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Teachers' Experiences with Spanish-Speaking, Bilingual Families in a Science Learning Context: Empowering Teachers through Home-School Partnerships

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ABSTRACT: Teacher-parent collaboration can play a critical role in promoting diverse students' post-secondary education attendance and academic success. Although teachers are tasked with initiating a trusting collaboration with parents, few research studies focus on teachers' learning through working with diverse families. Informed by Nieto's notion of highly qualified teachers, we offer insights into the lived experiences of in-service secondary science teachers who engaged with Spanish-speaking, bilingual parents in their children's science learning in the context of bilingual family science workshops. Analysis of in-depth interviews with four teachers and participant observation field notes from the workshops highlight the potential for designing new professional development opportunities to support secondary teachers in collaborating with parents who bring a wide range of cultural, ethnic, socioeconomic, and linguistic resources in supporting their children's learning and schooling.

Keywords: *equity, Spanish-speaking and bilingual families, teacher perspectives, teacher professional development*

Introduction and Literature Review

Current standards-based educational reforms are failing many of our students in part because high-quality education is not as accessible to culturally diverse and working-class students as it is for their middle-class, white counterparts (Paris, 2012). As U.S.-born and immigrant Latinos[i] continue to be identified as the largest minority group in the U.S. (United Nations Department of Economic and Social Affairs (UN DESA; 2015), challenges in achieving their academic aspirations, especially in STEM (science, technology, engineering, and mathematics) fields, demands systematic changes in order to reach the goal of promoting academic success for all students in U.S. public schools. Garcia and Guerra (2004) call for new approaches to disrupt the deficit perspectives held by many school personnel toward Latinos, blacks, emergent bilingual, and other minoritized students "who become the targets of reform" (p. 151).

A persistent family-school connection has been identified as one of the strongest hopes in promoting minoritized students' post-secondary education attendance and retention (Wiberly & Noeth, 2005). Despite the widespread evidence of the advantages of parental engagement for the well-being of children, concerns persist about a lack of teacher-parent interactions that facilitate parental engagement within immigrant communities (Hornby & Lafaele, 2011), especially at secondary school levels (Eccles & Harold, 1993; Hill & Chao, 2009; Lazar & Slostad, 1999). Cultural, linguistic, and social differences between teachers and immigrant parents are often seen as a barrier to collaboration, despite being desired by all stakeholders (Adair, 2014; Souto-Manning & Swick, 2006; Soutollo, Smith-Bonahue, Sanders-Smith & Navia, 2016).

Teachers play a central role in fostering a trusting collaboration with parents, as teachers' attitudes and practices, including those around race, ethnicity, and socioeconomic status, are critical factors influencing the degree to which parents become involved in their children's schooling (Hoover-Dempsey & Sandler, 1997). Research that focuses on secondary in-service teachers' learning in working with diverse families is rare with notable exceptions (e.g., Hoover-Dempsey, Walker, Jones, & Reed, 2002; Symeou, Roussounidou, & Michaelides, 2012; Tatto et al., 2001). In addition, few programs have been designed to encourage pre-service (Hammond, 2001; McCollough & Ramirez, 2012) or in-service teachers (e.g., Buxton, Allexsaht-Snider, & Rivera, 2012; Shymansky, Yore, & Hand, 1999) to collaborate with the parents of immigrant students in their children's learning in STEM fields and in preparation for college.

The LISELL-B project (Language-Rich Inquiry Science with English Language Learners through Biotechnology; Buxton et al., 2017) has been one of the few research-based approaches bringing in-service secondary science teachers and Spanish-speaking, bilingual families together in science-learning settings to enhance middle and high school students' science learning and college preparation. One component of this large-scale project, the bilingual family science workshops, was designed to support partnerships between science teachers and Spanish-speaking, bilingual parents and their children and to explore new spaces for parent-student-teacher collaboration.

As researchers in the LISELL-B project (a doctoral student who was a research assistant and two faculty members who were the principal investigators of the project), we sought to understand the lived experiences of in-service secondary science teachers working with parents to enhance their children's science learning in the context of bilingual science family workshops. By exploring teachers' lived experiences with families, we aim to show the possibility for alternative spaces to facilitate teachers' work with Spanish-speaking, bilingual families in support of adolescent children's schooling while also contributing to the growing body of

literature examining education for pre-service and in-service teachers being asked to work with diverse families.

In the following section, we review the research on family-school collaboration in secondary schools. Then we focus more explicitly on family-school collaboration in science education. Next, we share the conceptual framework that oriented our thinking, based on Nieto's (2005) work on highly qualified teachers. Finally, we thematically describe the range of teachers' perspectives, reported as a result of their participation in these workshops, and conclude with implications for teacher education programs and future research to encourage secondary school teachers' relationship-building with Spanish-speaking, bilingual families, critical to supporting students' learning in the classroom.

Review of Parent Involvement in Secondary Schools

Educational researchers and U.S. legislators have agreed on the pivotal role of parent-student-teacher collaboration in supporting student achievement and college preparation (Henderson & Mapp, 2002; Jeynes, 2011; No Child Left Behind Act [NCLB], 2002). While home-school interactions change as the child proceeds through the grade levels, such interactions have nevertheless been shown to be essential for positive student outcomes at all levels (Catsambis, 2001; Hill et al., 2004; Sanders, 2009). While parents may feel the greatest need to engage with their children's teachers in the early grades, the developmental challenges and the acceleration of academic demands in secondary schools require ongoing collaborations in support of adolescents (Patrikakou, 2004). However, parent-teacher interactions in the secondary grades are "often much less visible, though just as valuable" (Ferguson & Rodriguez, 2005). The underutilization of home-school partnerships occurs at all levels, yet further declines through children's transition from the elementary to the secondary level (Eccles & Harold, 1993).

When collaboration does occur for secondary students, parent-oriented events typically reach only a "narrow segment of the parent populations and represent only select types of parental participation" (Gonzalez-DeHass & Williams, 2003, p. 89). *Othering* narratives still circulate in U.S. public schools, in which members of the dominant White middle class are treated as "us," defining as "others" those who are not members of this group (Bonilla-Silva, 2013). Wainer (2004) cites "cultural illiteracy" that prompts institutional and teaching practices to be discriminatory toward students and their families who do not belong to the dominant group as an important factor. Shields (2004) uses the term "pathologizing" to explain prevalent deterministic and neglectful attitudes toward differences in schooling (p.112). Pathologizing is a notion that situates academic or social problems in students' low-income or other minoritized status and problematizes bilingual families without analyzing the connection between school input and student outcomes. Furthering a similar argument, Weiner (2006) points out another form of deficit thinking that considers teacher characteristics as the only reason for school failure. Policy makers often find this explanation convincing as it seems simple: "fix the teachers we have or hire new and better individuals" (Garcia & Guerra, 2004).

We know that school success or failure relies on more than individual experiences; they are actually "saturated with broader social, economic, and political contexts" (Jones & Vagle, 2013, p. 131). Even before the first day of school, "children's positions in the current educational system seemed destined to re-create—rather than challenge—the social position of their own parents" (Lareau, 2000, p. 185). We see that many ethnically and linguistically diverse students live in poverty, and it has long been known that those are the same children who are most likely to be offered larger class sizes, fewer learning resources and materials, and lower professional

development opportunities for their teachers than the children in higher socioeconomic communities (Anyon, 1980; Nieto, 2005). Furthermore, the lived experiences of children in their homes and communities are not given equal value by social institutions. White middle-class families' cultural practices and child-rearing strategies are seen as complying most closely with the standards and expectations of most school settings (Lareau, 2011). As educators and as researchers, we explicitly reject ideas that consider only one type of home-school relationship as desirable. Instead, we embrace differences as a starting point for fostering dynamic teacher-parent relationships, but to do so requires a deep and self-critical analysis of perceived social and cultural differences in family-school interactions. This analysis requires that educators not predetermine any particular family practice as inappropriate and that educators not attempt to "convert a wide range of behaviors by families into a uniform (and historical) style of interaction" (Lareau, 2000, p. 4).

