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"Estoy acostumbrada hablar Inglés":[1] Latin@[*] Pre-service Teachers' Struggles to Use Spanish in a Bilingual Afterschool Mathematics Program

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In this article, the author explores factors that appear to contributed to bilingual Latin@ pre-service teachers' difficulties in using Spanish as an instructional resource while working on mathematical activities with bilingual Latin@ students in an urban afterschool mathematics program. Qualitative analysis of the per-service teachers' oral and written comments reveals two main patterns associated with their difficulties. The first relates to their schooling/academic experiences, which were predominantly in English. The second relates to their experiences with students in the afterschool program who showed preference in using English. The author discusses implications of the findings for mathematics teacher preparation.

Keywords: bilingual instruction, Latin@ education, mathematics education, teacher education, urban education

> I always talk to them (the children) in English, when I realize it, I try to switch to Spanish but then it just sounds weird and it does not sound natural. I always thought that Spanish was my dominant language, but I guess not.

Juanita,[2] a bilingual Latina elementary pre-service teacher (PST), wrote the above statement after 4 weeks of working in an urban after-school mathematics program, *Los Rayos,* with children who were also Latin@s and bilingual.

[1] Translation: "I am used to speaking in English."

[2] All names are pseudonyms.

EDITOR'S NOTE: Gutiérrez (2010) explains the use of the @ sign as a means: "to indicate both an 'a' and 'o' ending (Latina and Latino). The presence of both an 'a' and 'o' ending decenters the patriarchal nature of the Spanish language where is it customary for groups of males (Latinos) and females (Latinas) to be written in the form that denotes only males (Latinos). The term is written Latin@ with the 'a' and 'o' intertwined, as opposed to Latina/Latino, as a sign of solidarity with individuals who identify as lesbian, gay, bisexual, transgender, questioning, and queer (LGBTQ)" (p. 5). Gutiérrez, R. (2010). The sociopolitical turn in mathematics education [Special issue]. *Journal for Research in Mathematics Education Research, 41*(0).

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Throughout this time, she used little Spanish in her instructional interactions with the children, even though the program was designed to promote mathematical biliteracy, in English and Spanish. In fact, other bilingual Latin@ PSTs, who worked in *los Rayos*, also used almost exclusively English with the children. But why would someone whose home language is Spanish and is fluent in Spanish not use it as a resource when working on mathematical activities with Spanish speaking children? Why is this an issue for the mathematics education of Latin@ students and what are some implications for the mathematics teacher preparation of Latin@ PSTs? Here, I address these questions and discuss results from a larger study, which examined bilingual Latin@ PSTs' use of language during their participation as facilitators in an urban after-school mathematics program (Vomvoridi-Ivanović, 2009). I have two purposes: (a) to understand the challenges that bilingual Latin@ PSTs may face as they attempt to integrate their home language (Spanish) in mathematics instruction and the underlying factors that contribute to these challenges, and (b) to draw implications for the mathematics teacher preparation of Latin@ PSTs, and other PSTs who went through the educational pipeline as Language Minority Students (LMS).[3] Through the elevation of the voices of Latin@ PSTs, I highlight the historical, sociopolitical, and linguistic factors culminating in bilingual Latin@s' struggles to incorporate and leverage Spanish to maximize young Latin@s mathematics learning. The findings I present, as well as their implications, are applicable to many urban contexts, nationally and internationally, where the languages of instruction and of use by students, families, and the wider community are different.

Conceptual Framework

Literature on bi/multilingual mathematics learners considers students' home language(s) as resources that teachers need to build on to support students' learning of mathematics (e.g., Adler, 2001; Barwell, Barton, & Setati, 2007; Fuson, Smith, & Lo Cicero, 1997; Gutstein, Lipman, Hernandez, & de los Reyes, 1997; Khisty, 1997; Moschkovich, 2000; Setati, 2005; also see the edited volume: Tellez, Moschkovich, & Civil, 2011). This literature has taken a strong position for the use of the students' home languages in teaching mathematics and has argued that to facilitate LMS' participation and success in mathematics, teachers should recognize and utilize their home languages as legitimate languages for mathematical communication. There is still a question, however, of how to pre-

[3] By using the term LMS, I refer to those students whose linguistic and cultural backgrounds have not traditionally been considered as resources for academic learning.

pare those teachers who share similar linguistic backgrounds with LMS[4] to integrate their knowledge of student's home language in mathematics instruction.

The literature on teacher preparation for linguistically and culturally diverse students has been primarily concerned with English monolingual teachers (Lucas & Grinberg, 2008; Villegas & Davis, 2008) and has not paid adequate attention to the preparation, support, and empowerment of LMT, who may need different kinds of supports to incorporate their home language(s) into pedagogical practices in mathematics. This focused attention is particularly relevant to Latin@ teachers as they are the fastest growing minority teacher group, especially in urban school districts where the Latin@ student population is the highest (Strizok, Pitsonberger, Riordan, Lyter, & Orlofsky, 2006). According to a report from the National Center for Educational Statistics (NCES, 2011), in 2009, Latin@ teachers made up 8% of the U.S. teacher population and Latin@ students made up 22% of the U.S. student population. These percentages have more than doubled during the past two decades. In addition, according to the same report from NCES, in 2009, 21% of the U.S. student population spoke a language other than English at home, with Spanish being the predominant language.

Because the majority of LMS are Latin@s (NCES, 2011), Latin@ teachers tend to teach Latin@ students (Villegas & Davis, 2008), and many Latin@ teachers speak Spanish, it is vital for the field of mathematics teacher education to consider ways of helping Latin@ pre- and in-service teachers to build on the unique strengths they bring into teaching mathematics, particularly their knowledge of Spanish. Literature in this area, however, is scant, as research in mathematics teacher preparation has been primarily conducted in English monolingual settings (Clift & Brady, 2005). In teacher education, typically, language is treated as a subject, and is separated from the content subjects. This situation is evidenced by the absence of substantial language and discourse content and on teaching practices appropriate for bi/multilingual classrooms in most mathematics teaching courses for PSTs (Setati, 2005).

