TRANSLANGUAGING TO ENSURE LATINX MATHEMATICS LEARNERS THRIVE

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This paper reports on a study designed to showcase Latinx bilingual children's linguistic and cultural resources for learning mathematics in an after-school mathematics club. Specifically, we examine the design of the activity system (Engström, 1999) and social interactions therein through a translanguaging perspective in which students leverage their language and culture to engage in mathematical learning. Our primary objective is to highlight some to the triumphs and struggles of bilingual children as they expand communicative practices and mathematical resources via interactions with bilingual facilitators and electronic communication with a math wizard, El Maga.

Keywords: Communication, Instructional activities and practices, Equity and diversity, Informal education

This paper presents a translanguaging perspective in which students use their agency to develop and affirm their Latinx bilingual mathematical identities in the context of an afterschool math club. Although research has disproven deficit-oriented beliefs that using native language during mathematics learning is unnecessary or harmful (e.g., Khisty & Chval, 2002; Moschkovich, 2007), there is still much to understand about the intricate processes by which Latinx bilingual students use their language and culture to engage in mathematical learning (Razfar, 2013). Therefore, our aim is to highlight how Latinx bilinguals leveraged their communicative practices and mathematical resources while communicating electronically with a math wizard. Specifically, we highlight critical features of a mathematics teaching and learning environment that supports Latinx bilinguals' translanguaging and what translanguaging affords learners. We use the term "bilingual" or "bilinguals" to center the reality that these students are multilingual, even if only emerging multilinguals. Additionally, we use the term "leverage" to reflect students' agency to capitalize on their communicative and linguistic repertoires (see Martinez, Morales, & Aldana, 2017, for a review of how this term is used by scholars).

Latinx Students and Mathematics

Latinx students are one of the fastest growing school age populations in the U.S. (NCES, 2016). Yet, Moll (2001) posits that classroom practices have continued to create a distance between Latinx students' language, cultural knowledge, and what they know academically. These systems persist in marginalizing, and thus not privileging linguistic, social, and cultural capital to help create dehumanizing school practices (Langer-Osuna, Moschkovich, Norén, Powell & Vazquez, 2016). Moreover, guiding texts like Principles to Actions: Ensuring Mathematical Success for All (NCTM, 2014) asserts that all students must have access and opportunity to study mathematics. As such, math classrooms have been encouraged to move from isolated seatwork to more social and verbal activities that require students and teachers to engage in more substantive mathematical discussions and collective practice (Bass & Ball, 2015). However, there is a concern that mathematics reforms may be in danger of ignoring the needs of Latinx students unless their needs are re-examined in light of the new demands of the mathematics classroom with its increased emphasis on communication and collaboration (Moschkovich, 2000). While this is a generalized perspective of classrooms with Latinx students, it nevertheless raises questions about marginalization and undervaluing Latinx students' learning resources in mathematics.

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Garcia, Ibarra Johnson, and Seltzer (2017) reminds us that all good education must begin with recognizing students' strengths that come from their own community's linguistic and cultural repertoire. Much of the research with Latinx students has focused on bilingual language learners. The research is often framed from a deficit perspective focusing on the relationship between students' proficiency in their first language and learning mathematics (e.g., Mestre & Gerace, 1986) or the obstacles faced by Latinx bilinguals learning mathematics across languages (English and Spanish) (e.g., Khisty, 1995). Deficit perspectives emerge when bilinguals' linguistic resources are ignored or forbidden in the classroom while only privileging the dominant school language (Langer-Osuna et al. 2016). These are de-humanizing practices with the sole purpose of controlling and dominating students' cultural identity and excluding it from the classroom and school (Gutierrez, 2017). Garcia (2017) argues that this view of language and academic discourse in schools acts as a barrier to knowledge (in our case, mathematical knowledge), only privileging those students whose linguistic repertoire mirrors the dominant school language.