Several powerful family engagement models have been proposed in the effort to challenge deficit views (Calabrese Barton, Drake, Perez, St. Louis, & George, 2004; Fournier, 2014; Gonzalez, Moll, & Amanti, 2005; Smith, Smith-Bonahue, & Soutullo, 2014; Swap, 1993). These models introduce alternative roles that parents and teachers can practice to support the academic and social development of children. For example, Swap's (1993) model of "two-way communication" signifies the mutual process of parent involvement that is the responsibility not only of parents but also of teachers. Fournier (2014) offers the concept of "inclusion," placing significant value on the expertise and resources of students' parents, families, and communities that are seen as providing unique learning opportunities outside of the classroom. This model illustrated an authentic relationship between teachers and families so that "students can take their rightful place to work and learn alongside each other" (p. 113). Calabrese Barton and colleagues (2004) offer the framework of "ecologies of parent engagement" to analyze the way diverse parents make sense of their engagement with the school. This framework validates parents' own cultural capital to support academic learning. In so doing, it is important to recognize and understand families' varied needs and concerns in their interactions with the school. All these approaches implicitly or explicitly emphasize celebrating cultural, socioeconomic, and linguistic diversities as strengths rather than limitations on learning. To do so entails building reciprocal and authentic relationships between teachers and parents—authentic relationships, in which all voices are valued for their contribution without hierarchical educational structures (Flecha, 2000).

Home-School Collaboration in Science Education

There is a small but growing body of research that focuses on family-school partnerships in science education and college preparation in STEM fields (Ash, 2004; Hammond, 2001; McCollough & Ramirez, 2012; Upadhyay, 2009; Weiland, 2015). Science is the discipline of focus in our work for two reasons: First, science is vital for school success and college and career opportunities, and students of historically non-dominant communities continue to be underrepresented in STEM fields (National Academies of Sciences, Engineering, and Medicine, 2017; Nevarez, 2015). Second, low-income and bilingual parents' potential for involvement in their children's science education is often overlooked.

Researchers in science education, particularly in informal science contexts, support the idea of interactive and multifaceted parental engagement in ways that acknowledge families' cultural practices. Ash (2004) has advocated for an alternative discourse of science learning within collaborative family interactions. Applying sociocultural paradigms in her work, Ash

investigated *dialogic inquiries* between families, researchers, mediators, and science exhibitions during an aquarium visit. She concludes that families engage with their children in dialogues through observing, questioning, and switching from everyday language to scientific language, practices that can serve as routes for advanced formal education and science proficiency. Drawing from Bakhtin's notion of *heteroglossia*, Rosebery and colleagues (2010) envisioned science learning settings that "conceptualize the heterogeneity of human cultural practices as fundamental to learning, not as a problem to be solved but as foundational in conceptualizing learning and in designing learning environments" (p. 2).

McCollough and Ramirez's (2012) work with pre-service teachers of Latino students and their families demonstrates the advantages of incorporating community knowledge into science lesson plans. As a part of coursework, pre-service teachers gathered funds of knowledge possessed by Latino families and then developed culturally relevant hands-on science activities to be implemented in the Family Science Learning (FSL) events that served elementary and middle schools located in ethnically diverse school districts. By facilitating pre-service teachers' work alongside Latino families in FSL events with an emphasis on culturally relevant science, McCollough and Ramirez were able to provide these future teachers with opportunities to engage with parents in authentic ways. Analyzing participants' written reflections, formal lesson plans, and survey responses, the researchers found that teachers' confidence levels and self-efficacy were increased when they recognized parents' strong interest and abilities to be involved in their children's science education.

Bernier, Allexsaht-Snider, and Civil (2003) examined in-service elementary teachers' experiences with low-income bilingual parents in their children's mathematics education in an alternative mathematics context in which teachers, students, and their parents learned together in egalitarian relationships as they "participated as co-constructors of knowledge within [the] mathematical sphere" (p. 24). By shifting the hierarchical power discourses, they resisted mainstream views of family-school interactions through situating teachers as learners, teachers, and leaders while they positioned parents as learners, teachers, and parents. The researchers argue that situating teachers in these three roles when they actively worked with families helps teachers to be learners of mathematics and led them to rethink their perceptions of what constitutes family-school collaborations as they started to conceptualize parents as strong resources in their children's mathematical learning. They also found that giving parents the authority to be teachers in these settings emancipated them from the feeling of "being not enough" as perpetuated by the dominant culture and created opportunities for them to be role models for their children's mathematics education. Even though this study did not specifically focus on teachers' experiences with families in children's science education, the study findings provide an important context for understanding the value of positioning teachers as learners in shifting power relations between teachers and families to challenge teachers to envision a more expanded vision of family-school relations with a particular content focus.

Throughout this analysis of the literature on family-school partnerships in science education, we have spoken little of practicing teachers' experiences collaborating with families in the context of science. This is because research focused on in-service teachers' experiences in family engagement and STEM education comprises rare exceptions in the literature (e.g., Buxton, Allexsaht-Snider & Rivera, 2012; Upadhyay, 2009). Although teachers are expected to collaborate with families, there continues to be a lack of professional learning opportunities and administrative support for in-service teachers to work with diverse families in this regard. Nieto's (2005) notion of *highly qualified teachers* is one of the few approaches that focuses on

teachers' orientations to and preparation for working with diverse students and their families, which is an approach that informs our research in this paper.

Conceptual Framework

In her research with a group of teachers writing about their own practices, Nieto (2005) redefines the notion of highly qualified teachers by presenting five core features that differ markedly from the discourse typically invoked around teacher qualifications focused largely on content knowledge (Darling-Hammond, 2013). Instead, Nieto argues that highly qualified teachers are those who possess a) *a sense of mission* to contribute to the common good; b) *solidarity with and empathy for students and their families* to help them feel affirmed in the classroom; c) *the courage to question mainstream knowledge* to support critical thinking; d) *improvisation* to learn how to negotiate teaching; and e) *passion for social justice* to challenge the systemic inequalities that minoritized students face in schools.

Nieto (2003) problematizes definitions of highly qualified teachers that focus narrowly on promoting high levels of subject matter and pedagogical knowledge without taking into account other important aspects of teaching, arguing that schools are not merely places for enactment of planned actions, but rather, they are places for the formation of relationships that are crucial components of teacher retention and student attendance and learning. A sense of belonging is not a luxury, but rather it is a core psychological human need. We need to belong with and to one another—our friends, teachers, families, and the communities in which we live—to find meaning and pursue goals in life. In this regard, teachers' care is critical in building a community of learners; it is key in nurturing a sense of belonging among young people, and this is even more important for those who are different from the mainstream culturally, linguistically, and socioeconomically (Nieto, 2003). Following Noddings, Luttrell (2013) also defined *being cared for and caring for* as essential to children's learning not only in the classroom but also among the members of the community. Students, no matter how young or old, articulate a clear sense of whether they perceive that their teachers care for them or not. Even a small gesture is enough to reveal teachers' assumptions regarding students, their families, and their communities (Nieto, 2012).

The aim of Nieto's (2005) redefinition of highly qualified teachers was to illustrate what is really essential for teaching and learning, not the current national educational agenda of "test scores… rubrics or benchmarks or 'best practices' or teacher tests, but students and teachers and the future democracy in our nation" (p. 11). One might think that without changes in broader sociopolitical contexts, teachers alone would not be able to move us beyond the current challenges we face in education. However, as Nieto said, "We cannot afford to sit around and wait for these structural changes to take place" (p. 8). We urgently need more teachers who strive for social justice and democracy both in and beyond the walls of the classroom and strive to provide all students with more equal and high-qualified education.

