# DISTRICT CERTIFIED CULTURALLY RESPONSIVE TEACHERS AND THEIR ELEMENTARY MATHEMATICS TEACHING PRACTICE: A MULTI-CASE STUDY

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*This multi-case study examines how three elementary teachers, all certified by their school district in culturally responsive teaching (CRT) through professional development opportunities, implement mathematics teaching practices that support CRT. Furthermore, this study examines the CRT certification process in the focal district and the structures that support teachers in their enactment of CRT. Data were collected via interviews, questionnaires, observations, teacher journals, and other reportable data. The teachers' CRT practices in mathematics fell into four large quadrants aligning with the work of Hammond's (2015) Ready for Rigor framework. The findings expand upon the literature and provide us with a more informed understanding of what CRT looks like in elementary mathematics classrooms with teachers who have been certified in CRT from a district developed and applied certification model.*

Culturally Relevant Education, Elementary School Education, Equity and Diversity, and Instructional Activities and Practices

## Purpose & Theoretical Framework

The achievement of historically marginalized students has been an ongoing concern for stakeholders. Gay (2010) stated, "The achievement of students of color continues to be disproportionately low at all levels of education, and the need to change these dismal conditions is even more pressing" (p. xxvii). While addressing student achievement in mathematics education, Bonner (2014) emphasized how data from the National Center for Education Statistics (NCES, 2009), indicated that from 1990 to 2007 there was, "little progress in closing the persistent mathematics achievement gaps between certain groups" (p. 377). More recently, data from the National Assessment of Educational Progress (NAEP; 2017) reported that though there were not significant changes in racial and ethnic disparities from the previous years, the scores of White students remain higher on average than those of their Black and Latinx peers, indicating that while the achievement gap is smaller than it was in 1990, disparities are still prevalent. Although there are numerous reasons why such achievement gaps persist between students of color and their White counterparts in mathematics, including but not limited to, tracking/leveling, access to resources, institutional racism, and stereotype threat, research has shown that the achievement of historically marginalized youth is likely to increase when learners have positive mathematical identities (e.g., Borman & Overman, 2004) and cultural identities (e.g., Moll, Amanti, Neff, & González, 1992). Teachers play a significant role in forming student perceptions and fostering the development of such identities (Schoen, Cebulla, Finn, & Fi, 2003).

Thus, Gay (2010) stated, "Culturally responsive teaching is a means for unleashing the higher learning potentials of ethnically diverse students by simultaneously cultivating their academic and psychosocial abilities" (p. 21). Though the theoretical framework for CRT has informed the educational community for quite some time, scholars (e.g., Hammond, 2015) continue to discuss the challenges of operationalizing CRT in practice. Mathematics education in particular has produced limited research examining the teaching practices of culturally responsive teachers in pre-kindergarten through 12$^{th}$ grade (preK-12) (Thomas & Berry, 2019). Bonner (2014) offers three reasons for why this might be the case, including: 1) the majority of the works are specific to one population such as African American learners (e.g., Ladson-Billings, 1994); 2) there is a broad focus

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on content and practice, making it non-mathematics-specific (e.g., Gay, 2010); and, 3) the works remain largely theoretical (e.g., Greer et al., 2009).

The purpose of this multi-case study is to examine CRT practices in elementary mathematics with three teachers who have been locally recognized and certified in CRT by their school district. Furthermore, the intent is to examine the CRT certification process in the focal district and the structures that supported the teachers in their enactment of CRT with historically underserved students, in their efforts to address the achievement gap. Though there is variability in how to define achievement gap (e.g., test scores, course enrollment patterns, cognitively demanding learning opportunities, etc.), this study is utilizing the terminology to emphasize the gap in standardized test scores, based upon how the focal district is operationalizing the construct and their desired outcome. This study is not about "gap gazing" rather language surrounding the achievement gap has been made explicit to describe the context within the district (Gutiérrez & Dixon-Román, 2011). This study is grounded in CRT both in theory and practice.

## Methods

### Research Questions

1. How do teachers become fully certified in CRT, and what structures support teachers in their enactment in the focal district?
2. How do three elementary teachers, who have been certified in CRT, implement mathematics teaching practices? How does the mathematics instruction support CRT?

### Site and Sample

William County (pseudonym) is located in a southeastern state and it is known for its diverse student population inclusive of over 90 spoken languages. There are approximately 14,000 students enrolled in elementary schools in the district. In an effort to close the achievement gap in William County, district leaders created a CRT certification program for preK-12 teachers, administrators, and counselors. Since the program's enactment in 2016, 40 individuals have been certified across the district. The majority of the certified teachers are elementary, and to date, no secondary mathematics teachers have received certification.

