Helping Preservice Teachers Connect to Students, Subject, and Self

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Abstract

Effective teaching involves connecting to the strengths of all students. Teacher candidates need opportunities to explore their own identities, while also finding ways to relate to the assets and perspectives their students bring to the classroom. It is critical that they recognize the strengths of multilingual students. This article shares two experiences that can help teacher candidates consider these elements within the context of mathematics in meaningful ways.

Discussion And Reflection Enhancement (DARE) Pre-Reading Questions

1. How can you validate students' cultural values and practices in your lessons?

2. How do you create opportunities in teacher education courses to challenge teacher candidates to examine their own beliefs, biases, and experiences?

3. What are ways teacher candidates can explore meaningfully connecting students, subjects and self in their lessons and instruction?

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Megan Burton and Gwendolyn Williams

> Math is something I am uncomfortable with myself, so trying to think of how to help someone who struggles in math is difficult for me…. Then you add on that they aren't solid in English…that terrifies me. I don't want to mess up.

This quote, written by a teacher candidate (TC) on the first day of a mathematics methods course, reflects the sentiments often expressed by many TCs as they enter a mathematics methods course (Bartels, Rupe, & Lederman, 2019). A challenge for many elementary education mathematics methods instructors (MMIs) is supporting growth in TCs' identities as mathematics educators, while also shifting their perspectives to view emergent bilingual learners' experiences as positive contributions to classroom instruction (Civil, 2016), rather than focusing on deficit thinking, which has been used too often by scholars, teachers, policymakers, and others to describe English learners (de Araujo, Roberts, Wiley, & Zahner, 2018). Through the analysis of vignettes and experiential learning, TCs can investigate their own identities as mathematics teachers and learners. Such activities foster confidence in planning and facilitate an equitable, rigorous, and coherent mathematics program that incorporates language and culture into the teaching and learning mathematics (TODOS, 2019).

Mathematics Methods Courses for Teacher Candidates

"Good teachers join self and subject and students in the fabric of life," (Palmer, 2007, p. 47). To do this, teachers must know their students, the content area (mathematics) and themselves. Mathematics methods courses allow TCs to explore how to teach and learn mathematics, which entails learning to leverage the diverse assets and needs of learners. Helping all students see their ability to effectively use mathematics in their lives involves understanding the lives of students (Aguirre et al., 2013). Teachers play a critical role in shifting student status to focus on the contributions bilingual learners' experiences add to the classroom (AMTE, 2015; Civil, 2016), rather than utilizing deficit thinking when discussing bilingual learners (de Araujo et al., 2018).

Experiential Learning

TCs must learn to relate mathematics to the personal lives of their students (Ewing et al., 2019). In order to support TCs in this action, MMIs must model this behavior for their students. The key to effective equitable instruction centers on relationships that acknowledge, build upon, and celebrate the identities of individuals and understand the theories that underpin the mathematical or instructional strategies being implemented (AMTE, 2015). One way to highlight the mathematics in the lives of TCs and their students is to provide experiences that emphasize this connection.

Example: Mathematics Photos Outside of School

In one lesson, TCs were asked to photograph examples of fractions, decimals, and percentages that they encountered. This included what they saw in their surroundings and those they used in their daily lives. Then they were asked to think about how contextualizing fractions, decimals, and percentages in students' and TCs' home lives could be beneficial to instruction. TCs reflected on recipes, shopping sales, gas prices, and measuring in their initial homework assignment (see Figure 1).

After having reflected on these experiences in their own home environment, TCs explored the neighborhood where their students live. TCs engaged in a community walk in order to locate examples of fractions, decimals, and percents they could share in their classrooms. Some of the images that were collected were windowpanes, food items, pie graphs from the newspaper, bookshelves, money, clocks, and bento boxes. Figure 2 is a photograph taken on the community walk showing produce at the Asian supermarket that was $1.98 per bunch, noted by one student that these were on sale at 20% off.