In the current paper, we use Nieto's (2005) qualities of highly qualified teachers to understand the lived experiences of in-service secondary science teachers working with parents for their children's science learning in the context of bilingual-family, science workshops to contribute to the knowledge base for supporting teachers' work with families. Nieto's ideas provide a useful framework for understanding how a school-based informal science learning environment, such as the LISELL-B workshops, could serve as a rich context for teacher professional learning and development of relationships with their emergent bilingual students and their families. We see Nieto's conception of qualities of caring and committed teachers as

helpful for conceptualizing how science teachers in the LISELL-B workshops articulated their learning about building relationships with their emergent bilingual students and their families.

Methodology

Research Context - The LISELL-B Bilingual Family Science Workshops

The LISELL-B project took place in two school districts in the Southeastern U.S. that have experienced a rising population of Spanish-speaking, bilingual students, mainly from Mexico, but also with origins in Colombia, the Dominican Republic, El Salvador, Guatemala, Honduras, Peru, and Puerto Rico. Wortham, Murillo, and Hamman (2002) refer to these areas as the new Latino diaspora, i.e., areas where long-term residents have rarely experienced living alongside immigrants. In each academic year from 2014 to 2017, the LISELL-B project offered five bilingual family science workshops to in-service secondary science and ESOL teachers, their emergent bilingual students, and those students' Spanish-speaking, bilingual families. Approximately 50 students, 40 parents, and seven teachers participated in each workshop. The four-hour long workshops took place in various academic environments, including university campuses, technical colleges, and school district career academies.

Each workshop included the following activities: a) a bilingual family conversation session in which students, parents, and teachers talked about planning for post-secondary education; b) a science activity session wherein students, their families, and teachers worked together on bilingual language-rich science investigations; and c) a career pathways/biotechnology session in which students and families visited science labs and discussed careers and studies in STEM-related fields with university faculty and college students. The workshops were followed by lunch to encourage informal dialogue among teachers, families, college students, and researchers.

Structuring opportunities for teachers, parents, and their children to learn alongside one another has been the core focus of the LISELL-B bilingual family science workshops. In this alternative space, we sought to build a cross-cultural science learning community in which students and parents who are often culturally and linguistically marginalized had opportunities to articulate and build on their cultural and linguistic knowledge. We hypothesized that this approach would promote increased academic engagement by involving students, parents, and teachers (who are mostly monolingual in English) in conversations and activities that were conducted in both Spanish and English. Teachers within the LISELL-B family workshops were conceptualized as "co-learners" (Buxton et al., 2012). When they sat alongside their students and parents in a circular arrangement during the workshop, and when they ate lunch together at the same table, teachers often found themselves in the role of second language learners of Spanish, while their school-based authoritative positions were rearranged into more egalitarian relationships. We supposed that this model would give teachers a chance to engage in a more authentic dialogue with their students and their parents: an opportunity that they rarely have in formal school settings. Building on Nieto, we saw interactive dialogue as essential if teachers were to cultivate "solidarity with and empathy for their students" and to develop a community of learners in the classroom (Nieto, 2005, p. 207).

Applying Nieto's (2005) definition of highly qualified teachers, we sought to understand the lived experiences of in-service secondary science teachers working with Spanish-speaking, bilingual parents for their children's science learning in the context of bilingual family science workshops by addressing the following research questions:

1. How did teachers experience their interactions with Spanish-speaking, bilingual families in the LISELL-B workshops?
2. How did teachers see themselves building relationships with families in these workshops?
3. What did teachers learn about working with families in these workshops?

Participants

We identified teachers who actively participated in the LISELL-B workshops over multiple years of the project and were able to give a rich account of their experience (Roulston, 2010). We recruited two secondary science teachers and two secondary ESOL teachers, who all had extensive experience in working with emergent bilingual students and their families in the workshops, to participate as focal teachers in the research. We purposefully selected these teachers from the large number of teachers who attended workshops because they had at least four years of consistent attendance at the workshops and agreed to participate in the present study. By gathering in-depth descriptions of the teachers' perceptions, we sought to gain insight into the experience of teacher participation in the bilingual family science workshops on an individual level by examining the cases of these four teachers.

The four focal teachers had participated in the workshops since the start of the LISELL-B project, and three of the four had been involved in our previous, related project. All of these teachers were English-speaking and monolingual. Three of the teachers grew up in what one of them, Mrs. Martin, called "middle-class typical southern American families where parents regularly take their children to museums and extra-curricular activities." Mrs. Martin is a European American 7th grade Life Science teacher and daughter of teacher parents. She said that her parents always encouraged and supported her to do well at school, such as helping with homework and attending school-based family events. She had been in the teaching profession for 25 years and had planned to retire at the time of this study. Ms. Hull is a European American 6th grade Earth Science teacher and said that her mother, who is also a teacher, always had her and her brother entertained in the summers and on weekends with science experiments. Ms. Hull entered the teaching profession five years ago and has remained in the same school since then. Mrs. Williams is a Dominican American and an experienced ESOL and middle school co-teacher in science classrooms. She is the one from her school who recruited the first students and families to participate in the LISELL-B program. She continues to teach in the middle school where she first started in the teaching profession. Mrs. Gale is a European American and experienced ESOL and middle school co-science teacher who grew up in a suburban area where she said she rarely interacted with people who were bilingual or immigrants. She started the teaching profession in another school district in the Southern U.S. and then moved to the county where she currently teaches in collaboration with science teachers.

Table 1. *Summary of Participants*

Teacher name	Race/ Ethnicity	School	Major & grade	Total years of teaching	Total years of workshop participation
Mrs. Molly Williams	Dominican-American	District#1 Sunnyside Middle School	6-8th grade ESOL/ Science co-teacher	15	5
Ms. Andrea Hull	European American	District#1 Sunnyside Middle School	6th grade Earth Science teacher	5	4
Mrs. Lillian Martin	European American	District#2 Mountainside Middle School	7th grade Life Science teacher	25	5
Mrs. Hanna Gale	European American	District#2 Mountainside Middle School	7-8th grade ESOL/Science co-teacher	15	5

Data Collection & Analysis

We were inspired by Van Manen's (1990) approach in the data collection, organization, and analysis process. The first author conducted semi-structured open-ended interviews with each teacher. In order to protect the interviewees' privacy, we kept the names of the interviewees confidential and have used pseudonyms in writing about the research. Interviews were scheduled to be convenient for the interviewees and were conducted in several places such as after the workshops, in teachers' own classrooms after school, and at lunch tables during other LISELL-B teacher professional learning activities. Interviews lasted between 45 and 70 minutes and were audiotaped and transcribed verbatim. We arranged the interview questions based on Patton's matrix of sequenced question types (Patton, 1987). As he suggested, we began the interview with experience/behavior questions, since they require minimal interpretation and are relatively easy to answer. Mostly, we opened the interviews with the question, "*How did you become involved in LISELL-B family workshops?"* This question served as a good transition question and played an "ice breaker" role in the interviews. Then we followed with sensory questions like, "*If somebody had been in the LISELL-B family workshop with you, what would s/he have seen you doing during the science activity session?"* This kind of question allowed respondents to recapture their experience by imagining it. Then we followed with opinion /belief questions such as, "*What would you tell one of your colleagues about why they should attend a family*

workshop?" and "*What do you think you have learned from family workshops about working with parents in children's science learning?* The wording—and sometimes the sequence—of the questions changed based on the participants and the flow of the interviews.

In addition to these interviews, nine hours of participant observation were conducted, and twelve pages of field notes were taken during three of the five workshops that the four focal teachers attended. Each set of field notes was completed within 24 hours of each participant observation to provide more accurate information about the events that were described. These observations were conducted to collect divergent data that would contribute to "immersion in others' lives and enhance sensitivity to interaction and process" (Emerson, Fretz, & Shaw, 2011, p. 3). Observations were conducted during registration and welcoming activities, family conversation sessions, science activity sessions, and the lunch period. The main focus of the observations was to develop a better understanding of how teachers communicated and interacted with families in these settings. The first author followed focal teachers as they rotated among sessions of the workshops. When possible, conversations were recorded; however, crowdedness and noise level of the activity rooms made this a challenging task.

