

## FAMILIES AS RESOURCES FOR THE LEARNING AND TEACHING OF MATHEMATICS

### FAMÍLIAS COMO RECURSOS PARA A APRENDIZAGEM E O ENSINO DA MATEMÁTICA

### LAS FAMILIAS COMO RECURSOS PARA EL APRENDIZAJE Y LA ENSEÑANZA DE LAS MATEMÁTICAS

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**ABSTRACT** | In this paper I discuss the importance of school staff (teachers and administrators) and families engaging in authentic dialogues about mathematics education, as an avenue towards an inclusive, equitable, and quality education. This is particularly important in communities that are largely minoritized, such as immigrant origin communities. Drawing on almost thirty years of working with families of Mexican origin in the Southwest of the United States, I present strategies that promote mathematical conversations between home and school. At the center of this work is the concept of parents as intellectual resources, which emphasizes parents' (families') experiences with and knowledge of mathematics as assets towards the teaching and learning of mathematics in schools. Focusing on the voices of immigrant parents, I discuss issues related to perceptions about mathematics education, valorization of knowledge, and language and mathematics. These issues are central to supporting the participation of all students in the mathematics classroom.

**KEYWORDS:** Equity, Funds of knowledge, Immigrant communities, Mathematics education, Parental engagement.

**RESUMO** | Neste artigo, discuto a importância de envolver a equipa diretora da escola, os professores e famílias em autênticos diálogos sobre educação matemática, como um caminho para uma educação inclusiva, equitativa e de qualidade. Isto é particularmente importante em comunidades minoritárias, como as de origem imigrante. Baseado em quase 30 anos de trabalho com famílias de origem mexicana no sul dos Estados Unidos, apresento estratégias que promovem conversas matemáticas entre a casa e a escola. No centro deste trabalho se situa o conceito de "pais como recursos intelectuais", que enfatiza as experiências dos pais (das famílias) e o conhecimento das matemáticas como valores para o ensino e a aprendizagem das matemáticas nas escolas. Focando nas vozes de pais imigrantes, discuto questões relativas às perceções sobre a educação matemática, a avaliação do conhecimento, e as relações entre língua e matemática. Estas questões são centrais para apoiar a participação de todos os estudantes na aula de matemática.

**PALAVRAS-CHAVE:** Equidade, Fontes de conhecimento, Comunidades de imigrantes, Educação matemática, Envolvimento dos pais.

**RESUMEN** | En este artículo discuto la importancia de implicar al equipo directivo, de profesores y de familias de la escuela en autênticos diálogos sobre educación matemática, como un camino hacia una educación inclusiva, equitativa y de calidad. Esto es particularmente importante en comunidades minoritarias, tales como aquellas de origen inmigrante. Basándome en casi treinta años de trabajo con familias de origen mexicano en el sur de los Estados Unidos, presento estrategias que promueven conversaciones matemáticas entre la casa y la escuela. En el centro de este trabajo se sitúa el concepto de "padres como recursos intelectuales", que enfatiza las experiencias de los padres (de las familias) y el conocimiento de las matemáticas como valores para la enseñanza y el aprendizaje de las matemáticas en las escuelas. Focalizando en las voces de padres inmigrantes, discuto cuestiones relativas a las percepciones sobre la educación matemática, la valoración del conocimiento, y las relaciones entre lengua y matemáticas. Estas cuestiones son centrales para apoyar la participación de todos los estudiantes en el aula de matemáticas.

**PALABRAS CLAVE:** Equidad, Fondos de conocimiento, Comunidades de inmigrantes, Educación matemática, Implicación de los padres.

## 1. INTRODUCTION

This paper is motivated by a deep interest in developing an inclusive and equitable quality mathematics education for all students. In particular, the focus of my research is in working-class communities of Mexican origin in the Southwest of the United States. I have spent close to thirty years working with students and their families noticing the richness of their mathematical thinking and the diverse experiences that they bring from their everyday life that could be relevant to mathematics teaching and learning. In what follows I present a research agenda grounded on the concept of developing an authentic dialogue about mathematics teaching and learning between home and school. I argue that by working with parents / families as partners we can move towards a more inclusive mathematics education where all voices are listened to and valued. (In what follows I use the term “parents” to refer to adult members in the role of children’s caregivers).

In Education 2030-Incheon Declaration (2015), we read “Participation must begin with the involvement of families and communities to boost transparency and to guarantee good governance in the education administration” (p. 58). In this paper I illustrate what following this principle can look like in the area of mathematics education. At the basis of my work is the idea of parents as leaders and advocates for their children’s education. Parents are their children’s first teachers and play a key role in the transmission of their cultural values. This is particularly relevant to note when working with children who may not come from the “mainstream” culture dominant in the school. This may be the case with children of immigrant or refugee origin, as well as other minoritized groups (e.g., in the U.S., Indigenous, Black, Latinx students). Like everybody else, parents bring their own perceptions about what mathematics teaching and learning should look like. When these perceptions do not match the school’s perceptions, tensions may arise and children may be caught in the middle. While these tensions could be dismissed as typical generational tensions (e.g., “when I went to school, math wasn’t taught this way”), I argue that when minoritized groups are involved, the situation is different as often their knowledge and experiences are dismissed, contributing to a feeling of not fitting in and having to conform to mainstream cultural rules. As Suárez-Orozco and Suárez-Orozco (2001) write, “immigrant parents walk a tightrope; they encourage their children to develop the competencies necessary to function in the new culture, all the while maintaining the traditions and (in many cases) language of home” (p. 89). The work I present here offers an avenue to navigate this tightrope, at least when it comes to the teaching and learning of mathematics, and hopefully the lessons learned can apply to other areas.

