BE BEAUTIFULLY UNCOMFORTABLE: INSPIRING LINGUISTICALLY RESPONSIVE TEACHING OF MATHEMATICS

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This research investigates elementary preservice teacher (PST) education experiences designed to inspire linguistically responsive teaching (LRT) of mathematics. A math methods course involved various opportunities for PSTs to engage in readings, discussion, reflection, and activities related to supporting emerging bilinguals with mathematics. This paper focuses on a lesson designed to promote “beautiful uncomfortableness” by having PSTs experience instruction in Spanish (not the primary language for most of the PSTs) using Mayan numbers (not familiar to PSTs). Data were analyzed qualitatively. A teacher learning cycle to promote LRT of mathematics is proposed and examined.

Keywords: Equity and Diversity; Instructional Activities and Practices; Affect, Emotion, Beliefs, and Attitudes

Objectives/Purposes

Linguistic diversity of students in U.S. schools continues to increase (National Clearinghouse for English Language Acquisition, 2011). Although some might consider mathematics to have limited language demands, research suggests that language is vitally important to teaching and learning mathematics (Moschkovich, 2002, 2013). Further, there is evidence that, overall, U.S. schools are not adequately supporting English learners (ELs) with mathematics (National Center for Educational Statistics, 2015). Clearly, there is an urgent need to prepare mathematics teachers who have beliefs, knowledge, and practices to teach ELs effectively (Lucas & Villegas, 2013). However, because teacher preparation programs have many demands, preparing preservice teachers (PSTs) for linguistically responsive teaching (LRT) may require strategic infusion of experiences (Ewing, 2017; Lucas & Villegas, 2013).

This research investigates experiences infused within an elementary math methods course that were designed to inspire LRT. Throughout the methods course, PSTs engaged in readings and activities related to supporting ELs. This paper focuses on a Mayan numbers lesson designed to promote “beautiful uncomfortableness” by having PSTs experience instruction in Spanish (not the primary language for most of the PSTs) and use of Mayan numbers (not familiar to the PSTs). The lesson was based on an experience that author 1 (A1) had in a Guatemalan school and that was unpacked via cogenerative dialogue with author 2 (A2) (Tobin & Roth, 2005). A teacher learning cycle (TLC) to promote LRT is proposed and examined.

Perspectives

This research is informed by Feiman-Nemser’s (2001) professional learning continuum and its application by Lucas & Villegas (2013) to tasks for learning to teach ELs. It is beyond the scope of this paper to explain or apply all components of their work; however, we identify aspects that support our data analysis and a proposed teacher learning cycle (TLC). From among Feiman-Nemser’s central tasks of PST preparation, we acknowledge the importance of “analyzing beliefs and forming new visions” (p. 1016). Lucas and Villegas mapped this central...
task onto “reflecting on and interrogating one’s preconceptions about ELL students, language diversity, and the role of other languages in school” (p. 103). We focused on these central tasks because of their potential to help PSTs to shift from deficit thinking about linguistic diversity toward more affirmative, proactive beliefs and LRT practices (Feiman-Nemser, 2018).

Along with drawing from the literature, we build ideas from our own research and experience as mathematics teacher educators, particularly, as we worked to better understand affordances and challenges when the primary language of instruction is not that of some or all of the learners. Our self-study (Truxaw & Rojas, 2013, 2014) helped us to identify a possible teacher learning cycle (TLC) to enhance LRT (see Figure 1). In the cycle, awareness (of affordances and challenges) is enhanced through attention to both academic components (e.g., literature, research, etc.) and also experiential components (e.g., immersion, simulations, etc.). Reflection on enhanced awareness can motivate new teaching practices (that also benefit from academic and experiential components). Double arrows indicate that movement could and should go in more than one direction – reflection enhances both awareness and teaching practice. To investigate the TLC in the context of the math methods course, we set up experiences that built from our own and that aligned with ones documented by others (e.g., Ewing, 2017; Gort, Glenn, & Settlage, 2011).

We ask the following research question:

How can LRT be infused within an elementary mathematics methods course?

**Modes of Inquiry**

Participants were elementary education PSTs (n=122) from three different years (2015, 2016, and 2018) of a math methods course taught by A1 in the semester prior to student teaching. Although the course varied somewhat from year to year, all included readings, videos, reflections, and activities related to linguistic diversity. The focus of this paper is analysis of a Mayan numbers lesson.

Data sources include: selected audio and video recordings of in-class experiences; documentation of readings, activities, and course materials; PSTs’ written reflections and work samples; and instructor journals. Qualitative data analysis involved constant comparative methods and thematic coding (Strauss & Corbin, 1990). Selective codes were drawn from our earlier research and from the literature (e.g., Truxaw & Rojas, 2013, 2014; Lucas & Villegas, 2013; Moschkovich, 2013). Open coding allowed additional themes to emerge. Comparisons were made between our self-study learning trajectories and those of the PSTs.