A few studies have focused on mathematics teachers' language practices in bi/multilingual contexts (e.g., Adler, 2001; Fabelo, 2008; Khisty, 1995; Setati, 1998, 2005; Setati & Adler, 2000; Vomvoridi-Ivanović, 2009; Vomvoridi-Ivanović & Khisty, 2007). These studies highlight the complexity of using more than one language during mathematics instruction and point to the fact that simply knowing how to speak students' home language does not ensure that the teacher will use that language appropriately, if at all, as a resource during mathematics discussions. Khisty (1995), for example, found that in classrooms where students and teacher were bilingual and Latin@, very little Spanish was used in the mathematics context compared with other subjects such as reading and/or language

[4] I will refer to these teachers as Language Minority Teachers (LMT).

arts. In addition, very few whole thoughts were conveyed in Spanish during mathematical explanations. Spanish was used in a perfunctory manner as an "instrument" to discipline students, to call their attention to the subject of the lesson, or to punctuate a statement. Finally, Spanish was used primarily to give encouragement and to motivate the class. In other words, Spanish was not used in the context of mathematics meaning making.

Fabelo (2008) also found that novice bilingual Latin@ teachers had difficulties using academic Spanish during mathematics instruction. She argued that bilingual Latin@ teachers raised in the U.S. who teach mathematics encounter the same issues with the mathematics register (Halliday, 1978) as they do with registers for other content areas in academic Spanish. They have learned the mathematics register in an academic setting in English or informally with their families in Spanish (Khisty, 1995; Ron, 1999). Many do not have training in the technical language of mathematics in Spanish and are left to develop it themselves (Vomvoridi-Ivanović & Khisty, 2007).

Not knowing the language of mathematics in their home language, however, is only one factor that might influence a LMT's choice of whether or not to integrate their home language in mathematics instruction. Setati (2005) pointed to the fact that different infrastructures in and around classrooms make different demands on mathematics teachers and this affects their willingness to use students' home languages for instructional purposes in mathematics. She noted, "to fully describe and explain the use of language(s) in multilingual mathematics classrooms we need to go beyond the pedagogic and cognitive aspects and consider the political role of language" (p. 464). Though it is rarely made explicit, one of the most common distinguishing features in schools with large numbers of LMS is their overwhelming press toward assimilation of students into mainstream cultural—including linguistic patterns (Clayton, Barnhardt, & Brisk, 2008). Clayton and colleagues argue that, on the surface, this cultural assimilation orientation, which is prevalent in most schools, seems to offer LMS an opportunity to gain access to the skills and recourses necessary to participate in the larger society on equal terms with others. Because English is seen as the dominant language associated with access to social mobility and success, this may influence LMT's language choices in mathematics instruction.

Clayton and colleagues (2008) further argue that in most instances, the goals of schools are bound to universalistic intellectual or social functions associated with the dominant society. In other words, the basic thrust of schooling is toward the breaking down of particularistic orientations and developing in their place a more universalistic outlook. Even where accommodations are made to include ethnic studies or bilingual education in the curriculum content, the structure, method, context, and processes through which the content is organized and transmitted are usually reflective of mainstream patterns and exert a dominant influ-

ence on the students. Schools are agents of the dominant society and, as such, they reflect the underlying cultural patterns of that society. As long as they reflect the structure and cultural fabric of the dominant society, they can be expected to perpetuate its values, attitudes, and behavior patterns associated within an explicit framework of assimilation.

The assimilationist nature of LMT's own schooling experiences results too often to the formation of certain *cultural models* (Holland & Quinn, 1987) for teaching and learning mathematics. Holland and Quinn defined *cultural models* as presupposed, taken-for-granted models of what is considered to be normal. In other words, they are shared conventional ideas about how the world works and "provide a framework for organizing and reconstructing memories of experience" (p. 4). Cultural models link values, goals, motives, emotional states, and knowledge (of things and processes, classifications, social relations, etc.), as relevant, together in a conventional representation of behavior (Kronenfeld, 2005). They are embedded in peoples' words and practices, and are shared with others through the media, written materials, and through interaction with others in society (Gee, 1996, 1999). The cultural model of what it means to be a mathematics teacher is initially passed on to future mathematics teachers while they are students and later passed on during teacher training and through the media (Setati, 2005).

In order to begin to think about how to help teachers who share similar linguistic backgrounds with their students develop and incorporate their knowledge of their students' home language into pedagogical practices in mathematics we first need to better understand the historical, linguistic, and sociopolitical factors that influence their language choices and especially their difficulties in using their home language as an instructional resource in mathematics. In this article, I unpack several factors that contributed to four bilingual Latin@ PSTs' difficulties in using Spanish as a resource while working on mathematical activities with bilingual Latin@ students in an urban afterschool mathematics program. I now turn to describe the context of the study, the participating PSTs, and the methods employed. Next, I discuss the factors that contributed to the PSTs' difficulties in using Spanish while working on mathematical activities with bilingual Latin@ children. I close my discussion with some concluding thoughts related to the implications for mathematics teacher preparation.

Methods

Context

The work presented here draws on a wider study that explored how Latin@ PSTs used language and culture as instructional resources in mathematics

(Vomvoridi-Ivanović, 2009). It reflects current work carried out by a Center for Learning and Teaching, funded by the National Science Foundation, which focuses on the research and practice of the teaching and learning of mathematics for Latin@s in the United States through the integration of socio-cultural theory, language, and culture. This Center for Learning and Teaching created afterschool projects at two of its sites, one of which, *Los Rayos*, is the context of the present study.

Los Rayos was located in a large Mid-western urban school district and in a community that has 93.5% of Latin@s, predominantly of Mexican heritage. The project took place in a neighborhood school that has a dual language (Spanish-English) program for all of its grades and predominantly serves the students of working class Mexican families. This neighborhood is representative of many predominantly Mexican and segregated neighborhoods in the city. This specific scenario of Latin@ students from these neighborhoods, becoming teachers of bilingual Latin@ youth deserves our attention if we want to improve what has been historically the mis-education of Latin@s in our cities (and elsewhere).

The afterschool program consisted of two parts: the actual informal learning environment, *los Rayos,* where bilingual Latin@ PSTs engaged in various kinds of mathematical activities with Latin@ children, and a debriefing meeting where PSTs and researchers discussed the children, activities, and various aspects of mathematics and curriculum that arose during the afterschool sessions.