During the analysis process, we aimed to explore commonalities and differences in what focal teachers experienced as they worked with Spanish-speaking, bilingual families in the workshops and how they experienced the phenomenon (van Manen, 1990). First, an inductive analysis and coding process was undertaken to seek emergent themes across all interview transcripts, artifacts, and field notes. All interview recordings were listened to and re-listened to, and transcripts and field notes were read and re-read, as the authors immersed themselves in the data. Next, a more concentrated line-by-line reading was enacted, while asking, "What does this sentence or sentence cluster reveal about the experience being described?" (van Manen, 1990, p.93). Sub-themes were coded around each sentence or chunks of sentences by adapting words used by participants whenever possible. A list of sub-themes was identified for each interview and sub-themes were consolidated into over-reaching themes in an attempt to capture what van Manen calls "the essence of some experience" in participants' description" (p. 94).

Next, we examined themes drawing from Nieto's notion of highly qualified teachers. We concentrated on the themes providing insight into teachers' relationships and assumptions regarding their students and parents who attended the workshops. Then we returned to interview transcripts and field notes to highlight sentences and phrases that suggested how the participants experienced working with Spanish-speaking, bilingual families in the workshops. This process led us to highlight the voices articulating the experiences of these four teacher participants discussed in the findings section.

Table 2. *An example of data analysis for the theme "Developing meaningful relationships with families"*

Example of Primary Data-Interview Excerpt	Example of Secondary Data-Field Note	Sub-theme
Mrs. Williams: *Catching up with people. I usually catch up more I usually come in and see all the families, "How you doing?" What have you been doing?"*	Mrs. Williams shows a picture to a mother (M5) from her phone and says, "Do you see? These trees were taller than me!"	Catching up with families
Mrs. Martin: *Parents (who attended workshops) came to the door, in the office, then I would know and speak to them. Otherwise, you wouldn't know who they were.*		Knowing parents
Ms. Hull: *Sometimes you try to sneak in because they can't come in…but you know it's a (meeting and greeting) to catch up and get to meet their families because they (students) are really excited too, like "this is my little sister, this is my older brother, do you remember him?"*	One mother approaches Ms. Hull and says something to her in a hurry. Then Ms. Hull loudly says "I will wait for them, don't worry!" She means that she will wait for the two girls to come out of the restroom and catch the bus. Then the mother leaves the building with the group to get on the bus.	Chatting with parents
Mrs. Gale: *Participating (in science activities) with the parents. And being flexible to whatever is needed as an educator. Helping the parents with lab and talking with them …*	She touches the student's shoulder and says something to her, smiling as they strip the alligator wire.	Helping parents

Findings

Our analysis identified three themes from the experiences of the four focal teachers in the bilingual family science workshops. These themes were: (a) teachers developed increased empathy for Spanish-speaking, bilingual families in schools where they are regarded as a minority group and their children are often marginalized in their learning of science; (b) teachers observed salient improvement in their emergent bilingual students' science learning motivation and their parents' confidence level to take initiative in their children's science learning as teachers developed more meaningful relationships with them; (c) workshops helped teachers question their own prior assumptions about Spanish-speaking, bilingual families and their knowledge and skills around science. These three themes are discussed in greater depth in the following sections.

Developing Empathy for Spanish-Speaking, Bilingual Families

First, regarding the experiences that teachers had with families in the workshops, our focal teachers indicated that attending these bilingual workshops as non-Spanish speakers helped them enter the shoes of emergent bilingual students and their parents and helped teachers to realize how challenging it is for these families when they attend a school event or activity in which the predominant language is English. As an example, Ms. Hull articulated:

> It was my first time ever experiencing that, where they were translating for me! That's why I was (like), "Oh my gosh! I am like an outsider here because I don't know what they are talking about!" It is an awesome perspective into it because you don't think like that. So it puts me as a student that comes into the classroom. Everybody is talking in a different language, and you want to be involved, but you are not sure how to do that.

Mrs. Martin also expressed how, as a monolingual teacher, communicating about science in another language was very eye-opening for her, as it was difficult to understand parent-student interactions during the science investigation session. This experience helped her to realize the lack of support and resources that emergent bilingual students receive in the classroom as they struggle to make meaning of science concepts and participate in science inquiry activities. She posited:

> I asked them [students] to translate for me today [during the workshop] and so I did not know what the guy [facilitator] said so I simply asked the student to tell me what they said…. It helps me see that the student doesn't understand what they are being asked to do on a real level. And how do you get that student to understand what they are being asked to do? It gives a different viewpoint not only for them but for me.

Similar to Ms. Hull, Mrs. Martin examined her own experiences in the workshops that were conducted mostly in Spanish and where she felt herself as an "outsider." The teachers realized how a sense of being an outsider aroused a feeling of fear and anxiety for them. Experiencing these feelings was very rare for the teachers, because, like most of the teachers in U.S. schools, they come from European American, middle-class upbringings in which they mostly lived in neighborhoods and schools where ethnic and linguistic diversity was a rarity. The feeling of being an outsider in the workshop space led the teachers to rethink the minoritized positioning of their emergent bilingual students in their classrooms, where the students see few if any teachers that look or sound like them and where school science standards and their own instructional strategies fail to recognize the resources that students bring to their own science learning process. The teachers started to recognize that having a lack of opportunities to connect science topics with their everyday experiences with their families and in their communities was one reason that emergent bilingual students become disconnected from science in their classrooms. They realized that this was limiting opportunities for student learning, as their emergent bilingual students were expected to assimilate into the science classroom with little recognition of their culturally constructed ways of knowing.

As Mrs. Gale said, "The students who just sit there [in the classroom] and you don't think they are trying; but it is not that they aren't trying or that they don't want to try; it is sometimes they don't know how. They have been told just to dive in…" Observing the students and parents in the family workshops as they responded to the bilingual handouts as well as to the science activities by drawing from their multilingual and multicultural resources, the teachers realized

that in their science classrooms, their students may really try, but that the learning opportunities they provided often leave out essential scaffolding for emergent bilingual students. They began to see that inviting the use of students' home language and cultural resources for learning and understanding science could help more students to be successful in science. For example, Mrs. Williams' contention of "being able to interact with them has taught me a lot about speaking, practicing using Spanish, the benefits of bringing them into that relationship between the schools, communities, and families" demonstrates her understanding in this regard. The value of validating different ways of knowing and linguistic resources and doing science was a crucial lesson that focal teachers learned as a result of the uncomfortable feeling of being "outsiders" during the STC workshops.

Developing Meaningful Relationships with Families

Second, in addressing the question of how teachers built relationships with families, our focal teachers' participation helped them to feel better acquainted with their students' parents who attended the LISELL-B bilingual science family workshops. Each teacher indicated that back at school they felt more comfortable making contact with students' parents through home visits or telephone calls after participating in the workshops. The LISELL-B workshops offered the teachers a range of experiences to cultivate familiarity, such as meeting with students' parents, siblings, and sometimes grandparents, and getting to know them better through shared workshop activities.

