Translanguaging and the Mathematics Classroom

The Translanguaging Study Group

Abstract

Understanding how students use language is important for mathematics teachers, particularly when considering how best to teach mathematics with bilingual students. Translanguaging is a theory that provides a useful lens for understanding the language use of bilingual students. In this article, we share our perspectives on translanguaging and how this perspective might impact our instruction with bilingual students.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. What is language?
2. What was your first experience thinking about language or what it means to know a language (or multiple languages)?
3. Some linguists have described a common understanding of multilingualism as a collection of individual languages. How does this align or differ from your conception of language?
4. How might your conception of language influence your mathematics pedagogy with bilingual students?
5. How does a mathematics classroom that encourages students to utilize all of their linguistic resources look and sound?

The Translanguaging Study Group is a group of scholars who came together to study translanguaging. This paper was collaboratively conceptualized through conversations with the Translanguaging Study Group (TSG). The TSG members who participated in the writing of this article included (in alphabetical order): Zandra de Araujo, Carlos Nicolas Gomez, Ji Yeong I, Elyssa Miller, Hector Morales, Sarah A. Roberts, Erin Smith, Miwa Takeuchi, Mary Truxaw, and Craig Willey. Correspondence can be addressed to Zandra de Araujo, dearaujoz@missouri.edu.

Translanguaging and the Mathematics Classroom

Mr. García teaches mathematics in a classroom of newcomers in an urban school serving almost entirely students of color. The students range in ages from 11-14, come mostly from Central American or Middle Eastern countries and have a variety of experiences with formal or interrupted education. Mr. García is a Latinx, Spanish-speaker with six years of experience teaching bilingual students. He favors the use of technology (e.g., Google Maps, digital cameras) to build a sense of community, which he views as a prerequisite to supporting students' mathematics learning. He frequently exposes the historical roots of mathematical concepts and applications to help students understand the value of cultural heritage and disrupt prevalent notions of who does mathematics. He moves delibrately through the curriculum, emphasizing problem solving, conceptual understanding, and mathematical reasoning.

Mrs. Ellis's school is in the suburbs of a major metropolitan city. The majority of students attending this school are from middle-income families, but there are also students from working class background and affluent families. Most of the students are white, but there is a small population of children (about 9%) whose first language is either Spanish or Hakha Chin. Mrs. Ellis, a fourth grade teacher, is in her third year of teaching and has received a minimal amount of professional development (PD) around teaching English learners (ELs), as they are commonly referred to in this school setting, from both her university-based teacher preparation program as well as on-site PD provided by the school's EL coordinator. She believes in the value of native language use to support a child's sense-making in mathematics but struggles to maximize this resource in both interpersonal interactions with the child and assessments. Mrs. Ellis also is cognizant of her responsibility to help provide access to the mathematics content for ELs, which is typically demonstrated by her focusing on certain nouns and verbs she perceives to be unfamiliar to the students, and is supported by showing pictures or drawing diagrams. Beyond these two key strategies, Mrs. Ellis admittedly struggles to support the students.

While these are very different classrooms, they represent two of the many classrooms that serve—or struggle to serve—bilingual learners in mathematics. Still, the two teachers share a desire to help all children learn, as well as an understanding that language and language development play key roles in these learners' mathematical success.

Teachers are increasingly aware of our historical failures to adequately support bilingual learners and have been exposed to various protocols (e.g., SIOP; Echevarria, Vogt, & Short, 2007) and strategies to increase access and engagement with mathematics. Yet, scholars have long warned that strategies, by themselves, are insufficient and the inequitable results on mathematics assessments among bilingual students show we are slow to make significant progress at a time when bilingual students constitute about 10% of K-12 enrollment in U.S. schools (National Center for Education Statistics, 2019).

In this article. we consider translanguaging as a means of reconceptualizing language in the hopes it will provide a useful lens to more effectively teach mathematics with bilingual students. Translanguaging is a theory of language that shifts us ideologically from perspectives commonly associated with language separation to one that values the complex and interrelated communicative practice that makes up bilingual students' linguistic repertoire (Cenoz, 2017). We use translanguaging (1) to focus on underdeveloped conceptions of language that undergird or inhibit more effective engagement of bilingual learners, and (2) to sketch a way forward, recognizing that aspects of translanguaging pedagogy have been used for years and that there is not one "best approach" to enact translanguaging across all contexts. In the following sections we present our current assumptions that have grown alongside our continued study of translanguaging.

