ACQUIRING A STANCE ON EQUITY AND SOCIAL JUSTICE WITHIN AN ONLINE MATHEMATICS SPECIALIST PROGRAM

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This research report will discuss mathematics specialists and the way in which they communicate ideas of equity and social justice within a master's program that leads to a state endorsement in mathematics education leadership. Many mathematics specialist programs focus on developing their mathematical content knowledge for teaching, but these specialized leaders also need to learn about curriculum, assessment, pedagogy, and leadership for school change. This research describes one mathematics specialist program's initial efforts in developing mathematics teacher leaders who take action within their K-12 school contexts. Preliminary findings suggest that the mathematics specialists within this program are aligning their views of equitable mathematics instruction with Principles to Actions (National Council of Teachers of Mathematics, 2014) and the Teaching for Robust Understanding Framework (Schoenfeld, 2015). Implications for the program are that we are still exploring how to incorporate these ideas and facilitate critical conversations as teacher educators within our classrooms.

Keywords: Mathematics specialists, Online learning, Equity, Social justice

Mathematics education researchers are called to view equity as a collective professional responsibility (Aguirre et al., 2017). While recent research publications related to our online mathematics specialist program have contributed to the field in the arenas of self-study (Baker & Bitto, under review), online teaching (Hjalmarson, 2015; Baker & Hjalmarson, 2019), and field experiences (Baker, Bitto, Wills, Galanti, & Eatmon, 2018), we recognize that we have more to do to improve our professional practice and to turn our research lens toward inequities in education. As reflective mathematics teacher educators, we strive to advance our master's students' understanding of equity and their readiness to advocate for more socially just educational structures in their contexts.

Our research journey began in Summer 2017 as we purposefully reflected on national equity conversations in our field within position papers and conference strands. Our emerging knowledge informed our interactions with one another and with our students. We questioned whether our program substantively engaged our master's students in ideas of equity and social justice. We further recognized that we needed to be intentional in creating learning experiences which would challenge their thinking and build their awareness as they worked toward becoming agents of change in their school communities.

This study captures our theorized entry points for making equity more explicit in our courses and our analysis of our students' evolving descriptions of equity. Our work is motivated by the tenets of the National Council of Supervisors of Mathematics (NCSM)/TODOS position statement (2016) titled *Mathematics Education Through the Lens of Social Justice:*

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Acknowledgment, Actions, and Accountability. We place our work in the "acknowledgement" phase, and the results of this study drive our movement toward the "action" phase in our own practice and in our candidates' practice as emerging mathematics teacher leaders. The implications of this work are especially important as our we move toward a 100% synchronous online program design which extends our sphere of influence beyond in the state of Virginia and builds an increasingly diverse community of learners. We seek to build a program that both respects their current thinking yet challenges their perspectives of equity and social justice in ways that make all of us more accountable.

Research Question

How do candidates in a synchronous online K-8 mathematics specialist master's program describe equity and social justice?

Theoretical Framework

Equity and Social Justice in Mathematics Education

As White female mathematics teacher educators in a highly-resourced suburban mid-Atlantic community with diverse public school populations, we acknowledge both our positionality and our own pursuit of deeper understandings of equity and social justice. We have collaboratively contemplated entry points into broader conversations about equity in our master's level courses for aspiring mathematics teacher leaders. Gutiérrez (2007) placed access and achievement together on a *dominant axis* in her framework for equity in mathematics education. This dominant axis reflects "the status quo" and privileges a "static formalism" which equates resource allocation and access for historically marginalized students. It further creates an achievement-driven pipeline which defines societal economic participation (p. 39). Gutiérrez also theorized a *critical axis* of equity in which "mathematics… squarely acknowledges the position of students as members of society rife with issues of power and domination" (p. 40). She offered a window/mirror metaphor for identity as a precursor to building power through mathematics to challenge marginalization in society. "Students should have the opportunity to see themselves in the curriculum as well as to have a broader view of the world" (Gutiérrez, 2012, p. 20).