During the workshops, teachers seemed to be involved in intimate conversations with parents, where their communication across language differences was based on shared science investigations with manipulatives that was often facilitated by children. Parents also seemed to be comfortable and felt encouraged to ask questions to their child's teacher about science concepts. This pattern was clearly apparent in field notes taken during a workshop:

> Mrs. Gale and a female student who sits next to her mother. They smile at each other since they lighted the bulb using batteries, wires, cups and carbon lead. Mrs. Gale touches the student's shoulder and tells her something, but I cannot hear what they tell each other. When the mother and her daughter connect it to the large batteries, it lights. The mother grabs her phone and takes the picture of the light bulb. She says "!Sí, sí!" As Mrs. Gale looks at them, she says, "This is awesome!" She also takes a picture of this successful experiment. The mother and Mrs. Gale show their pictures to each other, and they laugh together. With limited English, the mother leans toward Mrs. Gale and asks her how these pencil leads generate light. Then Mrs. Gale explains that since pencil leads are made of carbon, it lights up when we connect it to the batteries. The electrical energy from batteries travels through the circuit and transforms the heat to light in the carbon filament. Then she explains why we change lightbulbs. She says, "That's why we change the bulb when it burns out." It seems that Mrs. Gale wants to make sure that the mother understood what she explained to her and says to her daughter, "Could you translate it for your mom?" After her daughter translates what Mrs. Gale said, the mother looks at Mrs. Gale and smiles to show that she understood everything.

As Mrs. Martin explained how the workshops affected her relationships with her emergent bilingual students' parents, she described the excitement she saw on her students' faces

while they introduced their families: "This is my little sister, this is my older brother, do you remember him?" She stated:

> It is just more familiar. It is, it's just the fact you have seen them when you have been in the workshop. You recognize them, and you would speak even on the street. Whereas, if you have not been there [workshop], you wouldn't know them. If they walk to the [front] office and you are in the office, now you know who they are.

Mrs. Williams also seemed to enjoy being together with families and engaging with them during science activities in the workshop, as recorded through field notes:

> Mrs. Williams shows a picture to a mother and says, "Do you see? These trees were taller than me!" Then she turns and shows me the same picture. I see some fallen trees that she says had fallen down because of the storm two days ago. Then the topic of the conversation changes as Mrs. Williams holds the clips and says, "These are the alligator clips!" The mother says, "Crocodile?" As Mrs. Williams moves the clips she says, "You see, aaa." By opening and closing the clips, she tries to show that since it resembles an alligator's mouth, it is called an alligator clip. Then the table filled with laughter.

When I asked Mrs. Williams if someone had been in the LISELL-B family workshop with her, what that student or parent would have seen her doing during the workshop, her initial response was "catching up with the families." Her presence in the workshops was considered very important by the students and their families. She expressed how these informal conversations helped the students and their families to see her in a wholly different light, allowing her to show how she really cares about them. She stated:

> It gives you a chance to see these students outside the school setting. Once you make a connection with them, then you have them more engaged when they are in school. You know they know that you are interested in life outside of the school, that's what I am taking from the workshops.… I am sure they would ask me anyway because I am her teacher, but she knew she could come to me and I would help her with that scholarship. Just when I walked in, I was catching up with some kids. And the girl said, my brother wants to know if the scholarship [is available] for him to go to school, and he came today, and he has been in the program [LISELL-B workshops] for years, years and years…I liked how they know they can come to me and if I can do it, I would find something to help them.

Mrs. Williams developed new ways of seeing educational expectations for her students when she observed that the Spanish-speaking, bilingual parents were also asking many questions about opportunities for scholarships to send their children to college during the workshops. This observation was one of the reasons for Mrs. Williams to take a further step to provide families with detailed information about resources that they could access to support sending their children to college. Ms. Hull explained that attending the workshops has opened the door to improved communication with the parents more effectively than was possible in the formal school setting. She talked about visiting her students' houses to give them boxes of things to study science, such as science magazines to read and workbooks that include engaging activities to support students'

preparation in all areas of earth science during the summer. She made the following case for the program:

> Whenever a parent's signature is needed for English Language Learner students, I drive out there and bring them, you know, study packages and science magazines, and I am giving them packets to talk about. I don't think that they'd be very welcoming with students that you are not familiar with their parents or see them. You know… they look at you as such a respectable figure, more so than a lot of other family members do. Because, they understand what you want for their child, and I think that comes from seeing them in the community and seeing them at these workshops. So, yeah, I most definitely think that being involved in the community and being involved with them is so important, and that comes from the workshops.

As illustrated in their words, the teachers found a space to build an intimate dialogue with their students' families; and otherwise, as Mrs. Martin said, they might have never met with some of them or even recognized them on the street. When they greeted mothers, fathers, grandparents, and siblings, when they caught up with families and chatted with them about their life beyond the classroom, teachers developed a deep awareness of students' realities that they formerly may not have understood. The teachers recognized that their presence in this space made it more real, tangible, and concrete for the families that teachers have taken a genuine interest in them and their children's science learning. Teachers realized how building relationships made a lasting impression for students and their families and how the classroom environment really benefited from this. As Mrs. Gale said, "You have got the students' respect, you have parents respect you, and they do not think you are neglecting to support them or their children. When you have a relationship, they know that you are doing what is best for the students." These remarks illustrate how the teachers thought that the connections with their students' lives helped to establish trust, which is crucial for students to feel comfortable enough to participate in science activities and ask questions when they needed to be responsible for their active learning in the science classroom. Mrs. Martin summarized how building authentic relationships with students and their parents is crucial for students' affiliation with the school and their science learning motivation in the classroom when she reflected:

> At the workshop, you have the opportunity to sit next to the student and parent and see how they interact. It is really a wonderful thing. They are expected to sit with their parent and teachers at the same time—it changes everything.…Then you go back to the class with that child, the child sees you in a different light. You are not just their teacher, you are someone who is a friend to their parents [and] … understands who they are on a real level. So they are more likely to listen to you and do as you asked.

The focal teachers understood the value of establishing relationships with families and communities rather than simply working with students in the classroom as they started to see a salient improvement in their emergent bilingual students' science learning motivation and their confidence to take part in science learning activities in the classroom. Additionally, all focal teachers expressed that the families who attended the LISELL-B bilingual workshops started to attend school programs, such as family science nights and parent-teacher conferences, more regularly. For example, Ms. Gale remarked, "I think there were a lot of families that became more comfortable with advocating for their students because of what they did in LISELL-B.

There is still a language barrier but … I think that they came more feeling safe and secure to express some of their concerns or interests or support." Even though they saw some language barriers between teachers and families, the teachers saw that building relationships with families gave family members more confidence to support their children's science learning and college preparation. Building relationships with families does not only benefit students and families, but also teachers, as they recast their assumptions about their students' parents who are socially, linguistically, and culturally different from them. We discuss this idea further in the following section.

Questioning Prior Assumptions

Third, in terms of what teachers learned about working with families, each of the focal teachers was able to more clearly see that the Spanish-speaking, bilingual families have high academic expectations, and that they place a high priority on their children's science education. Mrs. Williams elaborated on what she learned in the context of family workshops:

> I was pretty amazed how many families would get up in the morning on a Saturday and come, so their children get this experience, and I knew my parents (of my students) worked very hard, a lot of them work 12 hours most days of the week. They have found a way to send somebody from their family with the children, and that was pretty impressive.

When I asked Mrs. Gale what she would have told one of her colleagues about why they should attend a family workshop, she pointed out the deficit views some of her colleagues have about Spanish-speaking, bilingual parents, viewing these "parents as having no desire or ever thought that their children will go to college." She said:

> Why they [her colleagues] should attend the workshops is because, it is our students, because it is involving parents, it is taking the stigma away from "our students can't do it," and you know… When I hear a teacher say, "They can't do this," I say, "You know what! Why don't you, at least, you know, encourage students and families?" And, you'll probably see, you will see the difference…. That they really do care about their child's education. That's something that I do take away from this; they are concerned, they are not [complacent]. They do not show up at the school, but they do care.

Mrs. Martin expressed that she also saw the parents in a different light in the workshops—as parents who can learn science alongside their children. She questioned the conventional wisdom viewing Spanish-speaking, bilingual and working-class parents as not able to nurture their children's education because of assumed limitations in their educational backgrounds, even though they may want to do so. Mrs. Martin posited:

> Because, you see the parents sitting with their child, doing the science activities. So that becomes possible. That becomes possible at home when they are not at school. That the parent can sit with their child even if the parent doesn't know what they are supposed to do and the child is not sure what they supposed to do, but they can figure it out together. And that becomes valuable, and you see that possibility.

