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Recommended Citation

Chao, T., & Adams, M. (2018). Critical Mathematics Teacher Noticing: Using Online Technology to Explore How Pre-service Teachers of Color Confront their Peers' Racial Positionings of Children. In T. Hodges, G. Roy, & A. Tyminski (Eds.), *Proceedings of the 40th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Greenville, SC: Clemson University and University of South Carolina.

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CRITICAL MATHEMATICS TEACHER NOTICING: USING ONLINE TECHNOLOGY TO EXPLORE HOW PRE-SERVICE TEACHERS OF COLOR CONFRONT THEIR PEERS' RACIAL POSITIONINGS OF CHILDREN

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Mathematics teacher noticing is a construct used heavily in research around mathematics teaching and mathematics teacher education. However, just as a focus on noticing draws attention to what a teacher “sees”, a focus on what a teacher does NOT “see” is equally important. In this study, we utilize an online video commenting tool to analyze what elementary pre-service teachers of color notice about the language and positioning of case study students through four-weeks of problem solving interviews. This tool served as a space for teachers of color to confront the racist ideologies present in how their peers positioned students.

Keywords: Elementary School Education, Equity and Diversity, Teacher Education-Preservice, Technology

Mathematics teacher noticing has quickly become a critical aspect of mathematics teaching and teacher preparation (Schack, Fisher, & Wilhelm, 2017), centering around the idea that effective mathematics teaching extends beyond just content knowledge, pedagogical content knowledge, or even beliefs. The physical act of “noticing” or paying attention to and being reactive to the minutiae of classroom moments is key to developing any teacher’s ability to empower children mathematically. Research connecting equity with teacher noticing, however, is still largely centered around how white teachers can use noticing when working with students of color, and does not recognize the way race impacts what teacher notice. In the United States, even as the teaching force grows more diverse, most students of color continue to work only with white teachers (Ingersoll, Merrill, & Stuckey, 2014), a troubling trend due to the racial and cultural blind spots of white teachers. Moreover, teachers of color who often have experiences that can reveal these blind spots are often silenced, particularly in pre-service education (Philip, Rocha, & Olivares-Pasillas, 2017).

The construct of mathematics teacher noticing is powerful, as it has given a name to a practice that all teachers engage in. So how can mathematics teacher noticing be used to delve into a mathematics teacher education that cultivates the racial and cultural knowledge necessary to empower all students? We explore this work through the following research questions: (1) When using a technology-based video commenting platform to explore children’s mathematical thinking, what do pre-service teachers of color notice in contrast to white teachers? (2) What does mathematics teacher noticing look like when connected to racial awareness?

Theoretical Framework

Mathematics teachers often hold “expert blind spots”, in which they find it difficult to “see” how their students struggle mathematically (Nathan & Petrosino, 2003). These blind spots are gaping holes in a teacher’s vision, in which a teacher who may not have experience being positioned as mathematically inadequate cannot understand the dilemma of their struggling students. We use this construct of blind spots to refer to how teachers who come from dominant backgrounds often view their classrooms and students through their dominant culture lenses, unaware of the extent of their blind spots (Louie, 2018).

The world that is familiar to mathematics teachers, is, of course, structured by racial ideologies in ways that operate invisibly. White supremacy creates a “racial grammar” that allows for the seemingly natural reproduction of the racial order (Bonilla-Silva, 2012). This racial grammar facilitates the construction of white stories as “universal” and creates strong perceptions about how things “are” and how people of non-white backgrounds are supposed to be (Bonilla-Silva, 2012). In mathematics education, combating this racial grammar involves taking a rehumanizing stance that recognizes and positions each and every student as not only human, but someone who holds substantial mathematical knowledge connected to their cultural and racial identities (Gutiérrez, 2018). A rehumanizing stance of mathematics teacher education also values the knowledge of teachers of color, listening to the stories they tell in order to help white teachers “see” blind spots that continue to oppress and dehumanize our children of color. Teachers of color must have space to think about, discuss, and interrogate the role of race within their classroom spaces and be empowered to share these noticings. We refer to this calling out of racial grammars and other oppressive mechanisms that operate within our field as *critical mathematics teacher noticing*.

Teacher video clubs could serve as a mechanism for engaging teachers in critical dialogue with each other surrounding their practice (Van Es & Sherin, 2008). However, while video clubs facilitate teacher dialogue around particular aspects of classroom practice, video club are also sociopolitical spaces where teachers from dominant groups hold more power and “voice”. One way to hinder this silencing is through technology that creates safer communicative spaces. For instance, technology that utilizes asynchronous watching and commenting allows teachers to take their time to watch a video and comment accordingly, to reflect not only on what they notice immediately, but on what they notice after repeated watching and reflection (Chao & Murray, 2013). Bringing the conversation online, then, opens up spaces for teachers to critique the deficit perspectives of fellow teachers safely, without the silencing effect of a video club.