The tensions between these two axes (Gutiérrez, 2012) orient our research community toward a broader agenda of social justice in which mathematics education evolves to effect change. This tension is deeply embedded in our own instructional decisions as we facilitate conversations about equity which both value and challenge the contexts that our experienced teachers bring to their graduate work. Rubel (2017) categorized standards-based teaching and complex instruction as "equity-directed instructional practices" (p. 69) within the dominant axis and culturally-responsive teaching and mathematics for social justice within the critical axis. Yet, we wonder if situated instructional moves which are intended to build mathematical competence (Berry, 2018; Gresalfi, Martin, Hand, & Greeno, 2009) are so clearly categorized. We believe that instructional practices can be highly contextualized and actually place our teachers at the uncertain intersection of achievement as the dominant axis and identity as the critical axis of equity in mathematics education.

We are asking our aspiring teacher leaders to operate in this tenuous space as we seek to understand how their views of equity evolve with the use of reflective tools designed to foster student identities as productive learners and doers of mathematics (Aguirre, Mayfield-Ingram, & Martin, 2013, Aguirre et al., 2017) and change student and teacher beliefs about mathematics

(Berlin & Berry, 2018; Horn, 2007). In our mathematics specialist courses, we engaged our students in the National Council of Teachers of Mathematics (NCTM) (2014) *Principles to Actions* effective teaching practices and the Teaching for Robust Understanding (TRU) framework (Schoenfeld, 2015) pedagogical moves as tools which promote equity in classrooms. We also facilitated conversations around the calls to take a social justice stance in the joint position paper from NCSM and TODOS. These tools and papers were a starting point for broader conversations among our faculty as we prepare our mathematics specialist candidates to understand all four dimensions of equity (Gutiérrez, 2007) and to become agents of change.

Mathematics Specialists

Mathematics specialists, also called mathematics coaches or mathematics teacher leaders, are recommended to, "enhance the teaching, learning, and assessing of mathematics in order to improve student achievement" (Association of Mathematics Teacher Educators (AMTE), Association of State Supervisors of Mathematics, NCSM, & NCTM, 2010, p. 1). To be prepared for varied contexts and responsibilities, specialists need expertise that includes deep knowledge of mathematical content and pedagogy (Ball, Thames, & Phelps, 2008) as well as the ability to develop teaching peers' mathematical knowledge for teaching (AMTE, 2013). It is recommended that credentialing and certificate programs develop content knowledge for teaching mathematics, which includes deep understanding of mathematics for grades K-8 and further specialized mathematics knowledge for teaching; pedagogical knowledge for teaching mathematics, which includes learners and learning, teaching, and curriculum and assessment; and leadership knowledge and skills (AMTE, 2013). NCTM *Principles to Actions* (2014) acknowledges the critical role of mathematics specialists in enhancing teacher capacity to enact research-based teaching practices.

Potential agents of change. Mathematics specialists can act as agents of change to implement policy initiatives related to standards, curriculum, assessment, and professional development within their K-12 school contexts (AMTE, 2013; Fennell, 2017). However, mathematics specialists face many challenges, including meeting the expectations of multiple stakeholders in the school system (e.g., teachers, administrators, and parents) (Chval et al., 2010), while teaching the learning of mathematics to those involved (Felux & Snowdy, 2006). Therefore, they require guidance and support to become experts (Borko, Koellner, & Jacobs, 2014; Chval et al., 2010) as experience and time are needed for both developing their leadership abilities and changing the mathematics practice within their schools (Campbell, 2012).

The mathematics specialist master's program at George Mason University is developing specific teacher leader skills and dispositions (Baker et al., 2018) which prepare our specialist candidates to become agents of change. But as we, as faculty, reflect upon the candidates' ability to take action to reform and advance their educational settings to be equitable and accessible, we wonder: How do candidates describe equity and social justice in a mathematics specialist advanced program?

Methods

Context

The George Mason University K-8 Mathematics Specialist Leader program, established in 2005, is comprised of ten 3-credit graduate courses (five content, four leadership, and one capstone internship course) based on current coaching leadership frameworks (Bitto, 2015) and national standards for mathematics specialists (NCTM, 2012; AMTE, 2013). Over the past decade the program has transitioned from traditional face-to-face to an online format. In Fall

2017, the first iteration of a 100% synchronous online program began. All coursework was delivered using a synchronous online format that utilized Blackboard Collaborate Ultra for communication (audio, video, and text) along with interactive Google slides in which candidates had editing rights allowing for simultaneous engagement with their instructors and peers on slides.

