Integrating Dimensions of Equity in Elementary Mathematics Methods

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Abstract: In this article the authors describe a well-known framework for equity in mathematics education and explain how they integrate it into multiple aspects of a mathematics methods course, including the clinical experiences in elementary school classrooms.

KEYWORDS: educator preparation, equity, mathematics education, mathematics methods courses, Professional Development Schools, PDSs, school-university partnerships, teacher education

NAPDS REVISED NINE ESSENTIALS ADDRESSED:

Essential 1: A professional development school (PDS) is a learning community guided by a comprehensive, articulated mission that is broader than the goals of any single partner, and that aims to advance equity, antiracism, and social justice within and among schools, colleges/universities, and their respective community and professional partners.

Essential 2: A PDS embraces the preparation of educators through clinical practice.

Essential 3: A PDS is a context for continuous professional learning and leading for all participants, guided by need and a spirit and practice of inquiry.

Essential 4: A PDS makes a shared commitment to reflective practice, responsive innovation, and generative knowledge.

Integrating Dimensions of Equity in Elementary Mathematics Methods

Mathematics is a universal subject, right? This question and incorrect sentiment are expressed all too often. Many mistakenly believe that mathematics is an objective, politically and culturally neutral discipline (Felton-Koestler & Koestler, 2017). In actuality, mathematics teaching and learning is a sociocultural process, shaped by an individual's personal experiences, as well as the experiences of others (Gutiérrez, 2013). Dominant cultural beliefs can influence not only what concepts are taught in mathematics, but who has access to such content and how it is taught (National Council of Teachers of Mathematics, 2014). Challenging the notion that mathematics is a neutral discipline in order to transform how it is taught is important, as research shows mathematics acts as the "gatekeeper" to students' future success, both academically and financially (e.g., National Mathematics Advisory Panel, 2008). Indeed, because mathematics has been conceived of as a "key mechanism in the distribution of opportunity" (Burdman, 2018, p. 1), the integration of equity in mathematics education has the potential to generate powerful outcomes. Through a purposeful and intentional approach to integrating equity in our elementary mathematics methods course, we aim to challenge prevailing assumptions about the apolitical, neutral nature of mathematics and engage our teacher candidates in considering how equity should be centered in their mathematics instruction.

Context

The elementary mathematics methods course that we (an assistant professor and doctoral candidate, both identifying as white females) co-teach at the University of South Carolina is an embedded methods course (see Hodges, Blackwell, Mills, Scott, & Somerall, 2017 for more information on embedded methods courses). Our course is taught at a local elementary school, Oak Pointe Elementary School, where the first author serves as the Professional Development School (PDS) university faculty liaison. Teacher candidates take this one-semester, elementary mathematics methods course as either second-semester juniors or first-semester seniors. Prior to this course, teacher candidates complete a culturally sustaining pedagogy course, which, as intended, showcases equity-oriented pedagogical approaches broadly, rather than in specific content areas. During our elementary mathematics methods course, teacher candidates engage in explorations of both mathematics content and pedagogical practices related to the effective teaching and learning of mathematics, including equitable teaching practices. While equity was previously addressed in our course, a more explicit and intentional focus on equity as it relates to mathematics education was needed to support teacher candidates' understanding and application of these complex ideas.

Centering Equity within Elementary Mathematics Methods

To situate equity at the forefront of our course, we use Gutiérrez's (2009) conceptualization of four dimensions of equity (i.e., access, achievement, identity, and power) as a framework. This provides structure and accountability in our planning and instruction. Using a guiding framework ensures we are intentional about integrating justice, equity, diversity, and inclusion with mathematics methods concepts from the first day of class to last day of class.

Overview of Gutiérrez's Conceptualization of Equity

When considering equity and mathematics education, Gutiérrez (2009) argues we must move beyond simply thinking of closing an achievement gap to situating equity as "the distribution of power" (p. 5) in society and in our classrooms. She uses two axes, the dominant and the critical, to show how four dimensions of equity—access, achievement, identity, and power—permit us to understand different aspects of equity and the relationships and tensions among them. Importantly, for mathematics education to be truly equitable, all four of these dimensions must be addressed.