All materials used in the program were written in Spanish and English and all informational meetings with children were conducted in Spanish first and then in English. PSTs and other afterschool personnel who were bilingual were encouraged to speak Spanish as much as possible to provide children with university role models who also spoke Spanish. Furthermore, the afterschool program was housed in a school that strived for biliteracy and it was hoped that the program would build on and extend this idea to mathematics. The environment in which the PSTs worked and the activities they were engaged in offered them many opportunities to choose to use Spanish, English, or a hybrid of the two. In other words, the project was conducted in a bilingual environment; bilingualism carried over to the debriefing meetings as well.

As part of their participation in the afterschool program, PSTs took field notes and reflected on their interactions with the children in *Los Rayos*. After each session in *Los Rayos,* PSTs constructed descriptive and reflective field notes that focused on their own and the children's use of language, the students' mathematical strategies, their own assistance strategies, and the students' interests. The same topics or items were discussed in the weekly debriefing meetings where the PSTs met with university researchers, whom I will refer to as Fellows, and discussed what occurred in *Los Rayos* by reflecting on their interactions with the children. These discussions were open-ended in that PSTs could easily and naturally raise

questions, offer suggestions, and try to make sense of their own and their students' mathematical behaviors as related to issues of language, culture, and identity, to name a few. Some of the Fellows that co-facilitated the meetings were native Spanish Speakers and the discussions in these meetings were bilingual.

Participants

Jose, Juanita, Maria, and Lupe, the four PSTs who participated in this study were all undergraduate students at a large University in the Midwest. At the time of the study, Jose and Lupe were elementary education majors and Maria was a secondary mathematics education major. Juanita was an undeclared major in her sophomore year and, at the time of the study, was strongly considering entering the elementary education program. (Here, I refer to her as a PST even though she was not officially an education major during the time of the study.)

All four PSTs' home language is Spanish and their parents are immigrants from Mexico. Jose and Juanita learned English prior to attending elementary school. Jose learned English from interacting with his English speaking babysitters, while Juanita began to learn it in pre-school. Maria and Lupe on the other hand did not begin to learn English until they attended first grade. Moreover, Lupe was born in Mexico and moved to the United States at age 5, while all other PSTs were U.S. born. All four PSTs were brought up in predominantly Latin@ communities and were schooled in the same urban public school district and attended different bilingual/ESL school programs. Specifically, Jose attended a "pull-out ESL" program and Juanita attended a "transitional bilingual" program until third grade after which they attended mainstream classrooms where instruction was in English only. Lupe and Maria, on the other hand, attended "maintenance bilingual" programs until sixth grade after which they also attended mainstream classrooms where instruction was in English only. All PSTs noted that during the time that they attended mainstream classrooms they were forbidden to speak in Spanish at all times.

Data Collection and Analysis

The four PSTs' field notes and oral comments during the debriefing meetings are the primary data sources for this study. Additional data sources used for triangulation are observations of the PSTs' interactions with the students and my personal field notes.

The PSTs were observed once per week for 4 weeks for approximately two hours each time as they participated in a debriefing meeting. These meetings ran concurrently with the afterschool sessions but on another day of the week. The meetings were videotaped, discussions were transcribed, and Spanish talk was translated to English. In addition, study participants' own field notes were collect-

ed twice per week for 5 weeks. In their field notes, the PSTs were asked to address (a) the language(s) used and the contexts in which those were used during the afterschool session amongst their group, (b) the children's mathematical strategies, (c) their own assistance strategies, (d) children's interests, and (e) participants' reflections on items 1 through 4. Finally, PSTs were observed twice per week for 4 weeks of the afterschool program as each worked with a small group of two to five fifth-grade bilingual Latin@ students. The afterschool sessions were videotaped, discussions were transcribed, and Spanish talk was translated to English.

Grounded theory (Strauss & Corbin, 1990) methodology was employed to identify recurring themes in the data. First, I identified excerpts from the PSTs' field notes and the transcriptions from the debriefing meetings where the PSTs referred to their own and the children's language. Then, I compiled a list of general framing codes, including participants' challenges in using Spanish during mathematical activities and PSTs' explanations as to why discussions were English dominant. Next, the data were coded, and the emergence of additional codes occurred through multiple passes of the entire dataset; four passes through the dataset were required before categories began to stabilize. The coding scheme aimed to characterize the nature and content of the PSTs' comments when they addressed issues related to language use. Finally, I identified the episodes from the afterschool sessions that the PSTs referred to in their comments and mapped them with the PSTs' comments.

Findings

Data analysis revealed two main patterns associated with the PSTs' difficulties with integrating Spanish talk during mathematical activities. The first pattern relates to their experiences as LMS in the U.S. educational system. The PSTs' schooling/academic experiences were predominantly in English. Specifically, their mathematics learning experiences were only in English at some point early in their schooling. As a result they lacked experience in talking mathematically in Spanish and had come to associate academic (including mathematical) discourses and institutions as being English monolingual. The second pattern relates to their experiences with students in *Los Rayos* who showed preference in using English. This preference was evidenced in two ways: by students' consistent use of English even when the PSTs addressed them in Spanish, and by individual students demanding that the PSTs and other students use English.

PSTs' Academic Experiences Were In English

Lack of experiences speaking mathematically in Spanish. All four PSTs expressed facing several challenges when attempting to facilitate mathematical discussions in Spanish both during the debriefing meetings when they were asked to discuss mathematical activities in Spanish, and when working with the students in *Los Rayos*. They attributed part of their challenges in facilitating mathematical discussions in Spanish to the fact that they had never been taught mathematics in Spanish and, hence, did not have experience speaking mathematically in Spanish.