Other studies have also shown that Latinx students use a wide variety of cultural resources to construct, negotiate, and communicate (spoken or written) about mathematics (Chval & Khisty, 2009; Varley Gutiérrez, Willey & Khisty, 2011). These resources include cultural knowledge (Gutiérrez, 2002), linguistic resources (e.g. mathematics register, mathematical discourse) (Celedon-Pattichis, 2003; Moschkovich, 2000), everyday experiences, life histories, and community funds of knowledge (Moll, 2001). Moreover, Razfar, Khisty and Chval (2011) advocates for a social-cultural model for language development in mathematics classrooms. They juxtapose social-cultural theory (SCT) against second language acquisition (SLA) models. In the SLA model, learners are perceived as passive recipients of mathematical knowledge proceeding in a linear developmental path and language is seen as an external tool. In contrast, SCT positions bilingual students as active agents in their language use, capable of working collaboratively, interacting, and communicating while grappling with challenging mathematical tasks. Given this disparity, a counter-narrative to common deficit perspectives, will allow us to illuminate the ways in which Latinx bilinguals encouragingly use their linguistic and other funds of knowledge while engaging their individual and collective agency to assert their identities as mathematics learners. Gutiérrez (2017) discusses such a rehumanizing perspective as one that positions the student as central to the meaning-making process while engaging in the practice of doing mathematics. This perspective refutes the imposing of standardized or normalized practices onto students, such as the routine expectation of students reproducing the teachers' idea of productive mathematical activity. Instead, a rehumanizing perspective fosters respect and dignity through privileging the viewpoint and experiences of the student, and the ways in which they develop personal understandings through their own disciplinary perspective on mathematics.

Translanguaging

We draw on translanguaging to reconceptualize bilingualism as a liberating and empowering communicative practice and resource capable of transforming learning the goes beyond students' transition to the dominate school language (MacSwan, 2017). Translanguaging is more than just a simple shift between two languages (i.e., English and Spanish). It is a complex and interrelated communicative practice that make up bilinguals' linguistic repertoire (Cenoz, 2017). Garcia (2017) posits, "…speakers use their languaging, bodies, multimodal resources, tools and artifacts in dynamically entangled, interconnected and coordinated ways to make meaning" (p. 258). Translanguaging classrooms are powerful spaces that take full advantage of and leverage students' linguistic repertoire to engage with complex content and texts, strengthen students' linguistic repertoire in academic contexts, draw on students' bilingualism for the purpose of expanding their

ways of knowing, and support students' bilingual identities that counter English only ideologies (Garcia, Johnson, & Seltzer, 2017).

Given the paucity of studies that use a translanguaging framework to understand language practices of multilingual persons in mathematics classrooms, we argue that translanguaging re-conceptualizes the mathematics learning and language practices of Latinx bilinguals. Mazzanti and Allexsaht-Snider (2018) report on a study in a kindergarten classroom with a large Latinx population. They find that their use of English and Spanish occurred simultaneously as a way to make mathematical meanings. These meanings were not limited to just linguistic accomplishments, but also used symbolic representation of numbers and visual models of the number problems to leverage these students' communicative resources. Other studies have focused on spontaneous translanguaging of 12th grade Latinx bilinguals in an upper level math classroom. Morales (2004) used a translanguaging and perseverance framework to compare the collaborative efforts of two groups of students solving a challenging mathematical task. Results show that when students are given the freedom to explore mathematics via their dynamic bilingualism they are able to spontaneously and dialogically leverage communicative resources to help them persevere and overcome in-the-moment obstacles. Morales & DiNapoli (2019) further ague that these students' translanguaging practices reposition students as competent problem solvers and agents of their own learning while leveraging bilingual identities as learners of mathematics reflecting a rehumanizing perspective for all students in the group.

Maldonado, Krause, and Adams (2018) also believe that emergent bilinguals could participate in mathematics teaching and learning in ways that are rehumanizing to all participants in the classroom. They explore ways in which a 2nd grade dual language mathematics classroom built a translanguaging stance where teachers made choices to build on children's thinking while engaged in mathematics instruction that develops knowledge, dispositions, and builds on students' cultural, linguistic, and community funds of knowledge. They argue that mathematics teachers must nurture a translanguaging stance by (1) Respecting others ideas. (2) Committing to caring for others and bringing the community together. (3) Collectively working together for the good of the individual and group. And (4) engaging in a mathematical practice together.