Dominant Axis. Access and achievement fall on the dominant axis, which Gutiérrez (2009) describes as "preparing students to participate economically in society and privileging a status quo - measuring how well students play the game of mathematics" (p. 6). Access is related to the opportunities and resources that students have to support their learning, including high-quality teachers, curricula, and positive classroom environments. Achievement refers to "student outcomes" (p. 5) that can be measured. Though standardized test scores are a common metric used, measurements of achievement also include the number of students who take higher-level mathematics courses or choose a mathematics-dependent profession.

Critical Axis. Identity and power fall on the critical axis, which Gutiérrez (2009) describes as "[ensuring] students' frames of reference and resources are acknowledged...so they may change the game" (p. 6). Identity involves taking into account students' personal histories and resources (e.g., cultural and/or linguistic resources), as well as how the socially-situated nature of students' multifaceted identities influences their learning of mathematics. Power "takes up issues of social transformation at many levels" (p. 6) and can include whose voice is represented in the classroom and curriculum, as well as whose knowledge has authority and is valued. Power also relates to using mathematics as an analytical tool for understanding and critiquing social injustices.

Applying an Equity Framework in Elementary Mathematics Methods

As mentioned, a more explicit focus on equity in our planning and instruction was necessary to ensure our teacher candidates not only learned about the relationship between mathematics and equity, but also had opportunities to make connections to previous coursework. Therefore, our overarching goal was to provide a framework for us and our teacher candidates that would explicitly address access, achievement, identity, and power in a mathematics education context. To do so, it was important that equity was included in each and every class, not simply in one class session, which can perpetuate students erroneously seeing equity as "different" from mathematics pedagogy. In the following sections, we describe how we introduce our equity framework, followed by how we use it to integrate equity throughout our course.

Introducing the Equity Framework

Prior to introducing the equity framework to our teacher candidates, we engage in an activity during the initial class session where they are presented with six words, each on a piece of large chart paper spread around the classroom: (1) equity, (2) mathematics, (3) access, (4) achievement, (5) identity, and (6) power. We include not only Gutiérrez's (2009) four dimensions of equity, but also the overarching concepts of equity and mathematics to provide

additional context and to spur connections among these concepts. Teacher candidates write down their individual thoughts when they read each word on the papers (e.g., definitions, connections, images, examples, etc.). They are encouraged to not overthink their responses, as we want to capture their initial thinking. Teacher candidates write their ideas without name attribution in order to help create an open, honest, and safe space for this complex work. After writing their ideas, teacher candidates then walk to each piece of chart paper and react to their classmates' thoughts, emphasizing ideas they agree with and noting any points of disagreement or questions that arise. This activity generates a snapshot of teacher candidates' initial understandings that we refer to throughout the semester as a touchstone when asking the teacher candidates to engage in a process of continuous critical self-reflection.

In the next class, we assign teacher candidates a portion of Gutiérrez's (2009) article to read in a Jigsaw format (Aronson, 1978). After closely reading and annotating their portion of the text, teacher candidates gather in small groups with those who have read the same section to share key insights and ask clarifying questions. Next, teacher candidates are placed in different small groups, wherein they have an opportunity to be the "expert" on their assigned portion of the text. In other words, each second small group setting includes individuals who have read different parts of the text; thus, allowing each teacher candidate to be the expert of the assigned section. Through their collaborative reading and discussion of Gutiérrez's (2009) article, teacher candidates begin developing an understanding of the four dimensions of equity (i.e., the equity framework for our course). Following the in-class group activity, teacher candidates then read the article in its entirety on their own, allowing for additional time for understanding and reflection.

Integrating the Equity Framework

In order for our teacher candidates to truly understand that equity is an integral part of teaching mathematics, we embed the ideas behind our equity framework within each class session. Moreover, because we want to move their understanding beyond dominant conceptualizations of equity that focus on access and achievement to more critical ones, we are intentional to emphasize the identity and power dimensions of the framework. With Gutierrez's (2009) four dimensions of equity guiding our planning and instruction, we have modified how we have typically addressed these dimensions.