After reflecting on his language use during his first session in *Los Rayos*, Jose mentioned in his field notes that he felt more comfortable explaining himself in English rather than in Spanish when doing mathematics. The other PSTs shared the same experience with Jose, as can be seen in the following excerpt from one of the debriefing meetings. During this debriefing meeting, one of the Fellows, Salvador, presented a mathematical task dealing with proportions in Spanish. He asked the PSTs to solve it using Spanish only. After discussing and solving the task collaboratively, the PSTs were asked to reflect on the process of solving and discussing this task in Spanish. One of the PSTs mentioned that it was difficult for her to discuss the task in Spanish as she feels more comfortable expressing her thinking in English than Spanish. Jose and Juanita shared the same feelings with that PST and added:

> **Jose:** And for that reason, I'd really rather use English to express myself when it comes to math. Um…I can hold the concepts in Spanish…but if I wanted to explain a point I'll go—and switch the Spanish—I'll do it in English. …I knew I had to speak in Spanish because we were more pushed but I was thinking in English and was translating what I wanted to say from English to Spanish. I just feel more comfortable explaining myself and it just clicked…but I used English in my mind to figure it out. …I've been taught math in English and not in Spanish.
>
> **Juanita:** I thought about it (the task) in English, and then tried to translate it in Spanish.

Jose expressed his difficulty with thinking about mathematics in Spanish and with explaining mathematical ideas in Spanish. Just like Juanita, he talked about his need to think about a mathematical task and reason mathematically in English and then translate it to Spanish if asked to explain his thinking in Spanish. He attributed his difficulty in thinking and expressing mathematical ideas in Spanish to the fact that he had not been taught mathematics in Spanish. Both Jose's and Juanita's comments underscore the importance of mathematics discourse in the learning of mathematics.

Other PSTs, namely Maria and Lupe, claimed that they felt very comfortable expressing themselves in Spanish. In fact, Maria said that she always thinks in Spanish, rather than English. Still both Maria and Lupe mentioned that when it comes to talking about mathematics with the students in *Los Rayos* they would often resort to English due to their lack of the necessary mathematical terminology in Spanish. They also expressed that many times, when they would read the Spanish version of the activities they had to use the English version because they would not understand the terminology. During the same debriefing meeting Maria and Lupe reflected on their comfort level in using Spanish when doing mathematics with the students or at the debriefing meetings:

> **Maria:** It depends…on the vocabulary because sometimes we don't know how to—we don't know what one word means.
>
> **Lupe:** I'm comfortable with both, but like the way Maria said it depends on the vocabulary. Cause if like some word is in Spanish like for math that I'm not sure what they mean but if you tell it to me in English I might go like "yea, it's this shape" or something.

According to Maria and Lupe, not knowing mathematical terminology in Spanish made their task of speaking mathematically in Spanish more difficult. However, it remains unclear as to whether Maria and Lupe were really referring to their not knowing mathematical terminology in Spanish or simply to the fact that they were simply not used to talking about mathematics in Spanish because they had been taught mathematics in English.

The PST who perhaps expressed most intensely her discomfort in facilitating mathematical discussions in Spanish was Juanita who repeatedly noted this in her field notes. She found it difficult to use Spanish during mathematical discussions, seemingly because she lacked the specialized language of mathematics in Spanish. This is evident in her field notes:

> I always talk to them (the students) in English, when I realize it I try to switch to Spanish but then it just sounds weird and it does not sound natural. I always thought that Spanish was my dominant language, but I guess not…

When Juanita was asked to elaborate on her comment that "it does not sound natural" she responded:

> It sounds as if I am trying too hard, and sometimes I do not use the right words. It's like I don't feel comfortable using Spanish when I do math. I don't know all the words and I can't explain it in Spanish.

Juanita' statement that she is unsure as to whether Spanish is her dominant language as she had previously thought leads to her realization of the difference between conversational and academic fluencies. Juanita, just like the other PSTs, were fluent in conversational Spanish but not in academic (mathematical) Spanish. This realization appeared to unsettle them, and they realized that to facilitate mathematical discussions in Spanish they needed to learn the specialized language of mathematics in Spanish and to practice doing mathematics in Spanish.

Associating academic discourse and settings to English. Another challenge that the PSTs appeared to face when trying to speak mathematically in Spanish was that because of their educational experiences, they had come to associate academic discourse to English language rather than Spanish. Through reflecting on their personal histories as LMS, they expressed that throughout their academic career they have made a very strong effort to develop English academic proficiency and they have come to associate English as being the language used in academic (including mathematical) discussions. Also, they had associated academic institutions as being English monolingual establishments because that had always been their experience. They expressed that it felt "weird" to talk about mathematics in Spanish in *Los Rayos,* which was housed inside a school, and they also felt "weird" using Spanish during the debriefing meetings, which were housed inside the university (i.e., an academic setting where they typically used English). Some of them shared experiences of having been forbidden to use Spanish in school and even though they all remember this as being a painful experience, overtime they developed the notion that Spanish is not the language used for academic discussions and in academic institutions.

During a debriefing meeting, the PSTs reflected on their background experiences growing up as LMS in a large urban mid-western school district. During this meeting we were discussing several issues related to using different natural languages in different contexts. Maria, reflecting on her use of Spanish and English inside and outside academic establishments commented:

> In general, I feel more comfortable speaking Spanish but like when it comes to school it's like you know, all of our lives we have been told "you have to do this right, you have to speak in English, you know it's the language of America" and they are teaching it in school and you need to speak English to get a good job so we grew up feeling pressured to like speak in English. But once we are outside and we are free in the environment then we are more comfortable to speak however we want.

Maria's comment points to the pressure these PSTs felt to use English inside academic institutions and to the fact that they grew up learning that English is the dominant language in the United States. They realized early on in their academic careers that to succeed in schooling they needed to learn how to speak English well. At the same time, they feel that outside academic institutions, and in situa-

tions where they do not feel any type of pressure to use a certain cultural language, they feel comfortable using Spanish as well as English. After discussing several factors that the PSTs felt affected their language choice in different contexts, including in the context of mathematics, Jose summarized the discussion as follows:

> I think we were all saying that because when we're feeling that we're doing something that's in school or is related to school because our school experience was in English that we have to speak in English. But if we are outside, then we don't feel that sort of like pressure so it's basically the environment. And then we were saying that we've been taught math in English so we might not know the terminology in Spanish and in the school in general we use academic language and we do that for math too and this is not the language we use outside. So maybe it's both, right?