Participants

There were 16 mathematics specialist candidates in the first synchronous online cohort, including female (87%) and male (13%); a combination of White (69%), African American (19%), and Indian American (6%) educators. All of the candidates were employed in K-12 schools, with the majority (81%) in elementary schools (K-5) and 19% who taught at the secondary level (6-12). The candidates represented varied educational settings, including 81% who resided in districts in Virginia, which does not use Common Core State Standards; others were outside of Virginia in Common Core states (13%) or in international schools (6%). Prior to the beginning of the cohort, 25% of the candidates were already working in mathematics specialist positions without formal preparation coursework.

Data Collection and Analysis

Data was collected via identical surveys that were given at the beginning of the program and midway through coursework. Consisting of 23 questions total, initial questions centered on participant demographics such as job title and K-12 setting. Eight questions utilized a Likert scale (1-5), were taken from the EMC survey (Yopp, Burroughs, & Sutton,, 2010), and delved into one's comfort facilitating leadership activities such as modeling instructional practices, collaborating with stakeholders, providing feedback, and identifying gaps in their peers' knowledge. Six questions aimed at understanding participants' perceptions of high-quality mathematics instruction and collaborating with various K-12 stakeholders (e.g. teachers, administrators). Five questions were open-ended and centered on each of the dimensions of the TRU Framework (Schoenfeld, 2015).

Responses were analyzed qualitatively. An in vivo coding (Saldaña, 2016) scheme was used in order to capture the specific language of the participants. Categories shared by the participants were aligned and the reduction of these categories led to the emergence of a few prominent themes (Maxwell, 2005). These themes will be elaborated on and discussed in the following sections.

Results

Preliminary findings indicate our mathematics specialist candidates' descriptions of equity within mathematics education evolved during their program in the following ways: 1) changing their descriptive language; 2) increasing understanding of a teacher's responsibility; and 3) developing knowledge of facilitating rich mathematics experiences.

Advancing Their Perspectives of Equity

At the beginning of the program, mathematics specialist candidates characterized equity as differentiation. In the pre-program survey, they spoke about "meeting students' needs" 27 times and used the term "differentiation" 10 times. More specifically, they described "differentiation" and "meeting the needs" as a function of resource allocation. That is, if teachers and mathematics specialists provided the right combination of tools, access, and resources, they were being equitable in their instructional approaches. Participants articulated a critical role for differentiation in achieving equitable mathematics instruction. They also recognized that many factors contribute to ensuring each student has access to meaningful learning.

The math specialist candidates discussed how differentiation in mathematics instruction was a way to "level the playing field" for low-performing students. One candidate said, "Each student enters a mathematics classroom with a different skill set. Collectively, they possess a variety and multitude of levels and deficiencies." They also communicated a commitment to access for all students by "making content available to all and treating all students with dignity regardless of their level is important." Furthermore, they described equity as teachers utilizing multiple formats to meet the needs of students, either collectively or individually, as demanded by the differences in student readiness.

This focus on providing access for the purpose of higher achievement was aligned with the dominant axis (Gutiérrez, 2007) of equity. They viewed equity as addressing mathematical weaknesses instead of fostering the identities of students of varied cultural backgrounds as productive doers of mathematics. The mathematics specialist candidates talked about the (lack of) prior knowledge as a deficit rather than communicating a mindset that views potential in each student.

However, in the mid-program survey the language the specialist candidates used to discuss students and their understandings shifted. There were fewer references to differentiation and meeting students' needs and a deeper recognition of the value all students bring to classroom learning experiences. Their language also shifted from viewing (lack of) prior knowledge as a deficit to an opportunity for meaningful learning. For example, one candidate wrote:

> Equitable math instruction means that all students have access to high quality math instruction. All students need to have a voice in the classroom with lots of opportunities to share their thinking. Teachers need to hold all students to high standards and provide support to them. By using best practices, all students can have a deeper level of math understanding and be problem solvers and think critically.