I secured the consent of Skylar, Elizabeth, and Clay (pseudonyms). Skylar and Elizabeth are both Black women and Clay is a White man. Skylar and Elizabeth both teach at River Elementary (pseudonyms for school names) and Clay is at Ivy Elementary. The participants teach mathematics in different grades such that Skylar is pre-kindergarten, Elizabeth is third-grade, and Clay is fourth-grade. Their years of teaching experience range between five and 11 years. Additionally, their ages range from late-20s to late-40s. All of the teachers were part of the most recent cohort to receive certification. To incorporate multiple perspectives, I also draw upon the voices and the actions of district leaders.

### Data Gathering Procedures

**Mapping cultural reference points questionnaire.** The first module of the district's CRT certification focuses on teachers recognizing their own cultural lenses. To inform my understanding of how the teachers are pushing themselves outside of their own cultural boundaries, I had them complete a questionnaire (Hammond, 2015) following the first interview.

**Teacher journals.** A key component of CRT examines how teachers react in the moment and how they use those experiences to inform their practices in the future, as seen in Bonner (2014). Following each observation, I asked the teachers to briefly reflect upon their own instruction using a journal protocol to gauge awareness.

**Interviews.** The first, semi-structured interview focused on the teachers' perceptions of their enactment of CRT in mathematics education and their experiences with the certification process. The second teacher interview focused on emerging themes surrounding the teachers' CRT practices and their perceptions of district structures.

**Classroom observations.** I observed the actions of the teachers inclusive of both how they gained knowledge of their students and how they used such knowledge to inform their teaching practices. I observed (and video recorded) the teachers (using protocol) for at least 10 full mathematics lessons (1.5 hours each; time of a unit). Data were collected using fieldnotes.

**Other reportable events.** Other reportable events in this study is multifaceted, including: informal, unstructured interviews and conversations that arose; various forms of artifacts such as assignments, student work, photographs, and the teachers' certification portfolios; and data points from involvement in community partnerships, division meetings, and school-wide meetings in public spaces.

### Data Analysis

The information gathered from the questionnaire served as preliminary data that led toward the development of other methods; particularly, by helping to inform the observations. The journal reflections were re-read, and compared to the data for the corresponding classroom observations to analyze teacher awareness. Both interviews with the teachers were recorded and transcribed to allow for member checking. All fieldnotes were transferred into write-ups, and analytic memos were written intermittently to document emerging themes and inferences from data collection. Data sources were triangulated and re-read and re-coded to document emerging patterns and themes of CRT practices. I compared confirming and disconfirming evidence and continued to adjust my findings until all of the evidence was accounted for. Additionally, I engaged in peer debriefs and consulted with experts in the field about emerging themes and patterns, aligning with the theoretical frameworks to ensure trustworthiness.

## Findings

### District Professional Development & Structures

The focal district has enacted a CRT certification program inclusive of three professional development modules and three characteristics of focus for monthly cohort meetings. The three modules include: 1) recognizing your cultural lens, 2) engaging diverse learners, and 3) ensuring equitable parent participation. The characteristics of the CRT certification state that culturally responsive teachers: 1) acknowledge and incorporate the importance of cultural heritage of all students, while reflecting on their own personal cultural influences; 2) provide multi-cultural instruction and differentiation for relevance and rigor; and, 3) build positive learning partnerships with students and families. To receive certification, teachers have to demonstrate within their portfolios that they are working to enact CRT and present evidence of student achievement. The compilation of their work is also presented at a district-wide Equity Conference. Furthermore, district structures are in place with the purpose of continuing to influencing the teachers' learning and implementation of CRT. These structures are evidenced in the county's Equity Model that acts as a structural hierarchy of support (See Thomas (2020) for further discussion of the Equity Model and district-level support structures.).

### CRT in Mathematics Classrooms

During my time working in the classroom with the teachers, it became evident that their conceptions of CRT were highly influenced by the work of Hammond (2015) and the *Ready for Rigor* framework. However, similarly to other works surround CRT, some of the components of each quadrant exemplified particular tenets that are more thoroughly captured in other literature (e.g., Gay,

2010; Ladson-Billings, 1994). The findings have been outlined in Figure 1. The quadrants are oriented to mathematically model the coordinate plane and the ways in which the teachers went about building CRT at the beginning of the school year. However, it is important to acknowledge that after the initial phase (of consecutive order), this is very much viewed as a continuous cycle without particular attention to order and the quadrants are not mutually exclusive. Furthermore, gaining knowledge has been placed at the center of this model.

Although mathematics teaching and learning are embedded throughout Quadrants 1-3, Quadrant 4 on information processing is most specific to mathematics education. All three teachers emphasized the importance of helping their students to first develop growth mindsets or mathematical mindsets (Boaler, 2016) when tackling challenging tasks that require cognitive demand and problem solving. Furthermore, in the domains for relevance, mathematical representations (Berry et al., 2017), and discourse, I examined how such standards-based practices (NCTM, 2000) were accompanied with CRT strategies to help students process information. The teachers viewed these as strategies for "stimulating brain growth to increase intellective capacity" (Hammond, 2015, p. 17). For sample excerpts and a thorough examination of the findings on CRT in practice as demonstrated in Figure 1 refer to Thomas (2020).