1. Be cognizant of the power of labels.

There is a growing acknowledgement for the need to be purposeful about the terminology that we are using when we talk about linguistically diverse students. We want to acknowledge that labels matter and have power. Although

we are still not quite sure what that terminology should be, we do have ideas about what it should not be.

In this paper, we, like García (2009), use the term *bilingual* to encompass bilingual students and ascribe to the definition that bilingual is "all language practices that include features beyond those described by linguists and educators as forming a single autonomous language" (p. 158). Under this definition, students who have access to or are in the process of acquiring access to multiple languages would be described as bilingual. Although the (inter)national discussion around labels will continue, it's important to recognize which labels currently exist and are used. In addition, we must consider the hidden assumptions and other considerations associated with these terms (Table 1). We feel it is important for researchers and teachers to be purposeful about the labels they use, think through these labels, continue to contribute to this conversation, and acknowledge the political and social nature of these conversations.

Table 1

Considerations for Particular Labels

Term	Considerations
Limited English Proficient	● Highlights English dominance ● Highlights deficit perspective ● Often used as a local "measurement" of proficiency
English (Language) Learner	● Highlights English dominance ● Highlights deficit perspective ● Often used as a local/federal "measurement" of proficiency ● Used regularly currently in the literature, practice, and in policy documents
Emergent Bilingual	● Suggests individual is not already bilingual ● Assumption that individual speaks only two languages ● Assumption of separate languages
Bilingual	● Assumption that individual speaks only two languages. ● Possible assumption of separate languages. ● Widely used in literature, practice, and policy
Multilingual	● Suggests individual speaks multiple languages ● Possible assumption of separate languages ● Used in literature but not widely used in policy
Translanguager	● Suggests individual translanguages ● Not widely used in the literature, practice, or in policy

2. Acknowledge fluid, dynamic language practice (translanguaging) as the bilingual norm.

García's (2009) notion of translanguaging affirms fluid language practices that are the norm to bilinguals' lives. Instead of seeing bilinguals as people having multiple independent and self-contained languages, García viewed one linguistic repertoire for bilinguals, that is, translanguaging. García (2012) posits that "translanguaging takes as its starting point the *language practices of bilingual people as the norm*, and not the language of monolinguals, as described by traditional usage books and grammars" (p. 1, emphasis in original). This lens legitimizes fluid language practices as unique resources and practices that bilinguals can access, instead

of perceiving fluid language practices as a deficit or a sign of incompetence.

Translanguaging is an action. Maturana and Varela (1992) and García and Wei (2013) maintain that languaging is the continuous knowing and meaning-making with languages through ongoing interactions with others. Therefore, translanguaging continues to evolve as bilinguals engage in interactions and meaning-making through new encounters and new situations. This contrasts with historic notions that perceive languages as operating statically and independently within individuals. Consequently, García contends that we cannot accurately gauge bilinguals' authentic capabilities if we separate their language repertoires artificially. Such artificial separation will mask bilinguals' capabilities of generating new linguistic expressions that can bring forth new aspects of knowing. To illustrate what this dynamic language process looks like while learning mathematics, we present a vignette of a group's collaboration on a problem involving exponential functions.

Ines: …empezamos de cuatro pies. *(…we start at four feet.)* Si toma si come un pedacito son ocho, si come un pedacito son dieciseis, el tercer pedazo dieciseis y dieciseis. Treintaidos ¿no? (*If she drinks, if she eats one piece it becomes eight, if she eats one piece it becomes sixteen, the third piece, sixteen and sixteen, thirty two, no?)*

Jessica: Pero, ¿cómo sacastes eso? *(But how did you get that?)*

Ines: Porque si empezamos con cuatro pies, como yo les digo, si come un pedacito y sale, aumenta de altura de doble. *(Because, if we start at four feet, like I'm telling you, if she eats one piece and it comes out to, her height grows double.)*

Jessica: Ohh, her height doubles.

Elena: You know it's the same thing. Mira, dos, you multiply one times two is two, two times four is eight, y si pones two times two is four, four times four is sixteen. *(You know it's the same thing look. Two, you multiply one times two is two, two times four is eight, and if you put two times two is four, four times four is sixteen.)*

Carina: In squared times 2 is equal to your out.

This above vignette illustrates how the dynamic and fluid movement between mathematical and everyday language in Spanish and English provides the group the necessary tools to clarify their mathematical thinking (Morales, 2004).

Language is living, emerging, and dynamic and does not construct walls between itself (García, 2012). Thus, bilinguals develop one holistic language repertoire that they are fluidly and tactically enacting and renewing. From the translanguaging lens, creating a classroom culture where bilinguals' fluid language practices are affirmed can bring forth mathematical understanding that maybe be otherwise masked or suppressed.