**Results and Discussion**

We briefly document the focus lesson within the math methods course, noting connections to the TLC. Within the course, the PSTs had experienced readings, activities, and reflection to enhance their academic awareness related to teaching ELs. We recognized that awareness and reflection that were predominantly academic could go only so far in “analyzing beliefs and forming new visions” (Feiman-Nemser, 2001, p. 1016). Infusing powerful experiences, accompanied by reflection, had potential to further enhance awareness. Therefore, the Mayan

numbers lesson was designed to encourage experiential awareness. To introduce the lesson, A1 told PSTs that she had had a powerful experience in a second-grade Guatemalan classroom. “I’m going to give you some of the experience I had … If this feels uncomfortable, then I’m doing what I intend to do.” (A1, October, 2018). Instruction, slides, and handout were in Spanish. A handout labeled “Numeración Maya,” asked students to “Forma el número …” followed by numbers written in Spanish. Many of the PSTs spoke some Spanish (i.e., they were emerging Spanish learners). When the handout, slide, and verbal instructions asked PSTs to “Forma el número treinta y nueve” (form the number thirty-nine), many PSTs wrote “39” on their handouts. A1 then “clarified” that they should “forma el número 39 usando los numerales Mayas” (form the numeral 39 using Mayan numbers). After showing the “repuesta” (the answer) using Mayan representations (see Figure 2), A1 provided verbal feedback in Spanish. Next, A1 provided an explanation in Spanish, accompanied by visual representations and Spanish text on a slide (see Figure 3). PSTs were given opportunities to practice with other numbers. A1 circulated throughout the classroom, observing, providing feedback (in Spanish) and asking students to speak only in Spanish. Very few PSTs were able to successfully complete the requested tasks. After the initial lesson, A1 asked students to reflect about how they felt during the lesson. PSTs shared strong feelings of frustration, feeling unintelligent, and tendencies to shut down and give up. One PST said, “I felt frustrated when you came over and tapped on my paper because I hadn’t written anything down. I was like, what do you expect me to do? I don’t know how to do it.” (See Table 1 for additional PST quotes.) A1 commented, “This is a room of educated, intelligent people … and you felt like shutting down.”

Following the group reflection discussion, A1 provided a worksheet and slides that included Spanish, along with English translations. Additionally, A1 provided more “think time” and encouraged PSTs to speak in any language with peers to try to make sense of the ideas. Many more of the PSTs were able to generate Mayan representations. The class then reflected again about their experience as learners and also about teaching practice that might support emerging bilingual students. Further discussion, along with recognizing challenges, acknowledged that students may be held back from learning important concepts and skills because of language. Discussion included focus on keeping cognitive demands high while providing linguistic supports (e.g., Cummins, 2000). Then, small groups worked together to generate and share

posters of ideas to support linguistically and culturally relevant teaching practice. One poster included a phrase that inspired the title for this paper, “Be beautifully uncomfortable.” Table 1 shows examples of themes and quotes from PSTs that are aligned with our earlier work and the literature. Additional findings will be shared during the presentation.

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<tr>
<th>Challenges</th>
<th>Example PST quotes</th>
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<td>Lack of opportunity to reason in one’s primary language can hinder sense making.</td>
<td>“I was thinking, ‘if she would just put the instructions in English, I’d be able to do this…’ A lightbulb went off – okay, if teachers were doing this with ELL learners, it would be so much easier if they could put it in Spanish.”</td>
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<td>One is likely to appear (and feel) less intelligent than one really is.</td>
<td>“I was disengaged because I was frustrated and confused.” “It just makes me want to hug my ELL students.”</td>
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<td>Academic language is more challenging than conversational language</td>
<td>“Being someone who spoke Spanish, … I was fine. But then … everyone was like, what is it if yours is wrong? … I don’t know Mayan numbers.”</td>
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<td>Working to understand even basic instructions can be challenging.</td>
<td>“I thought it was really powerful because it’s what a lot of English language learners experience. … it’s hard to put into words how someone feels … I was really confused.”</td>
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<td>Asking meaningful questions in a second language can be difficult</td>
<td>“I didn’t understand how to ask you in Spanish, ‘Can you teach me how to do Mayan numbers?’”</td>
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Note: PST quotes are from 2015, 2016, and 2018.

Conclusions

This research demonstrates potential for informing teacher preparation programs about strategic infusion of experiences to promote LRT. The TLC provides a scaffold for considering the importance of interactions of awareness, reflection, and teaching practice – including both academic and experiential opportunities. Indeed, experiences such as the Mayan numbers lesson, scaffolded with the TLC, show potential to promote “analyzing beliefs and forming new visions” (Feiman-Nemser, 2001, p. 1016) and “reflecting on and interrogating one’s preconceptions about ELL students, language diversity, and the role of other languages in school” (Lucas & Villegas, 2013p. 103). These are small, but important steps in preparing linguistically responsive teachers of mathematics. Long journeys begin with small steps.

References