## 2. SETTING THE CONTEXT

In this section I present an overview of the key concepts and relevant literature that support the research agenda in this paper. In the first part I describe the theoretical framework on which my research is grounded. In the second part I provide some key findings from research with parents and mathematics education in different international contexts.

## 2.1 Funds of Knowledge

When I arrived to Tucson, Arizona, about thirty years ago, I became involved in the project “funds of knowledge for teaching.” At the basis for this project is the rejection of a deficit view on minoritized communities. Instead the work is grounded on the concept of funds of knowledge, a term coined by Vélez-Ibañez and Greenberg (1992), “our position is that public schools often ignore the strategic and cultural resources, which we have termed funds of knowledge, that households contain” (p. 313). Norma González, Luis Moll and other colleagues further elaborated and applied this concept to the “funds of knowledge for teaching project” aimed at improving the educational opportunities of Mexican-origin communities in Tucson, Arizona (e.g., González, et al., 2005). Their work has since then been applied and expanded across the world (e.g., in Spain, the work of Esteban-Guitart and colleagues with funds of identity, Jovés, et al., 2015). Some central ideas from this work that are relevant to the research agenda I present here are the importance of building relationships with the communities involved, and in particular the concept of *confianza* (trust), and the richness of experiences and knowledge that all households have, which provide “cultural and cognitive resources with great potential utility for classroom instruction” (Moll et al., 1992, p. 134). An example of these ideas in mathematics is the case of a seamstress I analyzed in González et al. (2001). In that analysis we see evidence of the seamstress’ sound understanding of measurement and geometric concepts (e.g., the circle as a locus of points equidistant from a given point). Bringing in the seamstress’ expertise to a classroom context would not only validate a knowledge that is often not acknowledged (Harris, 1997), but also provide for a contextualized experience for students to engage in explorations of mathematics.

The ethnographic work with community members such as the seamstress led us to the development of workshops with parents (mostly mothers) who expressed an interest in learning more about the mathematics that their children were learning in school. This work led to another theoretical construct that informs the work presented here, namely the concept of parents as intellectual resources (Civil & Andrade, 2003). While at the heart of the funds of knowledge work was learning from the community / families, as we started working with parents in these mathematical workshops, we saw the importance of establishing authentic dialogue between parents and researchers about mathematics. That is, our workshops were not designed to be sites of transmission of mathematical knowledge from the “expert” to the “learner”, but instead, we were all learners together. We were guided by the idea of learning as participation (Rogoff, 1994). For example, as the mothers engaged us in an exploration of the mathematics in “Papel Picado” (a Mexican craft), they became the leaders of the activity as they were the experts (Civil & Andrade, 2003). As Civil and Andrade (2003) write, “In looking at home-school partnerships, there seemed to us to be urgency for parents to be intellectually engaged, especially mothers in language minority and working-class communities” (pp. 155-156). This work led us to challenge approaches to parental involvement, particularly in schools in minoritized communities, where parents are often viewed from a deficit perspective and expected to conform to the school’s expectations (Baquedano-López, et al., 2013; Fennimore, 2017; Jiménez-Castellanos, et al., 2016). Instead, the concept of parents as intellectual resources views parents as contributors of knowledge who are true partners in their children’s learning of mathematics. In the next section I provide some key findings from the literature on minoritized parents’ views of mathematics in

several contexts. Listening to and understanding parents' views of mathematics teaching and learning is fundamental to the idea of parents as intellectual resources since it is through this dialogue that we can develop the research agenda I present later in this paper.

## **2.2 Immigrant Parents' views on mathematics education**

In this section I focus on research with parents of immigrant origin and mathematics education in different countries. While some of the findings are likely to apply to parents from other minoritized contexts (not necessarily of immigrant origin), my work (and thus the research agenda I present in this paper) centers on parents of immigrant origin. This means that they often need to navigate not only different approaches to the teaching and learning of mathematics, but also different schooling arrangements. For example, Civil (2011) describes a debriefing with a group of mothers after a visit to a mathematics class in a middle school (ages 11-14). Through this visit they noticed a fundamental difference between the classroom arrangement in Mexico (their country of origin) and the U.S. In Mexico's classrooms, the students remain in the classroom and the teachers are the ones who move from classroom to classroom. In the U.S. middle and high school setting, the students are the ones who change classrooms. This led to a rich discussion on teaching implications. Civil (2012) presents an overview of key research findings with immigrant parents in the domain of mathematics teaching and learning in different countries. In general these research studies point to some concerns among immigrant parents' experiences with and expectation for their children's school mathematics. Usually these concerns are about their children's school not putting enough emphasis on for example the memorization of multiplication facts, the level being less "advanced" than in their country of origin, and the differences between parents' ways of doing mathematics or how mathematics was taught in their country of origin and the approaches in their children's current school (e.g., in the United Kingdom, Abreu & Cline, 2005; O'Toole & Abreu, 2005; in the United States, Civil & Planas, 2010; Colegrove & Krause, 2017; Quintos et al., 2019; in Japan, Takeuchi, 2018; in Spain and the United States, Civil et al., 2005). Drawing on this body of research with immigrant parents and mathematics education across different parts of the world, some themes emerge (e.g., parents' perceptions of mathematics teaching and learning; valorization of knowledge; language and mathematics) that guide the research agenda presented in the next section.

