English before coming to the University, so it was even worse. It is not easy to take a college math class for the first time if you are not a native English speaker, so I had a hard time figuring out the math terminology in English. Some terms are very similar to Spanish, but some of them are completely different. Unfortunately for me, it was a college class, so the teacher did not care if I understood or not.

**Sara:** When I started college, I had had only one year of English. The first semester I took a math course, and it was really difficult for me to understand everything the teacher explained; I was frustrated about that class. I wanted to drop it, but at the same time, I did not wanted (*sic*) to waste my time, so I just try (*sic*) hard and I looked for help. The teacher did not do anything to support my learning because I never asked; I was really quiet, so maybe he did not even notice my need.

Because the PSTs were learning to communicate in English, the dominant language of instruction in their United

States classrooms, they felt trepidation when asking their mathematics teacher for help. When their teachers did not initiate a bridge between their mathematical thinking in Spanish and English, they sought out help from others or exercised more efforts into their studies in order to be successful in mathematics.

Miria's words evoked sadness and frustration in myself because she felt that she needed to be fluent in English in order to be successful in mathematics. I could envision a young Miria seeking help on her mathematics homework, but was unable to communicate her needs to her teacher. Ultimately, Miria concluded that her mathematical proficiency was dependent upon her English fluency. Scholars such as Khisty and Chval (2002), Mosckovich (1999, 2002), and Gutierrez (2002) would argue that Miria's conclusion is an unfortunate misconception in mathematics education— students learning English as their second language should not believe that valid mathematical thinking requires a mastery of the English language. Although it typically takes second language learners on average seven years to develop their cognitive academic language proficiency (Cummins, 2008), they still bring mathematical knowledge and experiences to the classroom that serves as a resource for developing new knowledge (Celedón-Pattichis, Musanti, & Marshall, 2010). Even more so, linguistically diverse young students can solve challenging mathematics problems if given the chance to model the actions in that problem (Turner, Dominguez, Maldonado, & Empson, 2013).

Although I initially thought my experiences in Germany might have mirrored the stories told by the PSTs, their experiences were a window into the isolation that some non-native English speakers experience when learning mathematics in a second language. Maricela's experiences were particularly insightful because, although she was fluent in conversational English, she still needed a bridge between her mathematical knowledge in Spanish and her new mathematical knowledge in English. The PSTs' stories served as windows to the experiences of those learning mathematics in a second language and as a way to inform the goals of my course. I realized I needed to provide more subtle opportunities for my non-native English-speaking students to communicate their thinking such as drawing pictures or using their hands to model their thinking. My students should not need to master English first in order to have these opportunities.

The issues of learning mathematics in a second language resurfaced in the PSTs' pre- and post-methods belief survey responses. When asked, "How does your own background (e.g. language, culture, class, gender, race) impact your mathematics teaching?" they said,

**Maricela:** Background is useful because I am bilingual and know what all they [new Mexican immigrants] went through to be in this country.

**Miria:** My second language is English and I think students might have a hard time understanding me because I do not speak fluently. But I also know that I am going to be able [to teach] students who speak Spanish because that is my native language.

Maricela and Miria both viewed their opportunity to communicate in English and Spanish as a resource to their practice, but Miria also recognized that her emerging English pronunciations also could pose a challenge to her students. As another window moment for me, her story helped me to question my belief that mathematics was a universal language. As a young teacher, I required students to emphasize the "key words" and use correct mathematical terminology. In doing so, I could have neglected to notice the diverse ways that my students could communicate their mathematical thinking. As such, I probably missed opportunities for some of my students to see themselves as smart in mathematics; I now see some of the complex issues facing students who are learning mathematics (or PSTs learning to teach mathematics) in a second language. In order to recognize these complex issues, I needed to find more opportunities for PSTs like Miria to share her experiences with other PSTs.

## Mathematical Strategies and Algorithms are Universal

In the PSTs' description of their prior learning experiences, they described other ways in which learning mathematics in Mexico was different than in the United States, specifically the mathematical strategies and algorithms. In one example, Maricela described how she became frustrated when her teachers wanted her to mimic the traditional algorithm for a long division problem because they refused to honor her shorter, valid way of solving the problem. While explaining the difference between learning mathematics in Mexico and the United States, she said, "[A difference for me was] knowing everything from memory. I did everything in my mind [when

I was in Mexico]. [It was] hard for me to do it the way they [my teachers in the United States] wanted me to."

Maricela found it challenging to replicate the American "traditional algorithm" even though the method she learned in Mexico for dividing whole numbers was still valid. Her teachers in the United States did not validate Maricela's mathematical strategies from Mexico, and it was challenging for Maricela to learn this new algorithm. When I asked her what this experience meant to her as a future teacher and the challenges that she might face in the classroom when students present their own mathematical strategies, she noted in her initial interview that

> [A challenge might be] teaching them the way you were taught, but you need to teach them the way they learn here [in the United States]. The way I learned isn't the way [that they are taught here in the United States], doesn't make sense [to teach them differently]. [I] cannot teach them in a way they haven't been taught before.

Sara similarly echoed Maricela's sentiments about being aware as to the different ways that mathematics can be taught. Sara more specifically stated in her pre-methods survey "Math is not taught using the same methods everywhere. What seems common to one child may not be common for another." As a future teacher who learned mathematics in Mexico, Sara was aware that her students might express their mathematical thinking in different ways and that she might not be familiar with all of the strategies at first.