As Mrs. Martin said, teachers saw a possibility for revising their previous assumptions about parents not possessing language skills and science content knowledge to be able to help with their children's homework as well as assumptions that these parents were different from the European-American, middle-class parents whose home culture more closely matches the cultural and linguistic norms reflected in U.S. public schools. Watching students and parents interacting with each other around the science inquiry activities during the workshops, the teachers came to understand these families' rich history with agricultural, food science, and health science topics. For example, they listened to Spanish-speaking, bilingual families' experiences in herbal treatment of basic ailments such as coughs and sore throats, they listened to parents' experiences with growing plants and their knowledge about the connection between plants, seeds, and germination, and fathers' working experiences in chicken plants and food industries. The teachers saw that even if parents are unsure about how to help their children with school science because of their limited familiarity with school expectations, they saw that families have scientific understandings to pass on to their children. The teachers saw the possibility that their students and their parents could collaborate and learn school science together and that this process was beneficial for their children.

Talking with the parents at the workshops, teachers also recognized how important and how valuable their children's education was for these parents. They heard the parents expressing very positive ideas about the abilities and the future academic trajectories of their children. Maybe the teachers had some idea that these Spanish-speaking, bilingual and working-class parents valued education in some way, but they did not have a sense of how central a family goal promoting education was. Teachers learned that these parents would go to great lengths to make sure that their children succeed in school as they listened, for example, to stories of some mothers or fathers whose spouses still live in a different country but the family views living apart as a necessity if they want their children to have a better opportunity to succeed in life. Teachers learned that the parents' views of what is best for their children highlight educational attainment, as some parents talked about how they grew up in México, and how they didn't get to go to school beyond fifth grade, and how they are willing to do whatever it takes to provide their children with better educational opportunities than they were provided. These were some of the experiences that helped teachers question commonly accepted assumptions, including their own biases, about Spanish-speaking, bilingual parents' involvement and their interest in their children's science learning.

Discussion

The teachers' accounts make it clear that their participation in the LISELL-B bilingual family science workshops helped to form a communicative bridge between school-based and home-based science learning and intercultural understanding between teachers and Spanish-speaking, bilingual families. The teachers developed empathy for their emergent bilingual students and their families as they experienced the feeling of being an "outsider" in the workshops. This became a catalyst in their understanding about the difficulties that their emergent bilingual students face as a result of the invalidation of their cultural and linguistic resources in their school science learning. Teachers questioned their prior assumptions about the abilities of Spanish-speaking, bilingual parents to support their children's science learning as they recognized the families' science-related strengths and resources. The teachers developed meaningful relationships with families and observed the crucial role that these relationships

played in emergent bilingual students' motivation for learning science in the classroom and for the self-esteem of parents as active members in their children's science learning support system.

Attending these workshops afforded the teachers opportunities to reflect upon their pedagogical practices and taken-for-granted notions of what they value in their science classrooms. The workshop experiences were instrumental for the teachers' understanding of the value of building trusting relationships with their students and their families, which, in turn, was crucial to their recognition of different ways of knowing and doing science that their students were engaged in outside of school. Perhaps most important, teachers saw that their efforts to attend these workshops were instrumental in their emergent bilingual students' and their families' gaining increased confidence about participating in school science. The significance of trusting relationships in which all lives and voices are validated is an especially crucial component of Nieto's (2005) notion of *highly qualified teachers*. Trust is central to the work of caring and committed teachers who are willing to challenge the current dehumanizing practices that too often fail to give emergent bilingual students a voice in their own science learning.

While we valued and leveraged each of Nieto's five aspects of highly qualified teachers as we conceptualized and facilitated our family workshops, we did not explicitly name or teach these constructs in the work. Thus, it is not surprising that our teachers expressed and embodied some of these aspects more clearly than others. In analyzing our workshop content, we see that we mostly emphasized experiences that helped the teachers to develop *empathy for* their emergent bilingual students and families, such as when they experienced how their own language limitations hindered their involvement in the learning activities during the bilingual family workshops. We also found some evidence that teachers started *to question mainstream knowledge* as they learned how much parents were willing and able to support their children in their science learning regardless of their own educational and linguistic backgrounds. We did see some evidence that participation in the workshops also helped the focal teachers to demonstrate aspects of the other three features from Nieto's framework for highly qualified teachers: *sense of mission, improvisation,* and *passion for social justice*. Considering the *sense of mission,* we saw a strong motivation among the focal teachers to participate in the workshops. Even though they did not discuss this explicitly, teachers' consistent attendance at the LISELL-B family workshops for multiple years can be viewed as a reflection of that mission.

We also saw some evidence that the focal teachers began to more fully value *improvisation* in their teaching practices as a way to push beyond standardized science teaching to better support their emergent bilingual students' science learning. The teachers observed the science instructional strategies we used when facilitating the LISELL-B workshops and how fully their students engaged with these science investigation activities as compared to their behaviors in more traditional science classrooms at school. Improvisation requires flexibility, which the teachers demonstrated via their validation of different ways of knowing and doing science in their classrooms that went beyond the pre-determined school science curricula.

Finally, our focal teachers demonstrated some ways in which the LISELL-B family workshops raised their awareness for the importance of challenging the systemic inequalities that minoritized students, including those who are emergent bilinguals, face in schools. For example, Ms. Hull started to drive to her students' homes and provide them with earth science learning materials to study over the summer, and she began to visit the homes of parents who could not go to the school. For some of the teachers, challenging the systemic inequalities meant having high expectations for students despite the socioeconomic and linguistic challenges they encountered in monolingual schools.

As Mrs. Gale articulated, “We do forget that our kids are not just test scores, not just grades. They are more than that.” Given the persistent idea that effective teaching is simply a matter of imparting high levels of subject matter, we saw Nieto’s conception of caring and committed teachers as helpful for imagining new ways to foster trusting relationships with students and parents. That is, Nieto’s ideas may help us to inspire other educators to design alternative contexts for teacher education that can disrupt aspects of the current dominant discourse of standardization and accountability in U.S. schools (Giroux, 2014).

Conclusion

As the number of emergent bilingual students continues to increase in U.S. public schools (UN DESA, 2015), it is important for teachers to have new opportunities to engage with Spanish-speaking and other bilingual families in out-of-school learning settings. In such contexts, teachers are not limited to the position of an “authority figure with the task of delivering judgment and evaluation of students’ performance” (Buxton et al., 2012, p. 2). As too many low-income and ethnically and linguistically diverse families are frustrated with the broken promises of equal access to high-quality education, and as "failing" is often identified as the predominant subject position available for their children, our project sought to support caring and committed teachers who wished to challenge the current educational discourse built on mono-cultural instructional strategies, text-based lessons, and social distance (Nieto, 2014). As Paris (2012) articulated, “Without such resistance, students will continue the age-old American saga of being asked to lose their heritage and community ways with language, literacy, and culture to achieve in U.S. schools. And this saga of linguistic and cultural loss has had and continues to have devastating effects on the access and achievement of students and communities of color in U.S. public schools” (p. 96).

STEM education can provide a significant pathway toward economic advancement and social contribution for youth of historically marginalized communities (Calabrese Barton, Tan, & Greenberg, 2017). While emergent bilingual students continue to be underrepresented in STEM-related career pathways (National Academies of Sciences, Engineering, and Medicine, 2017; Nevarez, 2015), increased student interest and achievement in science can be brought about through an alteration in the role of teachers in the school community. In alignment with two previous studies, the present study demonstrated that teaching science more effectively is not only about creating positive learning interactions inside the boundaries of the classroom, but also about developing trusting relationships with families and communities (Hammond, 2001; Upadhyay, 2009). Supporting emergent bilingual students’ active participation in their science learning and their planning for post-secondary education entails strengthening ties between the worlds of home and school, and giving students the confidence to pursue further success.