During this discussion, the PSTs noted that because they had been taught mathematics in English, they did not learn the specialized language of mathematics in Spanish and at the same time they learned to associate English as the language used in mathematical discussions in schools. Moreover, since their schooling has been in English, it is the language they are accustomed to using when they are discussing subjects related to school, including mathematics.

During a later debriefing meeting, while the PSTs were reflecting on their use of Spanish during a mathematical task with Salvador and Paco, the two Spanish-speaking Fellows, they revisited these issues:

> **Jose:** It's like all our lives we have been trying to speak proper English in school and to sound academic and then we come here and we try to talk about math in Spanish and math is academic and it is very hard. Now it feels weird to use Spanish in here because this [math] is not something I am used to talking in Spanish but in English only. It's like I am not used to talking about things I learned in school in Spanish because we always used English and I always tried hard to sound proper and here [at the University] we have to sound academic like when we write papers and it is all in English.
>
> **Juanita:** Yea it's like we—all these years we had to, to use English in school and now using Spanish is weird—I am not used to talking in Spanish in school—I mean when I'm in class. So this here [doing math in Spanish] is very different.
>
> **Lupe:** I remember in 6th grade when the principal told us we couldn't speak Spanish any more and that it would all be in English and I remember that really hurt—I really remember that—and it was very hard but I guess after that I got used to it and now it feels weird talking in Spanish when I am in school because I got used to the English but when I was little I didn't want to use all English because it was hard for me and I would rather do it in Spanish. Whoa! It switched! I just thought of that now!

> **Maria:** I also had that thing about not talking in Spanish anymore in 6th grade and it was hard for me too. But eventually you get used to the fact that English is the language for school and Spanish for outside.

All four PSTs had experienced one point in their schooling where they were forbidden the use of Spanish in the classroom. Whether this took place during the early grades, as in Jose's and Juanita's case, or during middle school, as in Lupe's and Maria's case, they all remember it as a painful experience. Lupe realized that in some sense she felt a similar discomfort when discussing mathematical activities in Spanish to the discomfort she had felt when she was forced to use English only in 6th grade. The fact that over the years the PSTs had gotten accustomed to using English when doing mathematics became an extra challenge for them when they tried to use Spanish in their mathematical discussions. Being bilingual does not automatically mean being an effective facilitator in two languages, and this is more nuanced than simply sharing the same home language.

During the same debriefing meeting Paco asked the PSTs why they switched from Spanish to English half way through doing a mathematical activity. Lupe and Juanita said that they have become used to speaking in English to everyone other than their parents and therefore have become accustomed to speaking in English rather than Spanish:

> **Lupe:** Yo pienso que primero tratamos de usar más el español pero yo estoy acostumbrada hablar en inglés. Porque en el día estoy en la escuela y hablo inglés. En la casa nomás hablo Español con mi mamá y mi papa. [*I think that first we tried to use only Spanish, but I am used to speaking in English. Because during the day I am at school and I speak English. At home only I speak in Spanish with my mother and father.*]
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> **Paco:** Pero es interesante porque yo no noto que ustedes estén luchando. [*But it is interesting because I don't notice that you guys are struggling.*]
>
> **Lupe:** Yo no estoy diciendo que lucho, yo estoy diciendo que estoy acostumbrada hablar ingles. [*I am not saying that I struggle, I am saying that I am used to speaking in English.*]

Lupe explained that not only had she become accustomed to using English inside academic institutions but also she has become accustomed to using English everywhere other than when speaking to her parents. Juanita shared the same experience and added that even with her parents she had to make an effort not to use English. Lupe regularly noted in her field notes that because she spends most of her time at the university where she speaks "in English all day long," it carries over to the afterschool without her realizing it. One thing that is interesting with Lupe's final comment is her statement about not struggling with speaking mathe-

matically in Spanish but rather simply being accustomed to using English. Paco's comment reveals that Lupe displayed competence in using Spanish when talking about mathematics and did so with ease. However, to Lupe, it felt more natural to use English rather than Spanish in mathematical discussions.

Students in Los Rayos Resisted Spanish

The second pattern associated with PSTs' difficulties in integrating Spanish during mathematical activities involves' the students' language choice. During the sessions that the PSTs expressed that using Spanish with the students was very difficult, the students' talk was English dominant, even when the PSTs addressed them in Spanish. In addition, individual students resisted the use of Spanish by demanding that the PSTs and other students in their groups speak English. Students' resistance to Spanish relates to the previous theme of associating academic (mathematical) discourse in English. Both themes result from strong socialization patterns that lead to disassociating mathematics with Spanish.

Student talk was English dominant. Juan, Maria, and Lupe attributed their increased (and often exclusive) use of English during mathematical discussions to the fact that students spoke amongst themselves in English and, as a result, they felt it was more natural for them to use English as well. Lupe reflected on this during one of the debriefing meetings:

> I go there…and before…we begin teaching or whatever I hear the kids talking in English so I don't know I guess I just…automatically—because they're doing it, you know, …I think about speaking to them in Spanish but I do…catch myself, like I'm saying all of this in English and I see how…we could be speaking Spanish but since they…hear me speaking English they're not…speaking it either.

Lupe here explains that because she would usually hear the students chatting in English before the afterschool sessions began, she would instinctively talk to them in English as well and that resulted in English dominant dialogue that carries into the mathematical discussions as well. Maria shared a similar experience as with Lupe, as her students would regularly use English when chatting about various topics. In Maria's and Juan's case, however, even when some of their students spoke in Spanish, they were "forced" to switch to English due to individual students in their groups who repeatedly demanded to use English.

Juanita also reflected on the few sessions where she had English dominant students in her group and explained that the fact that those students spoke English influenced her language choice as well:

> I hear them speak in English so I talk English and then I…notice myself speaking English so I try to switch it to Spanish but then I somehow get back to English and I try both of it but Spanish doesn't come natural to me. …Cause like if they ask me

> something, they usually ask me in English so I respond in English like I didn't think about the language.

Similar to the other PSTs, Juanita realized that because the students talked to her and to each other in English, using Spanish did not feel "natural."

