

## PRESERVICE TEACHERS' PERCEPTIONS OF A LESSON STUDY CONNECTING MULTICULTURAL LITERATURE WITH CULTURALLY RESPONSIVE MATHEMATICS TEACHING

Alesia Mickle Moldavan  
Fordham University  
amoldavan@fordham.edu

*This study examines preservice teachers' perceptions about a microteaching lesson study (MLS) that integrated multicultural literature to elicit culturally responsive mathematics teaching (CRMT) during a mathematics methods course. Participation in the MLS' iterative cycle of plan-teach-revise encouraged preservice teachers to develop their pedagogical knowledge, make cultural connections from texts to mathematical concepts, and engage in productive reflection. The MLS also provided preservice teachers with a supportive peer learning community that fostered collaborative learning to improve professional practice around CRMT. Suggestions are shared for how similar practice-based experiences can be used to enhance teacher education with focused practice addressing mathematical thinking, language, culture, and social justice.*

Keywords: Teacher Education-Preservice, Instructional Activities and Practices, Teacher Knowledge, Culturally Relevant Pedagogy

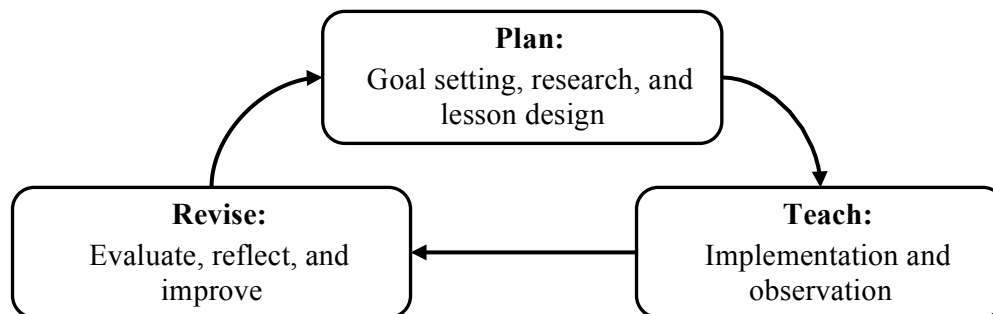
Mathematics teachers committed to humanizing pedagogy recognize schools as cultural spaces that draw on students' identities and experiences to leverage mathematical competencies (Yeh & Otis, 2019). When students explore mathematics from global perspectives (e.g., non-Western, indigenous) and applications, they can engage in enriched, meaningful learning that promotes empathy for diverse cultures and fosters problem-solving that transcends borders. One way for students to develop cultural awareness is through reading multicultural literature, which can serve as a mirror to reflect on one's own culture and a window to gain perspective into other's values, beliefs, and traditions. While multicultural literature naturally fits in literacy studies, it can also be used to study mathematics in culturally relevant contexts (Chappell & Thompson, 2000; Leonard, Moore, & Brooks, 2014). Those who wish to bridge multicultural literature into the mathematics classroom must recognize mathematics as a cultural construct and have the opportunity to plan, teach, and reflect on lessons with such texts (Iliev & D'Angelo, 2014; Sletter, 1997). This study reports on preservice teachers in a mathematics methods course who participated in a microteaching lesson study that integrated multicultural literature to make social justice and cultural connections to elementary school mathematics content. The following research question served as motivation for this study: What are preservice teachers' perceptions about a microteaching lesson study using multicultural literature to elicit culturally responsive mathematics teaching during a mathematics methods course?

### Theoretical Framework

Reform efforts in teacher education recommend preservice teachers have opportunities to teach mathematics through practice-based experiences that develop pedagogical knowledge and encourage reflective practice (AMTE, 2017). A microteaching lesson study is an example of a practice-based experience that utilizes a simulated teaching environment to reduce teaching complexities, develop pedagogical content knowledge, and elicit reflection from peer and self-assessment. Preservice teachers engaged in a microteaching lesson study benefit from collaborative participation in the iterative cycle of plan-teach-revise in a modified format (see Figure 1) that promotes connections between theory and practice in mathematics education (Fernández, 2005). This study builds on the

Preservice teachers' perceptions of a lesson study connecting multicultural literature with culturally responsive mathematics teaching

research of microteaching lesson studies and examines how preservice teachers can develop consciousness of culturally responsive mathematics teaching (CRMT) with multicultural literature.



**Figure 1: Lesson Study Model of the Iterative Cycle of Plan-Teach-Revise**

CRMT can be used to privilege students' cultural and linguistic funds of knowledge, foster meaningful connections to students' prior experiences, and value students' strengths and performance styles to make learning relevant and effective (Gay, 2009). This research used the framework for CRMT coupled with Aguirre and Zavala's (2013) CRMT Lesson Analysis Tool to examine explicit characteristics of CRMT: mathematical thinking, language, culture, and social justice. Framing the inquiry in terms of CRMT aided with organizing the synthesis and examining where efforts were made by preservice teachers to use multicultural literature to elicit CRMT in a simulated teaching environment.