Figure 1

Examples of Fractions and Decimals Shared by TCs

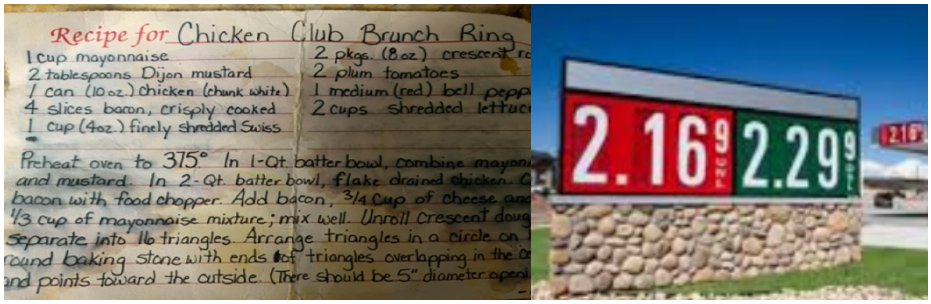

Figure 2

Example of Decimals and Percentages From Community Walk

TCs discussed how the items they photographed from their personal experiences before the community walk may or may not be relatable to learners in their classroom. These objects resonated with the TCs and were familiar to them. One TC mentioned that as a child, she didn't care about gas prices, so why would she expect students to care about it? Therefore, the TCs acknowledged the need to bring in a variety of photos and examples for their students to relate to.

As an extension of the preceding activity, MMIs asked TCs to encourage their students to email a photo of fractions, decimals, or percentages being used in their home (or to draw pictures if these were more accessible). These photographs were shared in the mathematics methods course as TCs designed lessons with the images they collected. Expanding the activity to involve parents and children finding fractions, decimals, and percentages at home proved to be extremely fulfilling. TCs recounted various family traditions and hobbies involving fractions, decimals, and percentages, such as cooking family recipes, dividing pies, stitching quilting patterns, constructing buildings, and reading music. They reflected on how excited students become when sharing stories about their families. TCs also observed that many more uses of fractions, decimals, and percentages were acknowledged through involving the family and community. Sports, pie graphs from the newspaper, bookshelves, money, clocks, and bento boxes are some examples of the images collected that TCs had not originally considered but upon closer examination of each they discovered fractions.

Through the analysis of these images, TCs discussed identifying the whole, equi-partitioning, unit fractions, associating fractions with decimals, and other critical elements of fractional reasoning (Flores, Burton, & Hinton, 2017). They also gained insight into the world in which their students live and the ways the students see mathematics around them. For example, one TC

remarked that a student's father, who works in construction, showed the student multiple ways that he uses fractions in his work. The TC said the student is typically shy but was eager to share this information with the class. Photos and drawings can foster understanding and alleviate anxiety over vocabulary questions that the emergent bilingual learners might have (Miller & Warren, 2014).

TCs investigated ways to utilize the photos students shared to assess thinking, to involve students in discussions, and to extend their mathematical learning. Too often students do not see the intersection of mathematics in questioning and problem solving to the world where they live (Felton-Koestler, Sutherland, & Tracy, 2016). These ideas push the teacher educator to examine the mathematics teaching practices and strategies to reach multilingual learners.

Unpacking Experiential Learning

Experiences should link mathematics inside the classroom to the mathematics students already encounter in their communities (Felton & Koestler, 2015). This activity encouraged TCs to relate mathematics to various communities and recognize the linguistic and cultural capital of their students (Cancienne, 2009). For example, one TC who had never visited the Asian supermarket found a wealth of new resources to integrate in her teaching. While many of the mathematical examples could be found at any store or supermarket, utilizing examples from the neighborhood where the school is situated, and products that are familiar to students, is important. Such an exercise highlighted the students' and TCs' cultural funds of knowledge that are portrayed through the photographs of mathematics in their lives (Aguirre, Zavala, & Katanyoutanant, 2012) and focused on conceptual understanding (Moschkovich, 2013). Experiential learning builds on student responses and active learning (Banse, Palacios, Merritt, & Rimm-Kaufman, 2017), while maintaining the focus on mathematical content (Moschkovich, 2013). Considering different perspectives allowed TCs to probe the cultural nature of mathematics (Planas, 2018).