3. Construct mathematics classrooms rich in language across modalities.

Developing a classroom culture where fluid language practices are affirmed requires rich language practices across all modalities. In the context of learning, modalities are "socially and culturally shaped resource[s] for making meaning" (Bezemer & Kress, 2008, p. 171). Examples of modalities include traditional language practices such as speaking, listening, reading, and writing; they also include resources beyond words such as gestures, context, visuals, objects, artifacts, touch, tone, multiple languages, etc. (García & Wei, 2014). Because different modalities provide different affordances and constraints of meaning making, translanguaging recognizes the importance of "all meaning-making modes" (García & Wei, 2014, p. 29). We extend García's (2017) translanguaging framework to accommodate how bilingual students use mathematical discourse and other linguistic repertoires, such as the mathematical register (Avalos, Medina & Secada, 2018) to enhance our view of understanding language in relation to teaching and learning mathematics. This is in line with other scholars (e.g., O'Halloran, 2015) who call for greater attention to the ways students move between language, symbolic notation, and visual representations as they engage in mathematics.

We have somewhat struggled to identify how multimodal communication and learning may manifest in classrooms where translanguaging is embraced. We acknowledge the practicality of resources that suggest specific multimodal strategies and tools for use within bilingual and multilingual classrooms (e.g., Celedón-Pattichis & Ramirez, 2012; Echevarria, Vogt, & Short, 2007). For example, Shein (2012) discussed the value of teachers using gestures while using questioning with bilingual students in mathematics classrooms.

Alternatively, teachers may use an interactive word wall displaying key terms (with definitions, examples, and/or visuals) and revisit interactively during lessons. While appreciating the practicality of specific strategies and tools, our understanding of translanguaging suggests that we should strive for a more holistic view of students and interactions that support meaning-making rather than relying solely on individual tools and strategies. To clarify this distinction, García and Wei (2014) provide an example of the differences between using translation features on an iPhone with texting practices where users select from emoticons, photographs, multiple languages, and so on in order to communicate effectively. Thus, translanguaging suggests multimodal perspectives that are fluid and dynamic as opposed to disjointed and static.

4. Recognize the interplay between identity and language.

Our identity is bounded within language. We are dependent on our language and discourses to be able to describe who we are through the stories we tell (Kaasila, 2007). As we become socialized into communities and subcultures, we learn new discourses to describe our ideology, beliefs, and what it means to be in the world. The interplay between identity and language is significant as it influences one's linguistic repertoire. Consequently, one's languaging is impacted by the access one has to different identity discourses (this includes symbols). For example, Lewin (2015) discussed how individuals who choose to participate in a punk subculture learn to use members' discourse by participating in rituals (e.g., going to shows and "losing themselves"; p. 173). Our social identities (e.g., gender, socioeconomic status, race, ethnicity) also provide access to particular discourses about our ways of being. Participation in these discourses is not chosen. Demonstrating white cisgender male attributes socializes one to particular ways of being and languaging. One has to then opt-in to learning the languaging practices of others. Consequently, the discourses of our chosen membership in subcultures and our social identities become embedded in our linguistic repertoire.

The interplay between languages and identity can also be seen in how Latinx students describe the relationship between language and being a doer-of-mathematics. For example, in the following transcript from an interview with Alondra, a 3rd grade Latinx student, she discussed how she felt math came easier to her because Hispanics do mathematics the same way as English people:

> **Interviewer**: How do you think being Hispanic plays a role in how you learn math?
> **Alondra**: Math is like kind of more easier for me than reading because like sometimes I don't know all of the words.
> **Interviewer:** Ok and how does being Hispanic help you with that in the math?
> **Alondra:** Because the numbers in Spanish are the same and some problems are the same like [how] Hispanics do the [math] problems. And the way they, the English people [sic] do it, I like—Hispanic they do it the same way.

Antonio, a third-grade Latinx student, discussed his languaging practices when doing mathematics:

> Well sometimes when I'm trying to do math I, I sometimes do it in Spanish and then I try to say it in English. And once it's like wrong, I do it—the whole thing in Spanish. And then if it's wrong still, I do the whole thing in English. And it's right then, then um, I'll like feel like I got it right just with only one try but I only got it right in like three tries sometimes. (Antonio, 3rd grade)

Alondra and Antonio demonstrate how their use of Spanish is embedded within their enactment of mathematical tasks. It also reflects how their identity as doers-of-mathematics is linked to their linguistic repertoire. These translanguaging practices can be a transformational power in developing bilingual learners' academic identities (Cenoz, 2017).