### **Research Methods**

A qualitative case study design was used with multiple data sources. Participants included 16 preservice teachers (14 females and 2 males) enrolled in an elementary mathematics methods course at an urban university in the northeastern United States. In the course, the preservice teachers were introduced to CRMT as the notion of contextualizing mathematics teaching and learning to students' lives (Gay, 2002; Ladson-Billings, 1995a, 1995b). After the preservice teachers familiarized themselves with CRMT with the aid of course readings and a discussion-based review of a sample lesson that was critiqued using Aguirre and Zavala's (2013) CRMT Lesson Analysis Tool, the preservice teachers were assigned a microteaching lesson study that required them to plan, teach, and revise an elementary mathematics lesson with reference to a multicultural text of their choosing.

To help guide the text selection and the design of the activity, the preservice teachers reflected on the ways the text and the lesson: (a) portrayed cultural authenticity, (b) depicted cultural diversity as an asset, and (c) promoted culturally relevant mathematical connections (Harding, Hbaci, Loyd, & Hamilton, 2017). Next, the lessons were critiqued for components of mathematical thinking, language, culture, and social justice as noted in the CRMT Lesson Analysis Tool. Each group was asked to submit their analysis and make any necessary modifications to strengthen the lesson prior to beginning the next phase of the practice-based experience.

After submitting their lessons and planning reflections, the preservice teachers were videotaped teaching their lessons twice to their peers. In round one, two group members taught the lesson while their other two group members and peers observed. Next, the group members reflected on their instruction and revised their lesson. In round two, the group members switched roles, reflected on their instruction, and submitted their final revised lesson. Peers gave constructive feedback throughout the rounds and assessed how the overall experience influenced their perspective of CRMT and their future use of multicultural literature in elementary mathematics instruction. The

lessons, videos, reflections, and peer feedback were coded for themes of CRMT using in vivo and descriptive coding techniques (Saldaña, 2016).

## Results

Findings revealed that the preservice teachers' perceptions of participating in the microteaching lesson study's iterative cycle of plan-teach-revise encouraged them to develop their pedagogical knowledge, make cultural connections from texts to mathematical concepts, and engage in productive reflection. Overall, the preservice teachers expressed positive experiences engaging in the microteaching lesson study and shared that this particular focus on lesson design with multicultural literature helped them to engage and be reflective in CRMT. They also shared how the practice-based experience provided them with a supportive peer learning community that fostered collaborative learning to improve their professional practice around ways to make social justice and cultural connections to mathematical concepts.

Through strategic lesson design with multicultural literature, the preservice teachers were successfully able to engage their peers in mathematical thinking of various concepts (e.g., measurement, counting, addition, geometry) through the elicitation of meaningful mathematics discussions related to cultural connections. Several preservice teachers used the stories found in the texts to set a context for learning a mathematical concept. For example, one group selected a text about a girl named Sadako and her paper cranes. The story provided a context for students to explore adding paper cranes using various addition strategies (e.g., counting all/on, making tens, friendly numbers, compensation, adding up in chunks). Another group referenced a book about quilt making and created a lesson about how the arrangement of patches on a quilt could generate different dimensions (e.g.,  $1 \times 24$ ,  $2 \times 12$ ,  $3 \times 8$ ,  $4 \times 6$ ). The lesson addressed various mathematical concepts (e.g., rectangular arrays, factors, area, perimeter) and provided opportunities for participants to create their own quilt patch that honors their cultural heritage to add to the classroom quilt. Through the lessons, the preservice teachers were able to elicit ways for participants to self-identify with the mathematics and see themselves as doers of mathematics. A preservice teacher summarizes this nicely in her statement: "In this experience, I was given the opportunity to think outside the box when it came to thinking of different ideas that would interest my students where they would have some ownership over the activity and feel included."

The practice of using multicultural literature to facilitate cultural connections also influenced the preservice teachers' awareness of and confidence in using cultural practices to address issues of social justice and exercise mathematics as an analytical tool to critique societal norms. For example, a preservice teacher shared, "I plan to use multicultural literature in my classroom to help students identify cultural assets and challenge/remove potential barriers." Additionally, several preservice teachers reflected on how they plan to use such texts to advocate for exploring new mathematical concepts (e.g., numerical representations, computations) that may not be present in the dominant mathematics studied. This is evident in a preservice teacher's reflection that said: "I have newfound confidence to incorporate other texts than what may appear in the curriculum to provide alternative perspectives and purposefully incorporate students' native languages in the teaching of mathematical concepts."