Instructional Vignettes

Instructional scenarios/vignettes also help teachers and TCs inspect and examine elements of teaching and learning (Turkan, 2016). Providing TCs with multiple examples of mathematical concepts is important to mathematics teacher education (Dreher & Kuntze, 2015). Specifically, vignettes provide real life situations through which TCs can study the sociocultural factors involved in how students may respond to mathematical experiences (Civil, 2016). Scenarios also show concrete examples of how language and mathematics are intertwined. Such a focus is critical for emergent bilingual students who face challenges in accessing mathematics instruction due to a limited vocabulary and developing conversational skills (Banse et al., 2017).

Vignettes serve as a springboard for TCs to reflect and interrogate their own identities and perspectives as mathematics teachers and learner as well as to relate to the identity of students in elementary mathematics instruction. This pedagogical method is useful to MMIs because it enables the TCs to reflect individually on a common classroom scenario before participating in a larger class discussion (Wilkerson, Kerschen, & Shelton, 2018). Scenarios should be short situations that readers can use to deconstruct and gain insight into teaching and learning. The following vignette is a sample of several that were given to TCs throughout the semester. Each situation was distributed on a sheet of paper with follow-up questions that they were to respond to in groups of four before participating in a whole class debriefing

Example Vignette: Play to Understand Representations and Connections

This example (see Figure 3) illustrates how teachers can empower bilingual students and utilize their cultural capital that emerges naturally during informal play. It allowed TCs to see the role they play in equalizing status among students and the way language is perceived.

Unpacking the Example Vignette

In this vignette, TCs are able to analyze the role of play in early childhood mathematics classrooms, while also noticing the role of language. Play is a vital element in creating space for problem solving, real world

Figure 3

Vignette and Follow-up Questions

Vignette: Bilingual Play

Three children are playing with blocks at centers: One student's preferred language is Spanish, another student speaks fluent English and Spanish, and the third student knows only English. As they play, students make hand gestures and use Spanish and English to communicate about which blocks they need and how to build the structures. After the free play, they are asked to reflect upon their time. They share that they have learned words from each other and that they could communicate by drawing the shape if the words were difficult to understand. They also described how they put two cubes (cubos) together to make a rectangular prism (prismas rectángulares), when they were out of rectangular prisms. Initially, they used two-dimensional terms (square, rectangle, cuadrado, and rectángulo) in the debriefing, but the teacher encouraged them to find the English and Spanish words on their iPads for the three-dimensional shapes.

After reading the scenario, respond to the following in your mathematics journal and be prepared to discuss with your group.

1. List the mathematical knowledge and/or practices demonstrated in this scenario.
2. How did the discussion benefit each student?
3. Do you agree or disagree with the teacher's extension? Why?
4. What might you ask or do to follow up and extend this learning?
5. How could you utilize this discussion in small group debriefing?

applications, discourse, perseverance, and identity development (Wager & Parks, 2014). Through play, students communicate and clarify their thinking using visuals, language, and gestures, each of which are important for clarifying meaning for all students, including emergent bilingual students (Moschkovich, 2013). This natural exploration also provides opportunities to use and correlate multiple representations of mathematical concepts (Dreher & Kuntze, 2015; Moschkovich, 2013). Instruction should enable students to access their funds of knowledge from their multiple linguistic repertoires (Aguirre et al., 2012; de Araujo et al., 2018), which is something that play promotes. These ideas about teaching and learning emerge from the analysis of the vignette. The TCs gained a deeper awareness of how their students' linguistic capital factors into their learning of mathematics. For instance, when TCs delved into this scenario, one TC immediately commented to her discussion group:

> With all the vocabulary and things [that] I am learning in this class I can't imagine knowing another language as well. I also think about how it is helpful having the bilingual student to help understand all that the Spanish speaking student knows, but how it's not fair to expect that student to always translate. What would I do if there weren't a bilingual student?

When pressed by group members, she explained:

> I mean often students could make these connections across languages with symbols and gestures, how can I help them see the value in understanding each other and in learning different ways to communicate? I love that they even drew pictures when needed. It's cool that so many of the words are similar in both languages and that they are learning together.