The experiences of our focal teachers in the LISELL-B bilingual family workshops have important implications for preservice and in-service teacher professional development programs; they suggest it is crucial to create infrastructures and learning opportunities to support teachers’ collaborative work with students and families from a wide range of socioeconomic, cultural, ethnic, and linguistic backgrounds. Our findings align with Hammond’s (2001) and McCollough and Ramirez’s (2012) projects, in that immersing teachers in community-based science learning programs outside of firmly structured school tasks provided increased understanding of students and their families’ strengths and potentials in science. Supporting prospective and practicing teachers in moving out of their comfort zones and putting them in co-learner roles with the

families of their students has the potential to shift power relations between teachers and families and to deepen intercultural understanding.

We must remember that many teachers lack facilitated opportunities to learn about their students and families from diverse backgrounds, and so it is not surprising that some teachers hold deficit assumptions about these families from backgrounds so different from their own. However, "[i]t will do no good to either moralize or blame teachers for their negative attitudes and biased behaviors. Teachers are not superhuman; they pick up the same messages and misconceptions that we all do. This means encouraging prospective and practicing teachers to reflect deeply on their beliefs and attitudes so that a shift can take place" (Nieto, 2005, p. 217) in their perspectives and practices about working with diverse students and families. As Nieto implies, offering a yearly school district seminar or taking one course during teacher preparation with advice about how to teach diverse students and work with their families will never be sufficient. We encourage teacher educators and teacher professional development facilitators to engage preservice and in-service teachers in sustained community investigation projects that offer opportunities for building relationships and empathy with students and their families and that foster critical reflections on their own practices. In line with previous research (Chinn, 2006; McCollough & Ramirez, 2012; Upadhyay, 2009), this study shows that providing teachers with sustained opportunities for in-depth understanding of the communities in which they teach can support them in taking action to leverage students' cultural and linguistic resources in their science learning.

In this study, we sought to foster concrete examples of the kinds of reciprocal collaborative relationships between teachers and families that Nieto (2005) described. We did this from the perspectives of in-service secondary science teachers working with Spanish-speaking, bilingual families. This work calls attention to some important related areas in need of future research, such as: How, specifically, do teachers of science and other content areas apply their learning from bilingual family workshop experiences in their classroom practices? How do parents and students attending subsequent workshops with teachers view their interactions with teachers, both in the context of workshops and in subsequent interactions at school? In conclusion, we believe that the research we describe here can serve as a model resource for further STEM-focused teacher education and policy initiatives that aim to encourage secondary science teachers to build more collaborative relationships with ethnically and linguistically families, with the lasting goal of fostering emergent bilingual students' school success.

References

Adair, J. K. (2014). Examining whiteness as an obstacle to positively approaching immigrant families in U.S. early childhood educational settings. *Race Ethnicity and Education, 17*(5), 643-666.

Anyon, J. (1980). Social class and the hidden curriculum of work. *Journal of Education, 162*(1), 67-92.

Ash, D. (2004). A reflective scientific sense-making dialogue in two languages: The science in the dialogue and the dialogue in the science. *Science Education 88*(6), 855-884.

Barnyak, N. C., & McNelly, T. A. (2009). An urban school district's parent involvement: A study of teachers' and administrators' beliefs and practices. *School Community Journal, 19*(1), 33-58.

Bernier, E., Allexsaht-Snider, M., & Civil, M. (2003). Teachers, parents, and mathematics: Exploring contexts for collaboration and partnership. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Buxton, C. A., Allexsaht-Snider, M., & Rivera, C. (2012). Science, language, and families: Constructing a model of steps to college through language-rich science inquiry. In J. Bianchini, V. Akerson, A. Calabrese Barton, O. Lee, & A. Rodriguez (Eds.), *Moving the Equity Agenda Forward: Equity research, practice, and policy in science education* (pp. 241-250). New York: Springer.

Buxton, C., Allexsaht-Snider, M., Hernandez, Y., Aghasaleh, R., Cardozo-Gaibisso, L., & Kirmaci, M. (2017). A design-based model of science teacher professional learning in the LISELL-B project. In A. Oliveira & M. Weinburgh (Eds.), *Science teacher preparation in content-based second language acquisition.* New York, NY: Springer.

Calabrese Barton, A., Drake, C., Perez, J. G., St. Louis, K., & George, M. (2004). Ecologies of parental engagement in urban education. *Educational Researcher*, 33(4), 3-12.

Calabrese Barton, A., Tan, E., Greenberg, D. (2017). The makerspace movement: Sites of possibilities for equitable opportunities to engage underrepresented youth in STEM. *Teachers College Record, 119*(7), 1-44.

Catsambis, S. (2001). Expanding knowledge of parental involvement in children's secondary education: Connections with high school seniors' academic success. *Social Psychology of Education, 5*(2), 149-177.

Darling-Hammond, L. (2013). Building a profession of teaching. In M. A. Flores, A. A. Carvalho, F. Ilídio Ferreira & M. T. Vilaça (Eds.), *Back to the future*: *Legacies, continuities and changes in educational policy, practice and research* (pp. 3-27). Boston: Sense Publishers.

Eccles, J., & Harold, R. (1993). Parent-school involvement during the early adolescent years. *Teachers College Record, 94*(3), 568-587.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes*. Chicago: University of Chicago Press.

Ferguson, C., & Rodríguez, V. (2005). *Engaging Families at the Secondary Level: What Schools Can Do to Support Family Involvemen*t. Southwest Educational Development Laboratory (SEDL).

Flecha, R. (2000). *Sharing words: Theory and practice of dialogic learning*. Lanham, MD: Rowman & Littlefield.

Fournier, G. M. (2014). The inclusion of parents and families in schooling: Challenging the beliefs and assumptions that lead to the exclusion of our students' firseachers. *Journal of Family Diversity in Education, 1*(2), 112-120.

Garcia, S. B., & Guerra, P. L. (2004). Deconstructing deficit thinking working with educators to create more equitable learning environments. *Education and Urban Society, 36*(2), 150-168.

Giroux, H. A. (2014). When schools become dead zones of the imagination: a critical pedagogy manifesto. *Policy Futures in Education, 12*(4), 491-499.

Gonzalez-DeHass, A. R., & Willems, P. P. (2003). Examining the underutilization of parent involvement in the schools. *School Community Journal*, *13*(1), 85-99.

González, N., Moll, L. C., & Amanti, C. (Eds.). (2005). *Funds of knowledge: Theorizing practices in households, communities, and classrooms*. New York: Routledge.

Hammond, L. (2001). Notes from California: An anthropological approach to urban science education for language minority families. *Journal of Research in Science Teaching, 38,* 983–999.

Henderson, A. T., & Mapp, K. L. (2002). *A new wave of evidence: The impact of school, family, and community connections on student achievement, Annual Synthesis 2002*. Austin, TX: National Center for Family and Community Connections with Schools.

Hill, N. E., Castellino, D. R., Lansford, J. E., Nowlin, P., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2004). Parent academic involvement as related to school behaviour, achievement and aspirations: Demographic variations across adolescence. *Child Development, 75*(5), 1491-1509.

Hill, N. E., and Chao, R. K., Eds. (2009). *Families, School and the Adolescent: Connecting Research, Policy, and Practice*. New York: Teachers College Press.

Hoover-Dempsey, K. V., & Sandler, H. M. (1997). Why do parents become involved in their children's education? *Review of Educational Research, 67*(1), 3-42.

Hoover-Dempsey, K. V., Walker, J. M., Jones, K. P., & Reed, R. P. (2002). Teachers involving parents (TIP): Results of an in-service teacher education program for enhancing parental involvement. *Teaching and Teacher Education, 18*(7), 843-867.