In another excerpt from the pre- and post-surveys, Sara and Miria reiterated that their experiences with learning different mathematics strategies in Mexico might play a role in how they will teach mathematics in the United States; they explained:

**Miria:** When I was in my classes [in the United States], it was hard [to learn math] because when the teacher was teaching something new, it was different from what they had teach (*sic*) me in my hometown [of Mexico].

**Sara:** It [my background] will have a big impact because I was taught in a different way.

Although both Miria and Sara recognized a difference between how they learned mathematics in Mexico and in the United States, they also realized that they needed to be responsive to their students' learning needs and that this difference in learning and teaching styles might not necessarily be problematic to their practice as a mathematics teacher.

As I listened to Sara and Maricela describe potential challenges in their practice, I had a mirror moment—the challenges she mentioned were now challenges I was facing myself. Even as a young teacher, I was confident that if I encouraged my students to use explicit traditional algorithms and procedures (or what I thought to be "traditional"), then my students should easily learn mathematics. Yet, by teaching only the algorithms and procedures that are familiar to some United States students, I may have limited opportunities for my students to communicate their mathematical thinking. After learning some other mathematical strategies in Germany, I came to realize that there is no one "traditional algorithm" (Philipp, 1996). I needed to move away from a first-person perspective of teaching and step into my students' mindset as they solved mathematical problems. As I slowly made this shift, more of my students became successful in mathematics.

Maricela's words resonated with my new awareness for the cultural differences between *doing* mathematics and *knowing* mathematics (Gorgorio & Planas, 2001). Maricela's experiences mirrored my developing beliefs about teaching mathematics—I, too, did not want to replicate practices that were only familiar to my style of learning. As Maricela shared her prior experiences with me, I realized that the work of helping my students to learn mathematics rested with *me*, not the other way around. Even more so, I needed to go beyond honoring the native language of my students; I also needed to honor the *valid mathematical strategies* of my students, even if I was unfamiliar with these strategies. Now, in my methods courses, we explore different, valid mathematical strategies used in other parts of the world.

Finally, Miria returned to the issue of recognizing and validating children's mathematical strategies as she elaborated in another post-methods survey question: "Another thing is that I want to be opened (*sic*) mind[ed]. When coming to school [as a teacher], I want to make everyone learn and value everyone['s] background and do not tried (*sic*) to make them believe the same way as me." Miria recognized that even though her experiences were different than many of her future students, she valued these differences and wanted to always search for new ways to honor how her students learned mathematics.

As I read about how Miria and Sara recognized the difference between their mathematics education

in Mexico and traditional mathematics pedagogy in the United States, I was met with both a mirror and a window moment. As a student, I was successful in a very traditional setting where algorithms, procedures, and memorization were emphasized. Early in my career, I replicated these ways of teaching mathematics for my students and I found little success. Yet, as I grew with experience, I shifted my practice from one that mirrored my own experiences to one that explored my students' ways of learning mathematics. My experiences in Germany and then later with Miria, Maricela, and Sara further solidified this shift in my thinking—I was eager to seek new ways to elicit and honor how my students learned mathematics and communicated their mathematical thinking. This shift was now a resource to my practice as a mathematics teacher educator.

After I finished my study with the three PSTs and my reflections on the experience, I reexamined what any of this might mean for my future practice. How did my own perceptions of mathematics influence and inform my teaching? How might my experiences in Germany influence my growth as a teacher? How might my process of seeking windows and mirrors with my PSTs inform my goals to model responsive pedagogies in my methods courses? More importantly, how might I provide more opportunities to create similar experiences for my PSTs with their own elementary students?

## Mathematics Teachers and Teacher Educators Recognizing their Own Windows and Mirrors

Before I met the three women in this essay, I believed mathematics was one body of knowledge that transgressed language, culture, and experience—math was just math. But Miria's, Maricela's, and Sara's personal stories of learning mathematics in a second language as new immigrants informed my vision for mathematics and mathematics education. Mathematics is not just a body of knowledge, but it can be an activity that we engage in outside of school (Foote, 2009; Wager, 2012) and can be contextualized in different ways for different people and/or cultures (Barton, 1996; D'Ambrosio, 1990). We as teacher educators need to provide more window opportunities for our PSTs to learn new ways that mathematics is used, learned, and interpreted. The process of finding more window opportunities may include the PSTs watching videos of immigrant children correctly solving a mathematical task and noticing their particular strategies. In the process of finding these new ways of doing mathematics, our PSTs may identify new mirrors among themselves and their students. My ultimate goal as a teacher educator is to help my PSTs develop an emerging framework that honors the diverse ways our students are mathematically smart—exploring our own mirrors and windows might be one small step towards that goal.

If I were to answer the same survey question as to how my background impacts my practice as a mathematics teacher, I might say that with each year in my career, my background changes. I learn something more than I did the day before about myself and about others. These new experiences add another layer to my role as a mathematics teacher educator. Each new experience also adds another opportunity for me to challenge how I position myself in the field of mathematics education research and my assumptions about teaching and learning mathematics. Given the dynamic nature of teaching, it is no surprise that we continue to change who we are and how we teach.

Miria, Maricela, and Sara provided me another window by which to explore the first-hand experiences of immigrant students and to consider the complex negotiation of how they learned in Mexico with how they might teach in the United States. As our classrooms become more diverse, we need to help our new teachers explore their own backgrounds (and the backgrounds of others) in order to reconceptualize how mathematics is indeed a universal language—*a complex, diverse language that we all use.*

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