As this example demonstrates, she was able to see the significance of language in the process of constructing meaning within a mathematical scenario.

Teacher educators can share vignettes such as this to encourage TCs to notice what mathematics they recognized, what assets were revealed, and what their next steps might be. As TCs analyze this vignette and similar scenarios, the elements of diversity and multilingualism need to emerge in the conversations. For example, one TC shared:

> I think hearing the similarities in language helps connect students. However, it also makes me think about all the other things the student who speaks Spanish could teach us and what else she could contribute to our learning. Like, I could ask all students where they find these shapes at home and all students could bring in different experiences. It makes me want to incorporate more things that she can share, not only to help her, but to help all of us.

TCs compiled different ways they might assist, elucidate, and deepen student mathematical thinking during and after this vignette. For example, one TC explained that extension activities could be finding other shapes that can be formed by combining shapes, sorting shapes by characteristics, or asking students to describe shapes. Having students investigate the properties of shapes creates more opportunities for language development while also strengthening their understanding about shapes. TCs reflected on the roles that culture and home language hold in the classroom vignette. One TC revealed that in her mathematics methods clinical placement, a student constantly called the cube a box, which prompted a conversation on how to incorporate students' experiential vocabulary with the mathematical terms they were learning.

Vignettes allow TCs to notice specific themes that are present in a narrative in order to build their professional content knowledge (Dreher & Kuntze, 2015). However, it should be acknowledged that TCs need practice in order to hone their noticing skills which the analysis of vignettes are designed to supply.

Connecting Mathematics, Culture and Identity

MMIs must focus on holistically empowering TCs in mathematics teaching and learning. TCs need to discover their immense power over not only the content, but also their students' attitudes towards mathematics. Their enthusiasm and wonder for both the subject and students are essential (Zavala, 2016). Helping students recognize their ability to effectively use mathematics in their lives involves "attending to the multiple identities—racial, ethnic, cultural, linguistic, gender, mathematical, and so on—that students develop and draw on as they learn and do mathematics." (Aguirre et al., 2013, p. 9).

In order for TCs to learn to effectively teach mathematics students, MMIs must offer both "mirrors and windows" into identities so that TCs see new perspectives on the world while still being able to see themselves reflected in the content that (Bishop, 1990). Examining mathematics through multiple languages and cultures can produce deeper insight, junctures, and understanding of content (Planas, 2018). Emergent bilingual learners can draw from a wealth of knowledge in their various languages to make meaningful correlations between their personal knowledge and the concepts of math (Aguirre et al., 2013). Designing activities that examine classroom norms, unpack multiple strategies to solutions, forge various cultural associations in mathematics, and compile multiple resources empowers TCs to deliver more effective instruction (Moschkovich, 2002). TCs should search for assets each student brings to the learning situation, authentic learning opportunities where mathematics is explored, and experiential learning opportunities that support all learners' mathematical identities (Miller & Warren, 2014; Moschkovich, 2002).

Closing

By integrating vignettes and experiential learning activities into math education courses, TCs can examine their identities, the identities of students, and the practices of effective mathematics teaching and learning. Then they are encouraged to consider how others view the content and how to maximize the unique identities of their learners. Each situation provides opportunities for TCs to analyze biases they may have about students and mathematics. It also pushes them to examine strengths of encouraging various strategies for teaching mathematics. For example, at the end of the semester one TC reflected on these activities and concluded:

> Before this class I was nervous about how to work with students that struggle with English and I thought about it as a struggle and weakness. Now I realize how much each student brings to the classroom and how much I can learn from them. It helped me see that using what they know as a strength and connecting the math to it is important for all of us.

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Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. How does your mathematics instruction incorporate the students' funds of knowledge?

2. What roles do your own experiences and learning play in the way you perceive mathematics teaching and learning?

3. How would these activities support (or not support) the development of the teachers with whom you work? What adjustments could you make to improve the impact of these experiences?

4. What activities can you provide to teacher candidates (TCs) to connect their students, the mathematics content, and themselves, as Palmer (2007) suggests?

5. What additional insights on the areas from this article can you find in the three TODOS monographs archived at https://www.todos-math.org/todos-publications?