When addressed to in Spanish, students responded in English. In addition to the student's predominant talk being in English, individual students would regularly show resistance towards using Spanish. In most cases, this resistance would take the form of consistently responding in English when the PSTs would address them in Spanish. But in other cases, students' resistance to Spanish was more aggressive and individual students would verbally ask and even demand English to be spoken in their group.

Jose, whose group was consistently English dominant, regularly described and reflected on the phenomenon of the first case in his field notes. He repeatedly noted that certain students in his group would use English even when he talked to them in Spanish:

> Today we had two boys who are English dominant they are Andre and Alfonso hence the dominant English speaking. I know that if necessary both Andre and Alfonso can respond in Spanish. …I would get one-word responses from them both when I would ask simple questions in Spanish, or they would simply respond in English, showing me they can fully comprehend what is being asked of them in Spanish.

Jose realized that even though both Andre and Alfonso understood Spanish, they chose to use English. He attributes the English dominance of the discussions during the afterschool sessions partly to the fact that certain students, such as Andre and Alfonso, consistently use English even when being addressed to in Spanish. In later field notes, Jose explains that this behavior has influenced his, as well as other students', language choice:

> Throughout the meeting with the boys we mainly spoke English. Again I believe it has to do with the main students who shape the tone of the group which influence the English dominance. I began talking to them in Spanish but I mainly got most of my responses in English so I think that is why eventually I ended up speaking English. Even Rodrigo spoke mainly English, which is funny because the first encounters I had with him he would mainly talk Spanish. I wonder if it's the others' influence on him that just have gotten him used to talking in English.

Jose explained that not only is his language choice influenced by the fact that certain students consistently use English but also that other students, like Rodrigo, who in the past have used a lot of Spanish, began using English as a result.

During a debriefing meeting, PSTs were asked to reflect on their observations that mathematical discussions in *Los Rayos* were being increasingly con-

ducted in English. Jose explained that when he first joined *Los Rayos* he was more conscious of his language choice and he was purposefully using a lot of Spanish. However, as time went by and students kept responding to him in English, he eventually gave up using Spanish:

> When I first…was there I was aware of my English and Spanish…when I wanted to…speak but I think in time, because some of them are more English dominant students there…I felt that they kind of like pushed us more towards the English language. …And not that like I was aware of that but I would sometimes even ask questions in Spanish to see if I can get like a response to it—and I would get some Spanish responses but (most were in English and) I know it is dominant English, I know that we have gotten deeply into English speaking because of that.

Jose would initiate discussions in Spanish or in both Spanish and English but students would reply in English, which led him to use English as well:

> The boys mainly spoke English today even if I asked them questions about the problems in Spanish they still would answer me in English. …I was hoping to spark a Spanish conversation using Spanish but it didn't happen. Even those other students who I know have great Spanish spoke mainly English like Rodrigo and Arnoulfo. I'm sure it had to do with the fact that English has been this group's main response language.

Jose realized that even students such as Rodrigo and Arnoulfo, who had used Spanish in the past, began using English almost exclusively. In other words, Jose realized that English had become the group's dominant language. The other PSTs shared similar experiences with Jose. They would often initiate discussions in Spanish but these discussions in most cases would eventually become English dominant because of the students' predominant use of English.

Even Juanita, who was the PST who regularly included Spanish in mathematical discussions, and was the PST that out of the four used the most Spanish, also realized that having English dominant students during two sessions made it difficult for her to carry out mathematical discussions in Spanish. Reflecting on this experience during a debriefing meeting she said:

> Even if I talk to them in Spanish—when I talk in Spanish I notice myself speaking in Spanish and I'm waiting for them to like answer back in Spanish but they don't. They answer in English. Even if I keep trying and trying they answer in English.

She expressed that her attempts to include Spanish were blocked by these students' consistent responses in English. For Juanita, it did not feel natural to talk to the students in Spanish if they responded in English. In fact, during these two sessions that Juanita is referring to, more than half of the times that she addressed the

students in Spanish or in hybrid languages they responded in English thus making her task of including Spanish talk more difficult.

Some students demanded English. The second form of students' resistance to Spanish was that of individual students' demands for English to be used in all types of conversations within their groups. One of Maria's students, for example, Monica, verbally demanded English every time Maria or any of the other students in the group used Spanish whether it was during mathematical discussions or when they were chatting about non-mathematical topics. Every time Monica demanded English, the group would switch to English and use English throughout the rest of the session. Maria noted this switch in her field notes of the first after-school session, writing: "I also tried to talk mostly in Spanish through the process of the activities but Monica would scream at me 'English please!'" In fact, during this session that Maria is referring to, Monica demanded English by interrupting the rest of the group that was having a side conversation gossiping about a girl in the school in Spanish and said: "En Ingles por favor." (*In English please)* and the group switched to English immediately after that. Later, while working on a mathematical activity, Maria's attempt to include discussions in Spanish was interrupted by Monica's request to use English. Prior to the excerpt that follows, Maria, Griselda, and Lisbeth were discussing one of the mathematics tasks in Spanish when Monica interrupted them:

Monica: Wait! I don't get this part. How can you go to the side up and then to the side if it's already here?
María: Ok, cuántas flechas hay aquí? [*Ok, how many arrows are there here?*]
Monica: Dos. [*Two*]
María: Ok
Monica: Why don't we talk about it in English?
María: Ok six. Six is right here, right?

As evident, Maria, the PST, attempted to respond to Monica using Spanish but Monica asked her to use English. Maria, in turn, immediately responded to Monica's request, switched to English, and continued the dialogue in English. In fact, every time Monica requested English, the entire group switched to English. Maria, however, tried to keep using Spanish when talking to the other girls in the group individually. Soon after, however, Maria resorted to English and used only English every time Monica was present:

> I feel like I need to speak more in English than Spanish because every time I try to talk in Spanish Monica doesn't want me to. She says that she doesn't understand. She keeps saying, "English please." Now if one of the other girls that know how to speak Spanish asks me a question in Spanish then I will talk in Spanish. But Monica wants to know what's going on. So I end up using English with everyone. It's just easier that way.