The preservice teachers also reflected on their own professional growth to enhance their pedagogical practice given the collaborative nature of the microteaching lesson study. Several preservice teachers noted the amount of effort that goes into planning meaningful lessons. For example, a preservice teacher said: "I now realize that a lot of planning and preparation is required to really give students the best possible mathematics lessons. I now have new tools to help me prepare the best lessons I can for my students." Other preservice teachers reflected on their newfound realization about culture in the classroom. For instance, a preservice teacher said: "Not only did this

experience teach me how to create a lesson plan and be aware of the academic needs of my students (or peers), but it also taught me how to be aware of their backgrounds and how culture plays a huge role in all subjects.” Similarly, another preservice teacher commented on how her appreciation has grown for using literature to shed light on how people engage with mathematics outside of the mainstream, Westernized perspective. She stated: “By incorporating multicultural literature, mathematics can become relatable and mathematics can create bridges that connect cultures and people. I now realize how much it can elevate a lesson.” A comparable statement made by another preservice teacher noted: “Previously, I had not considered how to integrate multicultural content into mathematics instruction. Yet, incorporating multicultural mathematics literature into instruction can foster greater acknowledgement and appreciation of students’ cultural identities, which facilitates better learning environments in our classrooms and schools.”

### Discussion

The significance of this work is to build on the research of microteaching lesson studies and examine how preservice teachers’ perceptions engaging in such a practice-based experience provides insight into how preservice teachers develop pedagogical knowledge and benefit from reflective practice. This study was unique in that the microteaching lesson study connected multicultural literacy with CRMT. Participation in this experience benefited the preservice teachers in that they were able to collaborate with one another and use constructive peer feedback to guide improvements in the planning, implementation, and reflection of their lessons. The preservice teachers were tasked with creating a learning environment that empowered students to see and engage with mathematics across cultures. Multicultural literature can serve as a conversation starter to introduce new mathematical ideas and widen students’ horizons. The findings from this work signify that efforts must be made in teacher preparation to implement innovative practices (e.g., microteaching lesson studies, multicultural literature) that elicit CRMT to improve the quality of mathematics instruction for all students.

### References

- Aguirre, J., & Zavala, M. (2013). Making culturally responsive mathematics teaching explicit: A lesson analysis tool. *Pedagogies: An International Journal*, 8(2), 163–190.
- Association of Mathematics Teacher Educators. (2017). *Standards for preparing teachers of mathematics*. Retrieved from <https://amte.net/standards>
- Chappell, M. F., & Thompson, D. R. (2000). Fostering multicultural connections in mathematics through media. In M. E. Strutchens, M. L. Johnson, & W. F. Tate (Eds.), *Changing the faces of mathematics* (pp. 135–150). Reston, VA: National Council of Teachers of Mathematics.
- Fernández, M. L. (2005). Learning through microteaching lesson study in teacher preparation. *Action in Teacher Education*, 26(4), 37–47.
- Gay, G. (2002). Preparing for culturally responsive teaching. *Journal of Teacher Education*, 53(2), 106–116.
- Gay, G. (2009). Preparing culturally responsive mathematics teachers. In B. Greer, S. Mukhopadhyay, A. B. Powell, & S. Nelson-Barber (Eds.), *Culturally responsive mathematics education* (pp. 189–205). New York, NY: Routledge.
- Harding, J., Hbaci, I., Loyd, S., & Hamilton, B. (2017). Integrating multicultural children’s math books into kindergarten through sixth-grade classrooms: Preservice teachers’ reflections. *The Teacher Educator*, 52(4), 386–407.
- Iliev, N., & D’Angelo, F. (2014). Teaching mathematics through multicultural literature. *Teaching Children Mathematics*, 20(7), 452–457.
- Ladson-Billings, G. (1995a). Making mathematics meaningful in multicultural contexts. In W. G. Secada, E. Fennema, & L. B. Adajian (Eds.), *New directions for equity in mathematics education* (pp. 126–145). Cambridge, UK: Cambridge University Press.
- Ladson-Billings, G. (1995b). Toward a theory of culturally relevant pedagogy. *American Educational Research Journal*, 32(3), 465–491.

Preservice teachers' perceptions of a lesson study connecting multicultural literature with culturally responsive mathematics teaching

- Leonard, J., Moore, C. M., & Brooks, W. (2014). Multicultural children's literature as a context for teaching mathematics for cultural relevance in urban schools. *The Urban Review, 46*, 325–348.
- Saldaña, J. (2016). *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage.
- Sleeter, C. E. (1997). Mathematics, multicultural education, and professional development. *Journal for Research in Mathematics Education, 28*(6), 680–696.
- Yeh, C., & Otis, B. M. (2019). Mathematics for whom: Reframing and humanizing mathematics. *Occasional Paper Series, 41*(8), 85–98.