Mathematics specialist candidates recognized complexities that they had not previously identified. One student considered socioeconomic status as she described equity, "All students should be provided with the same resources to learn mathematics. However, oftentimes, this is a challenge for students who are disadvantaged socioeconomically." This subtle shift indicates progress towards the critical axis (Gutiérrez, 2007) since the candidate acknowledges the position of the student in terms of societal power. Another candidate alluded to the institutional structures beyond the classroom which affect opportunities to learn. This candidate wrote, "Access is huge. If students are in a school or setting where they do not have access to quality instruction and safe learning environments, they do not have an equitable education." Again, this shift in language from the pre-program survey -- phrases such as "leveling the playing field" and "differentiating" -- to acknowledging systemic inequities in the mid-program survey indicates a deeper understanding of equity as the candidates shift their thinking from the dominant to the critical axis (Gutiérrez, 2007).

Increasing Understanding of a Teacher's Responsibility to Ensure Equitable Experiences

At the beginning of the program, mathematics specialist candidates communicated that students could achieve with sufficient access to resources. After class discussions about equity in the context of *Principles to Actions* and the TRU framework, they recognized that students brought their own mathematical understandings into K-12 classrooms. However, perceptions of equity emphasized resource allocation and achievement goals. For example, one candidate said, "We all know students work at different levels and all learn in different ways so providing equitable mathematics instruction would be providing our students with all the resources and

tools they would need to achieve the same goal." When sharing potential additional supports, mathematics specialist candidates identified students as a means to provide support to one another "via peers and one-on-one tutoring." These solutions to addressing student understandings placed the responsibility of learning on the students and minimized a teacher's role in facilitating equitable mathematics instruction.

The majority of mathematics specialist candidates recognized that there was a need to take more action in their instructional practices but were unable to articulate specific actions beyond differentiation. For example, a candidate said, "The teacher knows their students best and will be able to differentiate the instruction to meet their students' needs." This candidate indicated some responsibility to the teacher but was unable to verbalize specifics.

However, in the mid-program survey mathematics specialist candidates identified specific ways in which a teacher could begin to facilitate equitable mathematics instruction by addressing issues of identity. Responsibilities of learning were still placed on students, but in an appropriate way that indicated students would construct their own meaning based on instructional strategies. Now, candidates were communicating about individual student participation in constructing meaning:

> Students need to feel that they have a voice and role in the classroom. Rather than just a few students doing that majority of the talking and sharing, all students need to have ways to contribute in class. The teacher's role needs to be a facilitator so that the students are doing the heavy lifting of the thinking and learning.

Similarly, another candidate shifted the responsibility of learning towards the teacher, viewing the teacher as a leader who empowered her students to take ownership of their own learning. Furthermore, this candidate recognized the identity of each individual student and the students' societal positionality.

> Students will take ownership when they feel empowered to think and reason through math problems. When they are successful, this contributes to a positive math identity. Another thing about identity is students may not see themselves as a "math person" because of gender, race, or socio-economic status. We need to empower all students to become math people.

As candidates' views towards learning responsibilities shifted, questions simultaneously arose in how a teacher might move forward. "Equitable instruction ensures that teachers are focusing on the specific needs of students. But, how can each student be successful? What do they each need?" Such questions acknowledge the complexities of equitable instruction and indicate that the candidates are engaging in critical reflection about equity.

Developing Knowledge of Facilitating Rich Mathematics Experiences to Promote Equity

Mathematics specialist candidates acknowledged their role in creating equitable classrooms as facilitators of rich mathematical experiences. Their knowledge of this role is defined through initial surveys as a teacher's ability to teach mathematics content equally to all students. They recognized that while they do not have control of grade-level content requirements, they do have control of the facilitation of rich mathematics experiences that are delivered with this content. They stated this limitation, however, in the initial survey. Candidates described the ways that they overcame this limitation with descriptions of fairness and equality as definitions of equity. One candidate responded that, "While there is a belief that not one math program has the content necessary for all learners to be successful, I do believe that every school should have a common textbook program to which teachers can add supplementary tasks and activities." Another

candidate described equity through a teacher's decisions when delivering the content by stating that, "Content is set by the state. However, how the teacher structures the content experiences for students allows for equitable instruction." Further, a candidate stated that math content is inherently equitable because it can be delivered through various teaching practices.