## **3. A RESEARCH AGENDA**

In what follows I outline a research agenda that in broad terms addresses the following question: how can learning with and from parents about their knowledge and uses of mathematics inform the teaching and learning of school children? In particular, the focus is on parents from minoritized communities. I propose three main research activities that I have used in my work but I also point to areas that need further development:

- 1) Learning from parents' / families' uses of everyday mathematics. This can be done through the ethnographic home visits that are the center of the funds of knowledge for teaching project (González et al., 2005) but can also happen through what we have termed occupational interviews (Civil, 2016; Civil & Andrade, 2002). This latter activity could be further developed and provide valuable insight towards developing mathematics

curriculum materials that reflect the knowledge of the community (an example of this is the work of Jerry Lipka and colleagues with the development of mathematics materials building on the Yup'ik elders' knowledge, Lipka et al., 2005).

- 2) Learning with parents / families in mathematics workshops, also called *tertulias* (get-togethers; Quintos et al., 2019). These workshops are intended to be spaces for dialogue. It is through these dialogues that we learn about each other's valorization of knowledge (Abreu, 1995), that is what counts as doing mathematics? What do we think mathematics teaching and learning should look like? We also learn about the role of language and how language policy may affect parental engagement in their children's school mathematics (Acosta-Iriqui et al., 2011). Another powerful aspect is the idea of parents as facilitators of mathematics workshops for the community at large, as this emphasizes the notion of parents as intellectual resources. This approach underscores power issues that should be further investigated (Civil & Bernier, 2006).
- 3) Parents conducting classroom visits. This activity provides a common experience for researchers, teachers and parents to engage in a conversation centered on a mathematics class. It is another window into each other's perceptions of mathematics teaching and learning. We have developed a process for these visits (Civil & Menéndez, 2012; Civil & Quintos, 2009). However, most of our conversations have only involved the parents and the researchers. The teachers need to be part of these conversations.

#### 4. DISCUSSION AND IMPLICATIONS

Implementing the research agenda outlined in the previous section in different contexts across the world would allow us to learn more about the role that families (and parents in particular) play in children's mathematics learning. Learning how parents use mathematics in their everyday life and how they may engage their children in mathematical activities could support teachers' teaching of school mathematics. As I argue in Civil (2016), in addition to looking at the everyday uses of mathematics, an aspect that could have strong implications for equity is to gain an understanding of the nature of children's engagement in home/ community practices that may be mathematically rich. Children from different backgrounds may bring cultural ways of participation that are different from what schools expect. In particular, an analysis of how children engage in everyday practices with their parents and other family members could contribute to the study of collaboration developed by Rogoff and colleagues (Alcalá et al., 2018; Rogoff et al., 2017). In their work in the United States, these researchers have noted that children of Mexican Indigenous heritage engaged in what they describe as fluid ways of collaboration (they term it "sophisticated collaboration") which has clear implications as they can be an asset towards productive team work. In our current work we have seen some indication of what we call "collaborative interpretation" (Salazar & Civil, 2020) as the mothers engage in joint problem-solving. Exploring this idea further through the lens of sophisticated collaboration, as children engage in collaborative problem solving could serve to highlight the strengths in collaboration that some minoritized children may bring from their home environments.

Another important implication from this work centers on how to build on the information about parents' perceptions on the teaching and learning of mathematics gained through the

different research activities outlined earlier. As argued in this paper, we need to develop a true dialogue between parents and teachers (school and community) where the different views that we may all bring to mathematics teaching and learning come to the surface so that potential sources of tension can be addressed. Parents and teachers engaging together in mathematical explorations can serve as a setting for different approaches to doing mathematics to emerge. Power issues need to be taken into account, as depending on the nature of the tasks, teachers may be positioned as the more knowledgeable. Choosing tasks that build on the parents' funds of knowledge can position them as having a unique expertise (Civil, et al., 2019). Other researchers are using the context of mathematics workshops for families to develop teachers' understanding of families' experiences, in particular refugee families (e.g., the work Karsli-Calamak, et al., 2020, in Turkey with Syrian refugees).

In closing I finish with the words of one of the mothers with whom we worked, as she captures the importance of teachers and parents coming together as a family, when she says, "we are all equal. If you feel that you are equal to them [teachers], it's very important for all. Because we are all a family... If we break those barriers, you'll see, I think everything will work better."

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