5. Not equate English proficiency with mathematical proficiency.

Prior studies have found that teachers hold deficit views of bilingual learners (de Araujo, 2017; I, 2019) carrying a number of negative consequences for bilingual students. One such consequence is that bilingual students are assumed to have lower mathematical capabilities evident in the types of mathematical opportunities teachers afford bilingual students. For example, de Araujo (2017) found secondary mathematics teachers purposefully selected low cognitive demand tasks for their bilingual students.

The teachers did so, not only because the tasks contained fewer words, but also because they perceived the students as needing more procedure-based practice tasks. Curriculum materials also contribute to this conflation of English and mathematical proficiency as many resources marked for "English learners" are identical to those recommended for special education students (Smith, Dwiggins, & de Araujo, 2017).

The learning of mathematics is a discursive activity (Moschkovich, 2002). Therefore, we negotiate meanings and understandings of mathematical ideas. Moreover, we communicate those understandings to one another through language. If we perceive academic language in relation only to spoken and written English, then we will view bilingual students with language deficits. We might hear a student has difficulty articulating something aloud in English or notice they do not comprehend written English text. We then filter these student difficulties through the dominant views of bilingualism concluding that the student does not understand the mathematical ideas because they are not able to evidence their knowledge in English.

If we instead take a more expansive view of language, we would take the same student challenges and instead seek to support the student's communication in multiple modalities; drawing on their full linguistic repertoire. We would seek to understand the extent of the student's understanding by allowing and encouraging them to draw on all of their linguistic resources, not just those in English. We also would recognize *our* full repertoire of language which is rich in symbols and other modalities to help communicate. The emphasis throughout will be on understanding, not the limits of language. Teachers who embrace translanguaging as a theory of language would not provide easier mathematics tasks to bilingual students, they would seek to provide language rich experiences encouraging students to make sense of and communicate with their full linguistic repertoire (de Araujo et al., 2018). This would dethrone the supremacy of English as evidence for mathematical learning and instead aim to make sense of meaning through and with our full arsenal of linguistic resources.

Ongoing Questions and Discussion

In taking a translanguaging perspective, we can encourage bilingual students to embrace and utilize their full linguistic repertoire and agency as they develop and assert their identities as mathematics learners. We believe this perspective is necessary to rehumanize mathematics for bilingual students (Gutiérrez, 2017). A translanguaging perspective focuses on students' assets and helps us to foster respect and dignity for their language practices.

We acknowledge that we are still working to understand how we might take up a translanguaging perspective in our work. Our goal for this article was to provide an overview of translanguaging and potential implications this perspective has for our practice. We also hope this article has sparked a desire for continued study and exploration for researchers and practitioners. In particular, we hope future work will help answer questions such as: (1) What instructional practices support bilingual students in the mathematics classroom when we take a translanguaging perspective? (2) How might we prepare preservice teachers to understand and enact practices consistent with this perspective? (3) How might mathematics education research be transformed with and through a translanguaging perspective? As we seek to answer these questions, others will surely arise. It is our stance that these continued explorations and innovations are necessary as we seek to improve mathematics education for bilingual students.

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Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. In what ways do you identify with or feel dissonance with the classroom/teacher depictions in the opening?

2. Consider the opening classroom/teacher depictions. In what ways do you see the teachers' practices aligning with translanguaging (or not)?

3. In what ways do/can you plan for mathematics instruction to make room for students' use of their home languages and cultural understandings?

4. What are the challenges that translanguaging poses for you as a mathematics educator? Identify and talk through with other educators the challenges that are posed.

5. What ongoing questions do you have about translanguaging? How might you explore the topic further?

The mission of TODOS: Mathematics for ALL is to advocate for equity and high quality mathematics education for all students—in particular, Latina/o students.

Five goals define the activities and products of TODOS: Mathematics for ALL

1. To advance educators' knowledge and ability that lead to implementing an equitable, rigorous, and coherent mathematics program that incorporates the role language and culture play in teaching and learning mathematics.

2. To develop and support educational leaders who continue to carry out the mission of TODOS.

3. To generate and disseminate knowledge about equitable and high quality mathematics education.

4. To inform the public and influence educational policies in ways that enable students to become mathematically proficient in order to enhance college and career readiness.

5. To inform families about educational policies and learning strategies that will enable their children to become mathematically proficient.