> Math content contributes to equitable math instruction in focusing on the big ideas of math and conceptual understanding like equivalence, multiple representations, patterns, form, relationships, etc. that are also cross disciplines other than math. These are the enduring understandings that we want students to understand in the math content.

In each of these examples, the candidates are describing equity as equalizing access to content and/or the teacher's decisions in delivery of the content.

By the mid-program survey, the candidates shifted to describe equity as their ability to teach content through differentiation and student-centered tasks that value the uniqueness and individuality of each student. They began to value differences as an opportunity for rich mathematical experiences. One candidate reported a shift in their teaching by stating that s/he was "recognizing cultural and socio-economical differences and allowing students' experiences to guide task creation." As these candidates engage students in math tasks, they are not only recognizing differences, but valuing them by highlighting those differences through the mathematics content.

Also, candidates transitioned from defining equity as equality to equity as a teacher's ability to differentiate the mathematics experiences. For example, "If you teach the same content but differentiate it based on the varied abilities it is equitable." This differentiation is described as individualized by a candidate who stated that "When problems are presented it should be with content that students can make a connection to. If you know your students have never been to the beach, do not give them problems related to the ocean without first providing background knowledge" and "math is relatable to all students and there are multiple entry points to the problems." In differentiating the math experiences based on students' prior knowledge, they are facilitating student-centered math experiences, transitioning to individualization. Another candidate described rich content as individualizing content understanding and application:

> Content is content. Rich content goes beyond the surface and provides experiences with math that give pathways to a higher understanding of content. This is what we want for all children. Not a show and tell mathematics, but an environment where students can develop their own understanding, work collaboratively with others, and see the beauty in math.

Candidates began to focus on "all students" and how "students should be provided with ways to engage in the content." One candidate wrote, "All students need to be able to contribute to the classroom and have a voice. High quality tasks with multiple solutions provide ways for all students to have a voice and share their thinking." However, while the specialist candidates identified the need for students to take ownership of their own learning, no one discussed how teachers could develop opportunities for students to see themselves as doers of mathematics.

Discussion

We, as a program, reiterate that we are continuing to learn how to better prepare mathematics specialist candidates to engage in issues of equity and social justice. We embrace the call to change the structures which perpetuate inequities and recognize that we, as faculty, need to take a stronger stance. We acknowledge that the content and leadership experiences we provide to our

candidates are valuable, but they are not aggressively moving the conversation forward to empowering our master's students as agents of change. This analysis of the candidates' descriptive language of equity and social justice can inform our future programmatic actions. *Principles to Actions* (NCTM, 2014) and the TRU framework (Schoenfeld, 2015) resonated with our students' conceptions of effective K-12 mathematics teaching and was a comfortable way to begin conversations that center on designing high-quality classroom experiences. The conversations that arose from using the NCSM/TODOS (2016) position statement on equity and social justice were more critical in nature and allowed our candidates to see the differences between good mathematics teaching and equitable mathematics teaching. However, our candidates need more opportunities to envision ways in which they can challenge inequitable structures.

We, as a program, also need to look at how we address issues of equity and social justice across our courses and develop a common vision that will promote the systematic change we desire. Our candidates need more experiences to grapple with ideas of equity and social justice. We are reflecting on critical questions: How do we begin these critical conversations with mathematics specialist candidates so that we have evidence of their growth? How does one develop excellent teaching practices and advocacy skills in parallel?

Although we are developing classroom teachers and leaders who are embracing *Principles to Actions* (NCTM, 2014) and the TRU framework (Schoenfeld, 2015), we need additional tools which promote critical awareness and prepare our candidates to act. We also need to re-examine our data collection tools, specifically the survey. We need to capture how our candidates not only describe equity, but we also need to gather data that illuminates what equity looks like in their daily practice. We anticipate some disconnect between beliefs and actions as our mathematics specialist candidates, like pre-service teachers, are challenged by the reconciliation of exploring what they are 'supposed to' say with what they perceive possible in their school contexts. We hope that our candidates will feel empowered to change the systems within which they work. Without taking any action or modeling equitable teaching practices in our own graduate classrooms, our practices will continue to center on instruction that does not contribute to systemic change.

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