Research Design, Context, and Methods

Our research was conducted in a large, urban school district in a very large Midwestern city in the United States where 85.6% of the students are classified as coming from low-income families, and 13.7% are categorized as "English learners". Our research site was James Dual Language School. James was made up of approximately 425 students from Pre-Kindergarten through the 6th grade. The school population consisted demographically of 99.4% Latino/a. Additionally, 98.3% of the students were eligible for the government's free or reduced lunch program, and 68% of the students were categorized as English language learners (ELLs) (School District Data, 2007).

The research reported here is based on data gathered in an after-school project called "Los Rayos de CEMELA" adapted after the work of The Fifth Dimension (Cole, 2006) and La Clase Mágica (Vásquez, 2003). The after-school project was designed to give Latinos/as experiences doing non-remedial mathematical activities including problem solving and playing mathematics games that were intended to enhance students' knowledge of probability and algebraic concepts. Students were encouraged to be self-directed, to work collaboratively, to verbalize their thinking, and to ask questions. One of the goals of the after-school project was to promote mathematical bi-literacy. All participants were encouraged to speak Spanish. Playfulness between the adults and children was a critical part of the interactions in the after-school project. In addition, students communicated electronically with a mathematics wizard, El Maga, who engaged students in bilingual conversations about their mathematical experiences.

Findings

Despite our original efforts to privilege Spanish in the after-school, social forces prevented participants from fully realizing the potential and capital of Spanish. We highlight these challenges and discuss adjustments made to the after-school club to more authentically draw on children's, and families', funds of knowledge, including their linguistic resources.

The children's gravitation towards English – but also El Maga's persistence using Spanish and commitment to supporting language growth – was also documented in children's correspondence with El Maga (an undergraduate student facilitator).

As we mentioned earlier, we were particularly interested in creating a space that privileged communication in Spanish, so we purposely wanted to include the parents during the second session. We considered that including the parents would naturally encourage the students to speak in Spanish. We asked the students to explain the rules of the game and to demonstrate how to play the game to the parents. When Rodrigo played the Counters Game during the second session, he worked with a group that was more Spanish dominant. He played with two other students, Margarita and Rafael, his mother Olga, two more mothers, and an undergraduate facilitator, Carlo. All three mothers were Spanish language dominant, and their command of English was limited. When Rodrigo played the Counters Game again, he was more confident and even took on the role as sort of a referee making sure everyone including the parents played by the rules.

The after-school club got a critical boost from the parent-participants. Parents served multiple roles, one of those being a bridge where Spanish moved from its familiar place in family and community spaces into the academic space where children frequently preferred to speak English. Parents, through their presence and eagerness to participate alongside children, established new norms where mathematical conversations were in Spanish. Furthermore, parents embraced their role as collaborators in the design of the community mathematics projects. Their insights contributed to mathematical activity where problem solving was done within and through rich community and cultural contexts, rather than trying to bring cultural contexts into pre-fabricated mathematical activities. The evidence suggests that this collaboration allowed children and parents to draw on meaningful – although subjugated and grossly under-acknowledged and under-utilized – forms of funds of knowledge.

Conclusions and Implications

It turned out that parents, because of their language backgrounds, are natural examples of translanguaging. Mathematics learning environments are well-served by the involvement of multilingual parents and community members because they re-shape the linguistic lanscape in a way that elevates language use and development, and likely meta-linguistic awareness, too. Palmer et al. (2014) argues further that much of the work involving bilingual students is framed around an ideology and policies of language separation that encourage teachers to create separate instructional spaces (physical and other) for bilingual students to communicate in either the dominant or minority language. These ideologies and school policies also contribute to separating parents and other community members from the teaching and learning context and, moreover, do not take into consideration the power of communicating across multiple languages to adequately support the learning of mathematics among bilingual Latinxs. We are only in the beginning phases of understanding the intersection of language ideologies, mathematics learning environments and language practices. This data implies that further research should examine the role of various multilingual actors and the context of the mathematical activity in order to determine the myriad ways they support Latinx learners to thrive mathematically where traditional classroom practices and schooling structures have largely failed.

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