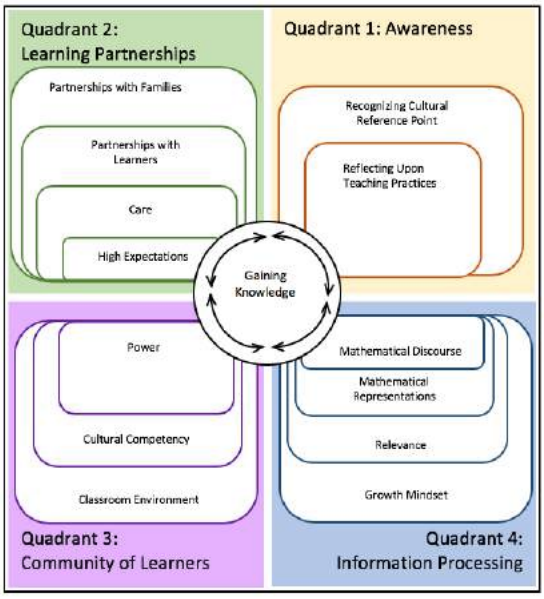


**Figure 1: Findings of CRT in Elementary Mathematics Classrooms**

## Discussion & Significance

The study is significant because its findings expand upon the literature (e.g., Bonner, 2014; Thomas & Berry, 2019) and provide us with a more informed understanding of what CRT looks like in elementary mathematics classrooms. Furthermore, as indicated by Cai et al. (2017) there is a need in the field to link research and practice, and this study attempts to bridge that gap with CRT. This work is unique because the teachers are certified in CRT and supported by district structures in enacting CRT practices. This study continues to inform our understanding of how to operationalize CRT in mathematics, and it gives us insight into the professional development and support structures that may influence the implementation of such pedagogy.

## References

Berry, R. Q. III, Rimm-Kaufman, S. E., Ottmar, E. M., Walkowiak, T. A. Merritt, E. G., Pinter, H. H. (2017). The mathematics Scan (M-Scan): A Measure of standards-based mathematics teaching practices. *Unpublished Measure (utilizing with permission),* University of Virginia.

Boaler, J. (2016). *Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages and innovative teaching*. San Fransico, CA: Jossey-Bass.

Bonner, E. P. (2014). Investigating practices of highly successful mathematics teachers of traditionally underserved students. *Educational Studies in Mathematics*, *86*(3), 377-399.

Borman, G. D. & Overman, L. T. (2004). Academic resilience in mathematics among poor and minority students. *The Elementary School Journal*, *104*(3), 177-195.

Cai, J., Morris, A., Hwang, S., Hohensee, C., Robinson, V., & Hiebert, J. (2017). Improving the impact of educational research. *Journal for Research in Mathematics Education*, 48, 2-6.

Gay, G. (2010). *Culturally responsive teaching: Theory, research, and practice*. New York, NY: Teachers College Press.

Greer, B., Mukhopadhyay, S., Powell, A. B., & Nelson-Barber, S. (Eds) (2009). *Culturally responsive mathematics education*. New York, NY: Routledge Taylor and Francis Group.

Gutiérrez, R., & Dixon-Román, E. D. (2011). Beyond gap gazing: How can thinking about education comprehensively help us re(invision) mathematics education? In B. Atweh, M. Graven, W Secada, & P. Valero (Eds.), *Mapping equity and quality in mathematics education* (pp. 21-34). New York, NY: Springer.

Hammond, Z. (2015). *Culturally responsive teaching & the brain: Promoting authentic engagement and rigor among culturally and linguistically diverse students*. Thousand Oaks, CA: Corwin.

Ladson-Billings, G. (1994). The dreamkeepers: Successful teachers of African American children. San Francisco, CA: Jossey-Bass.

Moll, L. C., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: A qualitative approach to connect homes and classrooms. Theory into Practice, 31(1), 132-141.

National Council of Teachers of Mathematics (2000). *Principles and standards for school mathematics.* Reston, VA: NCTM.

Schoen, H. L., Cebulla, J. J. Finn, K. F., & Fi, C. (2003). Teacher variables that relate to student achievement when using a standards-based curriculum. *Journal for Research in Mathematics Education*, *34*(3), 228-259.

Thomas, C. A. (2020). *Examining opportunities to learn and enact ambitious instruction, culturally responsive teaching, and culturally relevant pedagogy in mathematics education*. Unpublished doctoral dissertation. University of Virginia.

Thomas, C. A. & Berry, III, R. Q. (2019). Qualitative metasynthesis of culturally relevant pedagogy & culturally responsive teaching: Unpacking mathematics teaching practices. *Journal of Mathematics Education at Teachers College*, *10*(1), 21-30.