Maria felt that it was easier for her to speak to everyone in English since Monica claimed that she did not understand Spanish. In other words, she felt that English was the language that everyone in the group comprehended, and because Spanish was not, she resorted to using almost exclusively English regardless of the other students' English proficiency or whether they preferred Spanish. In fact, in the sessions that followed, Maria used only English even though she had students, Lisbeth and Miriam, who had displayed their stronger proficiency in Spanish and their preference in using Spanish. It must be noted that even though there were individual students who openly showed their preference to Spanish by consistently choosing the Spanish version of the activities, for instance, these students never demanded that Spanish be spoken. Although the PSTs had noticed and noted in their field notes those students whose preferred language seemed to be Spanish, the PSTs still chose to use English with their groups. The assumption on their part appears to have been that because everyone understands English to a certain extent, and some students openly resist the use of Spanish, by using English with everyone the sessions would run smoothly. These scenarios are commonplace—around the country, but especially in our cities—because of the increasing variations of language backgrounds and proficiencies.

Lisbeth, for example, was a student that Maria had identified as being Spanish dominant. Lisbeth always chose the Spanish version of the mathematical activity. When Monica was not present, Maria would converse with Lisbeth in Spanish. Nevertheless, during a session in October where Maria was working with both Lisbeth and Monica together, Maria did not use one word of Spanish with Lisbeth. Similarly, in the following session, where Maria worked with Monica, Lisbeth, and Miriam, even though both Miriam and Lisbeth chose the Spanish version of the activity, Maria did not use any Spanish with them during the entire session. Neither Lisbeth, nor Miriam complained or asked for Spanish. This lack of a request is possibly due to pressures they may have felt to work within English, as the importance of English is often overtly conveyed. The fact, however, remains that in both instances, when Monica was present, Maria did not use Spanish as a resource to support these girls' understanding of the mathematics involved in the activities.

Jose shared similar experiences with another student who demanded English, namely Alfonso. Even though Jose had noticed that Alfonso understood Spanish very well, he regularly demanded English be spoken in the group. Jose dealt with these situations similarly to how Maria did by talking to Alfonso in English and using Spanish to other students but eventually used English when addressing everyone. For example, during one session, Alfonso had the English version of the mathematical activity in front of him while the other students in the group had had the Spanish version in front of them. Jose asked one of the students in the group, Rodrigo, to explain the directions of the activity. When Rodrigo

started reading the Spanish version Alfonso interrupted him and asked him to read it in English:

Rodrigo: (reading) que son comunes al círculo y al pentágono pero no en el triángulo o el rectángulo. [*that are common to the circle and the pentagon, but not in the triangle or the rectangle*]
Alfonso: Do it in English!
José: He can do it however he wants. He can do it in English or Spanish.
Alfonso: I can't understand him.
José: (to Rodrigo) Can you tell him what you mean?

Even though Alfonso had the English translation of what Rodrigo was reading in front of him, he still demanded English and claimed that he did not understand. The conversation that followed afterwards was in English, except for one point later when Jose briefly interacted with Rodrigo in Spanish; but again, Jose was interrupted by Alfonso's request for English:

José: (to Rodrigo) Ok, let's take a look at it. Que son comunes al círculo y al…, ¿qué es eso? [*What are common to the circle and to the…, what is it?*]
Alfonso: Read it in English?
José: (to Alfonso) I will. (to Rodrigo) Pero no en el triángulo o el rectángulo. Significa que está afuera o adentro del triángulo? [*But not in the triangle or the rectangle. Does it mean that it is outside or inside the triangle?*]
Rodrigo: Lo que está dentro del triángulo; las estrellas que están dentro del triángulo no se pueden contar. [*Whatever is in the triangle: the starts that are inside the triangle, you cannot count them.*]
José: No se pueden contar esas. [*You cannot count those*] All right? (to Alfonso) Did you get that?

After that short interaction with Rodrigo in Spanish, Jose continues in English throughout the remainder of the session. This conversation is just one of the many examples in which Alfonso demanded English, and soon after the discussions would become English dominant, even when there were students in the group who were identified by Jose as being Spanish dominant.

Discussion and Implications

The patterns described throughout suggest that the PSTs' language choice was influenced by social definitions of Spanish and English that permeate our society. Historically, the education of LMS in the United States has been dominated by the notion of a common language for unity and, ultimately, Americanization (Lippi-Green, 2012). English enjoys hegemony over other languages. It is believed to be superior, desirable, and necessary (Shannon, 1995). The sociopolitical context of language learning in the United States has created an environment

where maintaining a language other than English is considered an obstruction to developing proficiency in English (Nieto, 2010). Latin@s have been on the receiving end of a pattern of devaluation of their language and culture for generations, in both schools and society. Spanish, the language spoken by the largest linguistic minority group in the United States, is too often associated with poverty and marginalization and is socially deemed an obstacle to academic success; it is too often undermined as public language, and is treated as fit only for family life. According to mainstream ideology, the message is that Spanish holds Latin@s back.

The notion of a common language, English, as the language of power is the driving force of many of the present movements of hostility toward other languages and their speakers (Nieto, 2010; Cummins, 1986, 2000). Many believe that learning English "is the solution to the problems of immigrants and ethnicity in modern U.S." (García, 2001, p. 49). The belief is that once the public language is learned, normalization occurs, and having one language, English, makes us American. The cultural and ethnic diversity that is upheld as an example is seen as a threat (Cummins, 2000). More times than not, when one speaks a different language, is from a different country, or belongs to a different ethnic group other than the Anglo majority group, one is considered a foreigner, and linguistically and culturally inferior. Learning English is a condition for belonging, for inclusion in our society. A major institution that perpetuates this belief is the nation's educational school system as it transmits the culture of the dominant class (McLaren, 2006).

Although there is no official language in the United States, the primacy of English in all aspects of our society is well established (Crawford, 2004). English is considered the language of political, economic, and social power. It is the language of prestige and now also the language of technology. Too often, the mainstream message in the United States is that languages and cultures that are different from the norm are not welcomed or desired by its people. English is viewed as an essential instrument of opportunity and success, and schools reflect the power structure of the society (García, 1990). In social conditions of unequal power relations between groups, classroom interactions are never neutral with respect to the messages communicated to students about the value of their language, culture, and intellect. Students in turn internalize these messages as the rejection by the more powerful culture. This internalization impacts their self-value (Macedo, 2008). For example, when educators discourage or prohibit students from using their home language in the school, it echoes the societal discourse that proclaims bilingualism or multilingualism as undesirable. It also sends the message that the students' home languages, if other than English, have no place in academic settings and are not fit to serve academic purposes.