Methodology

The data for this study came from an elementary teacher graduate degree and licensure program at a large, state university in the Midwestern United States. We focused on a diverse master’s degree cohort, where six of the 28 teachers identified as persons of color. Our analysis focused on an Elementary Mathematics Teaching Methods course instructed by the first author, in which each pre-service teacher worked one-on-one with a child in their student teaching internship. The teachers completed four interviews with a case study child: a “getting to know you interview” to begin the project, then three subsequent problem-solving interviews each week (Foote et al., 2015).

We utilized GoReact, an online video commenting tool to facilitate teacher noticing during the problem-solving interviews. Teachers individually filmed their interviews with case study students and immediately uploaded the video for their peers and instructor to watch and comment on. Then, in the three subsequent class meetings, the teachers met in person to watch the videos again, read each other’s comments, and engage in discussion about what they noticed. At the end of the four interviews, the teachers produced a report on what they learned from the student through the interviews and the conversations. We utilized all of this data in our analysis: the online video, the comments, and the written reports.

Findings

Our analysis focused on instances where pre-service teachers called out dismissive or deficit language they noticed their peers using, particularly if this invoked racial grammars. We found

that pre-service teachers of color's comments regularly emphasized the skills and reasoning displayed by students of color and challenged conclusions of white pre-service teachers. We believe these instances reveal what we refer to as *critical mathematics teacher noticing*, which requires an awareness of the structures and functioning of racial grammars as well as the ability to interrupt them.

Ms. Simmons, a biracial, Black pre-service teacher, was paired in online discussions with Ms. Harris, a white pre-service teacher. Ms. Harris chose Amir, a Black Somali-American second-grader, as her case-study student. Ms. Harris described Amir as struggling in mathematics and posited that "it might be because he isn't paying attention and isn't focused, and sometimes it might be due to a language barrier." In Ms. Harris's first video, she posed a problem where a boy had 13 cookies and ate six, then asked how many were left. Amir wrote the equation $13-6$. Ms. Harris then asked why he subtracted, to which Amir replied that the problem said he ate and that meant he should take away. Ms. Harris commented about this interaction, "I had a very hard time getting him to explain his answers no matter how long I waited, how I rephrased the question, or what questions I asked. This was the most explaining I got him to do during the whole interview."

Ms. Simmons' responded by challenging Ms. Harris' conclusion:

I don't know what all you asked him, but I see that he understands that "you ate" means "take away" so he chose subtraction. Maybe you could have asked him if "you ate" means you get more cookies or cookies are taken away, then you could ask if take away means you add or subtract. Maybe that would've provided more of an explanation than just asking why he chose subtraction. Sometimes students don't realize all of their steps until you point them out for them.

Ms. Simmons noticed Ms. Harris' deficit perspective, implying that there was more to Amir than what Ms. Harris saw. While Ms. Harris only noticed Amir's lack of focus or skills and refusal to explain his thinking, Ms. Simmons noticed the bigger problem of how her classmate spoke to and about Amir. Ms. Simmons also expressed a belief that students are capable of more than they can put into words and that teachers play a role in developing students' mathematical confidence.

Conclusion & Discussion

The mathematics teacher noticing work has largely focused on noticing mathematical discourse or action without specifically connecting to race or culture (Jong, 2017). Our work shows how, using critical mathematics teacher noticing, we can unpack the racial blind spots pre-service teachers hold when "noticing" the mathematical thinking of their children. We posit that the online video technology space created an immediacy for teachers to interact in dynamic ways familiar to them, and therefore, grow comfortable in couching their critique in their own social identities (i.e., as a teacher of color who has to deal with continual racial microaggressions from members of their cohort).

By putting the focus specifically on racial and cultural norms within mathematics education, we draw attention to the racial "blind spots" within mathematics teacher education overall. We introduce a new term to describe this unveiling of these blind spots in mathematics teachers, in which racial grammars that have been invisibilized are brought to light: *critical mathematics teacher noticing*.

However, this study does have limits. First, we only analyzed data from one particular cohort when they took an elementary mathematics methods course; not measuring their prior interactions with each other. Second, the first author of this paper was also the instructor of this

course, introducing bias into our interpretation of the data. And third, this is a snapshot of these teachers before they actually begin their practice. Data suggest that some of these teachers will take on racist or “othering” pedagogical stances in their first years of teaching (Chao, Hale, & Cross, 2017).

Technology can be used as a democratizing tool, an agent of change that allows various views and individual interpretations of the same media. The current research examining how we prepare mathematics teachers of color is emerging, exposing how heavily our existing structures are set up to only help white teachers without threatening their fragility (Picower, 2009). Just as we encourage our mathematics teachers to engage in classroom discussion that moves beyond the easiest and most accessible mathematical strategy, we must push our teachers to engage in conversations on equity that move beyond “safe” topics of diversity and social justice to recognize and confront white supremacy. As a field, we ask teachers to orchestrate open-ended, uncomfortable mathematical conversations in the classroom. Therefore, as mathematics educators, we must also engage in uncomfortable conversations about the blind spots our teachers and ourselves hold, especially as pertaining to perpetuating white supremacy.

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