For example, one instructional area of focus is the significance of teachers' and students' mathematical identities for success in mathematics. Previously, we accomplished this by having students reflect on their mathematical journey at the start of the semester, as well as read and reflect on an article about mathematical identity (Allen & Schnell, 2016). Now, in addition to using these instructional activities, we take a closer look at how teachers' and students' personal and social identities interact to shape their mathematical identities and opportunities. We engage teacher candidates in various activities that require them to think deeply and critically about these multiple identities and why they matter for equitable mathematics instruction. In one such learning opportunity, teacher candidates fill out personal and social identity wheels (College of Literature, Science, and the Arts, n.d.), reflecting on who they are and how they define themselves, as well as how they are positioned in society. These identity wheels serve as a springboard for critical discussions about how differential social positionings, some privileged and others oppressed, influence teachers' and students' experiences with mathematics and their interactions with one another in the classroom. Through this, we begin shifting teacher

candidates' common assumption that mathematics is universal or neutral and laying the foundation that identity matters.

As another example, creating a classroom that promotes productive mathematical discourse (e.g., Smith & Stein, 2018) is a key pedagogical approach we emphasize in our methods course. To ensure that equity is central to this conversation, teacher candidates engage in conversations and activities addressing how mathematical discourse specifically relates to power. For instance, teacher candidates analyze a mathematics teaching video through a "power and participation lens" handout (Drake et al., 2015). As they work through this reflective activity, teacher candidates capture instances of how particular power dynamics (e.g., status and authority) influence the teaching and learning of mathematics and consider how attending to these matters is necessary for equitable instruction.

As a final connection process, we repeat the opening chart paper activity, allowing teacher candidates to showcase and reflect on how their conceptions of equity have developed and evolved. While these are certainly not all of the ways we engage in this important work, these ideas showcase the purposeful focus on centering dimensions of equity in our elementary mathematics methods course.

Voice of the Teacher Candidate

While we have presented our viewpoint on how we use Gutiérrez's (2009) four dimensions of equity to frame our elementary mathematics methods course, we acknowledge that we do not teach in a silo. Our teacher candidates are critical collaborators in this work. Our goal is not to change our teaching practice alone, but to provide a space where teacher candidates are able to learn about equity and how to center it in their teaching practice as well. Therefore, the third author, our former student and now a first-year teacher, shares: (a) how our use of this equity framework helped her understand dimensions of equity in mathematics education, (b) the benefits of integrating equity throughout the course rather than addressing it in isolation, and (c) how the equity framework has influenced her teaching practice, both as a teacher candidate and first-year teacher. Below, she contributes her voice to the conversation.

> *Throughout my time studying, equity was discussed in my classes, but seldom was it applied so specifically to a certain subject, like mathematics. Being given the time to take a step back to analyze what our specific role is when it comes to fostering a classroom environment with these four dimensions at the core, specifically when it came to mathematics, was the reason behind a majority of my work in the classroom today.*
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> *The integration of equity in the course is something that stood out to me from the moment that we met as a class. So often equity feels like something that needs to be thrown in to check off a box for an education class, when in fact it should be the very backbone for all of our perspectives and decisions that we have to make. Influencing a group of people's beliefs is a hard thing to do, especially when it is a conversation that is so rushed over. Instead, to make any kind of continuous change, it is a conversation that should never stop happening. I think that is what made this class so influential to me, more so than my other classes, because every single time we met as a class, there was a conscious effort to relate what we are studying to the four dimensions....this framework went from a quick listen to a conscious belief system that I have developed, and I can confidently say I am a better teacher for it today.*

> *I felt a need to shift the power to the students and their voice, making sure that there was an equal amount of power for all students. I did this in several ways, especially throughout my full two weeks of teaching [as a teacher candidate intern], by creating socratic seminars, and shifting the classroom environment from lecture style to discussion style, allowing the students to see each other on the same playing field, with valid thoughts and opinions no matter who they were. Slowly but surely, with even a few changes, I noticed the environment shifting from something divisive to something loving. As I began teaching this August, I continued to practice this, along with focusing on the access my students had, their identity, and their achievement.*

Future Directions

Our next step for this work is a natural one within our PDS partnership: supporting equity-based mathematics instruction with teachers at Oak Pointe Elementary School. Guided by the lessons learned from our work with teacher candidates and the needs established at our partner elementary school, we will soon begin collaborative inquiry into equitable mathematics instruction. A small group of teachers volunteered to form an "equity team"; this team, alongside us and school administration, will guide all faculty as we learn collectively and collaboratively about ways to enhance how we view mathematics, who is invited to engage with mathematics, and how our instruction and classroom environments position learners of mathematics. This work not only supports student learning, but also aligns our equity-based mathematical practices across our PDS site and our embedded elementary mathematics methods course.

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