It is within this larger context that the four PSTs in the study were raised and continue to live in. It should not be surprising then that their use of language seemed to reflect negative definitions of Spanish as manifested in several experiences such as being forbidden to use Spanish in school, or by being explicitly told that the only way for academic success is to learn to use English in certain ways and to assimilate in the dominant culture. These experiences are not direct negations of using Spanish for learning mathematics, but they are subtle socially acceptable messages that get conveyed by the broader society, schools, media, political groups, and by interpersonal interactions that English is for mathematics. Students' reluctance to using Spanish in *Los Rayos* also reflects these socially acceptable messages that have English as the language for success and for academic subjects, such as mathematics, and Spanish as the language spoken at home. None of the children who worked with the PSTs in this study ever demanded the use of Spanish in *Los Rayos*, seemingly as if they didn't feel they had the right to do so. On the other hand, several students did not hesitate to demand that English be spoken in their groups and PSTs were quick to accommodate these students by using English only. Given the negative social definitions of Spanish and the high status associated with English, demanding English to be used, even in a bilingual setting such as *Los Rayos* was "naturally" considered to be a valid and socially acceptable request to make and the PSTs never seemed to question it until provoked to do so.

PSTs' personal histories and experiences within this larger sociopolitical context also led them to form certain *cultural models* (Holland & Quinn, 1987) for teaching and learning mathematics. The PSTs' experience as students has been in English. They had never been taught mathematics in Spanish after grade 3 where all their classes in mathematics were in English, their books were in English, and as they themselves noted, they were always expected to use English in academic settings. In addition, their teacher preparation classes were in English and the public discourse for teaching, as conveyed in the media, has always been in English. As a result they developed a habit of thinking, or a cultural model, that related academic settings and subjects to English. This cultural model for teaching and learning mathematics involved a subtle exclusion of Spanish and related mathematics to school and to English. In other words, doing mathematics in English was "normal" while doing it in Spanish sounds "weird" as one PST noted.

Such a cultural model makes the process of using Spanish as a resource to facilitate mathematical activities not so straightforward. PSTs' ability to use Spanish as a resource while facilitating mathematical activities is not just a matter of having the desire to use it, or of simply translating, or of having bilingual materials. It is also a matter of changing the habit of mind (i.e., cultural model) that has English as the language of schooling and of mathematics. It is a matter of including Spanish in the cultural model, which can be done through experience using

Spanish for academic purposes, in academic settings, and to discuss mathematical ideas. It is also a matter of realizing how the sociopolitical context of language both in the macro level—as manifested through public discourse and legislation—and in the micro level—as manifested through social interactions and daily experiences—shapes these cultural models and as a result affects teachers' language practices in bi/multilingual settings.

Several researchers indicate that teachers using a non-English language for instruction did not have the language skills or basic professional preparation to do so (e.g. Fabelo, 2008; Figueroa & García, 1994; Waggoner & O'Malley, 1984). Fabelo (2008) and Guerrero (2003) have argued that for in-service and pre-service Latin@ bilingual teachers gaining access to academic Spanish is the root of the problem. However, the findings of this study suggest that gaining access or learning academic Spanish is only part of the picture as this will not necessarily change Latin@ mainstream teachers' cultural models, which relate mathematics and schooling to English. Knowing academic Spanish in itself is not enough for countering one's habit of mind that has Spanish as the language for family and social life and English as the language of schooling and mathematics. It also is not enough for countering socially accepted behaviors that subordinate Spanish, and therefore, present themselves as additional obstacles when trying to use Spanish for instructional purposes. For Maria and Lupe, two of the PSTs in this study, for example, it was not a matter of gaining access to academic Spanish as they felt comfortable and were capable of using Spanish when communicating mathematical ideas. Nonetheless, students' resistance to Spanish as well as the fact that they had associated English with being the language of schooling and mathematics made it difficult for them to use Spanish.

So what does this all mean for the mathematics teacher preparation of Latin@ and other language minority PSTs? I provide two recommendations for the preparation and support of Latin@ PSTs in mathematics: (a) create spaces for Latin@ PSTs and other language minority PSTs to share their unique insights; and (b) provide language minority PSTs with opportunities to do mathematics in their home language.

If we want Latin@s and other language minority PSTs to use their linguistic knowledge (i.e., home language) for pedagogical purposes in mathematics we need to provide them with experiences that will help them include their home language in their cultural model of teaching and learning mathematics. Earlier I suggested that in order to include Spanish in one's cultural model of teaching and learning mathematics one needs experience using Spanish for academic purposes, in academic settings, and to discuss mathematical ideas; this includes having access to academic Spanish but the key is having the experience. Not only should language minority PSTs have opportunities to use their home language while assisting children in mathematics but also they should experience speaking mathe-

matically in their home language with other people who are academically proficient in mathematics in the university setting. These experiences could be in the form of taking a mathematics content course in their home language and discussing the various issues that emerge. This way, not only do Latin@ and other language minority PSTs gain access to academic language but also they come to recognize their home language as a valid language that can be used for academic (mathematical) purposes and in academic institutions. Moreover, language minority PSTs can gain knowledge related to issues of language in the teaching and learning of mathematics through their own experience as bilingual mathematics learners in this class rather than through readings only.

Furthermore, we need to provide language minority PSTs with spaces where they can reflect on the sociopolitical context of language and the schooling of LMS in the United States and how it shapes instructional interactions in mathematics. Such experiences could be implemented through a seminar where language minority PSTs engage in discussions around language, culture, and mathematics teaching and learning, based on their own background experiences as LMS and based on their experiences doing mathematics with children who share the same home language. These two recommendations, while somewhat unorthodox, are within the realm of new experiences language minority PSTs need in order to un-do decades of oppressive and subtractive schooling practices (Valenzuela, 1999), the same ones that continue to affect millions of urban Latin@s daily.

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