Hornby, G., & Lafaele, R. (2011). Barriers to parental involvement in education: An explanatory model. *Educational Review, 63*(1), 37-52.

Jeynes, W. (2012). A meta-analysis of the efficacy of different types of parental involvement programs for urban students. *Urban Education*, *47*(4), 706-742.

Jones, S., & Vagle, M. D. (2013). Living contradictions and working for change toward a theory of social class–sensitive pedagogy. *Educational Researcher*, *42*(3), 129-141.

Lazar, A., & Slostad, F. (1999). How to overcome obstacles to parent-teacher partnerships. *The Clearing House, 72*(4), 206-210.

Lareau, A. (2000). *Home advantage: Social class and parental intervention in elementary education*. Lanham, MD: Rowman & Littlefield Publishers.

Lareau, A. (2011). *Unequal childhoods: Class, race, and family life*. Los Angeles, CA: University of California Press.

Lightfoot, S. L. (2003). *The essential conversation. What parents and teachers can learn from each other.* New York: Random House.

Litow, S. (2008, July 21). A silent crisis: The underrepresentation of Latinos in STEM careers. *Education Week.*

Luttrell, W. (2013). Children's counter-narratives of care: Towards educational justice. *Children & Society, 27*(4), 295-308.

Mapp, K. L. (2012). *Title I and parent involvement: Lessons from the past, recommendations for the future*. Retrieved from http://www.americanprogress.org/issues/issues/2012/03/pdf/titleI_parental_invovlement.pdf

McCollough, C. and Ramirez, O. (2012), Cultivating culture: Preparing future teachers for diversity through family science learning events. *School Science and Mathematics, 112*(7), 443–451. doi:10.1111/j.1949-8594.2012.00158.

National Academies of Sciences, Engineering, and Medicine. (2017). *Promoting the Educational Success of Children and Youth Learning English: Promising Futures*. Washington, DC: The National Academies Press. DOI: 10.17226/24677

Nevarez, G. (2015, June 17). More Latinos with STEM degrees needed, here are top schools doing it. *NBC News*. Retrieved from http://www.nbcnews.com/news/latino/more-latino-stem-degrees-needed-here-are-top-schools-doing

Nieto, S. (2003). Challenging current notions of "highly qualified teachers" through work in a teachers' inquiry group. *Journal of Teacher Education, 54*(5), 386-398.

Nieto, S. (Ed.). (2005). *Why we teach*. New York: Teachers College Press.

Nieto, S. (2012). Teaching, caring, and transformation. *Knowledge Quest, 40*(5), 28.

Nieto, S. (Ed.). (2014). *Why we teach now*. New York, NY: Teachers College Press.

No Child Left Behind (NCLB) Act of 2001.(2002). Pub. L. No. 107-110, § 115, Stat. 1425

Patrikakou, E. (2004). *Adolescence: Are parents relevant to students' high school achievement and postsecondary attainment*. Cambridge, MA: Harvard Family Research Project.

Paris, D. (2012). Culturally sustaining pedagogy: A needed change in stance, terminology, and practice. *Educational Researcher, 41*(3), 93-97.

Prasad, P. (2005). *Crafting qualitative research: Working in the postpositivist traditions*. New York: ME Sharpe.

Rosebery, A. S., Ogonowski, M., DiSchino, M., & Warren, B. (2010). "The coat traps all your body heat": Heterogeneity as fundamental to learning. *Journal of the Learning Sciences, 19*(3), 322-357.

Roulston, K. (2010). *Reflective interviewing: A guide to theory and practice*. Thousand Oaks, CA: Sage.

United States Department of Education. (2002). Public Law print of PL 107-110, the *No Child Left Behind Act of 2001*. Retrieved Aug 21, 2008 from http://www.ed.gov/print/policy/elsec/leg/esea02/index.html.

United Nations Department of Economic and Social Affairs (UN DESA). (2015). *International migration report 2015.* Retrieved from http://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2015.pdf

Sanders, M. (2009). Collaborating for change: How an urban school district and a community-based organization support and sustain school, family, and community partnerships. *The Teachers College Record, 111*(7), 1693-1712.

Shields, C. M. (2004). Dialogic leadership for social justice: Overcoming pathologies of silence. *Educational Administration Quarterly, 40*(1), 109-132.

Shymansky, J. A., Yore, L. D., & Hand, B. M. (2000). Empowering families in hands-on science programs. *School Science and Mathematics, 100*(1), 48-58.

Smith, S. C., Smith-Bonahue, T. M., & Soutullo, O. R. (2014). "My assumptions were wrong": Exploring teachers' constructions of self and biases towards diverse families. *Journal of Family Diversity in Education, 1*(2), 24-46.

Souto-Manning, M., & Swick, K. J. (2006). Teachers' beliefs about parent and family involvement: Rethinking our family involvement paradigm. *Early Childhood Education Journal, 34*(2), 187-193.

Soutullo, O. R., Smith-Bonahue, T. M., Sanders-Smith, S. C., & Navia, L. E. (2016). Discouraging partnerships? Teachers' perspectives on immigration-related barriers to family-school collaboration. *School Psychology Quarterly, 31*(2), 226-240.

Swap, S. M. (1993). *Developing Home-School Partnerships: From Concepts to Practice*. New York: Teachers' College Press.

Symeou, L., Roussounidou, E., & Michaelides, M. (2012). "I feel much more confident now to talk with parents": An evaluation of in-service training on teacher-parent communication. *School Community Journal, 22*(1), 65-87.

Upadhyay, B. (2009). Teaching science for empowerment in an urban classroom: A case study of a Hmong teacher. *Equity & Excellence in Education, 42*(2), 217-232. doi: 10.1080/10665680902779366

Van Manen, M. (1990). *Research lived experience. Human Science for an action sensitive pedagogy*. London: State University of New York Press.

Wainer, A. (2004). *The New Latino South and the Challenge to Public Education: Strategies for Educators and Policymakers in Emerging Immigrant Communities*. Tomas Rivera Policy Institute.

Weiland, I. (2015). An exploration of Hispanic mothers' culturally sustaining experiences at an informal science center. *Journal of Research in Science Teaching*, *52*(1), 84-106.

Weiner, L. (2006). Challenging deficit thinking. *Educational Leadership, 64*(1), 42-45.

Wimberly, G. L., & Noeth, R. J. (2005). *College readiness begins in middle school*. ACT Policy Report. Iowa City, IA: American College Testing Policy Research Center.

Wortham, S. E. F., Murillo Jr., E. G., & Hamann, E. T. (Eds.). (2002). *Education in the new Latino diaspora: Policy and the politics of identity* (Vol. 2). Oxford, UK: Greenwood Publishing Group.

Zeichner, K., Bowman, M., Guillen, L., & Napolitan, K. (2016). Engaging and working in solidarity with local communities in preparing the teachers of their children. *Journal of Teacher Education, 67*(4), 277-290.

Notes

[1]In this article, and in much of the work we did with families and teachers during our bilingual family science workshops, we purposefully used the terms *Spanish-speaking, bilingual parents* and *emergent bilingual students* with the goal of focusing attention on the rich and diverse language resources that families and students brought to these contexts. However, in our project name, literature review, and discussions of teacher interview data, we have incorporated terms such as *Latino* and *immigrant* and *English language learner* as they were embedded in the school discourse. In the current socio-politically charged context of the United States, we recognize that we, along with all researchers and educators, must cultivate a growing awareness and sensitivity that all generalized demographic descriptors fail to accurately differentiate or describe many who identify as Latino who have lived and worked in the U.S. for generations; obscure the distinct homelands of origin of immigrant families; contribute to the erasure of indigenous families' practices and languages; and fail to acknowledge the emergent bilingual/multilingual nature of the experience of anyone who speaks languages other than English.