Math at the Core: Culturally Responsive Teaching and Math

When we think about culturally responsive teaching—that is, teaching in a way that recognizes and includes students’ cultural references, communities, and identities—we usually think about the humanities subjects: diverse texts in an ELA class, for example, or diverse perspectives in a U.S. history class. We often think about math and science as neutral, objective, and separate from the context of everyday society.

In actuality, the development and application of math, and the narratives surrounding math and who does math, are as subject to bias and perspective as any other human-developed discipline.

The ways in which we typically teach math in K–12 classrooms are fundamentally Eurocentric, based off of Greek texts. This discounts the various ways in which math has historically been developed, intuited, and represented in other cultural communities: ratios and patterns in Japanese origami, for example; symmetry in Maori decorations; measurement in quilting; or arithmetic, number ordering, and multiplication using the abacus or Incan quipus. Similarly, social narratives affect perceptions of who does math: mathematicians are often seen as white men. Cultural archetypes (such as Western individualism and competition, compared to collectivism) also play a role in math teaching and learning: how we ask students to engage in the mathematical practice of constructing viable arguments and critiquing others’ reasoning, for example, or whether we ask students to work independently or in cooperative groups when problem solving.

All these manifestations of biases, and the stories they tell, affect students’ math identities, or the “dispositions and deeply held beliefs that students develop about their ability to participate and perform effectively in mathematical contexts and to use mathematics in powerful ways across the context of their lives.”

In addition, the math classroom holds huge potential for students to develop a deep understanding of social, political, and economic issues with direct relevance to their own lives as well as important interdisciplinary skills, such as media and data literacy. Urban students might, for example, better understand health inequities by using ratios and proportions to analyze the density of grocery, convenience, and liquor stores or healthcare facilities in different neighborhoods of their city. They

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might use statistics and probability to better understand the concept of racial profiling in policing. Or they might use scatter plots to understand and make predictions about the spread of a pandemic like COVID-19. Indeed, it is critical that students see examples of math problems as relevant to themselves, their lives, and their cultures.

Students should also have an opportunity to research and understand statistics in more depth as it relates to their racial and cultural interest. Teachers can use frequency tables to examine aspects of police brutality in local communities and give students a direct connection to the data they collect. Math should offer another lens for understanding the world and how it works.

In **Math at the Core**, we seek to support the culturally responsive teaching and learning of math by incorporating diverse ways of doing math, by showing diverse people doing math, and by contextualizing math within relevant societal issues that students can connect to their own lives. The collection includes resources produced by the Center for Asian American Media and the National Multicultural Alliance (formerly, the Corporation for Public Broadcasting Minority Consortium); many of these resources include representation of math in diverse cultural contexts. Many of the media examples also include youth who are doing and teaching math. Finally, we seek to support the development of a classroom community of learners through suggestions for student collaborative work and communal talk and task structures.

In using this collection to teach math, we recommend that you do the following:

1. **Consider the identities in your class.** As you plan each lesson, ask yourself:
   a. Who are your students? Do they see themselves as people who do math? Do other people see them as people who do math? What assumptions might you be making about your students’ math identities? What does it mean to be a learner and doer of mathematics in the context of being Black, Latinx, or Asian, for example?
   b. What are the histories of the students in your class? Think about their histories in the context of school, home, culture, and community. How do these histories compare to your own?
   c. How do those histories connect to the math being taught? How have their people contributed to the development of or applied the math concepts being taught?
   d. Do the students you serve come from communities where they are behind or ahead of peers when it comes to math development? If so, what societal factors might have contributed to this?

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9 Reflection question “a” is loosely adapted from *The Impact of Identity in K–8 Mathematics*, p. 8. Reflection questions “b” and “c” are loosely adapted from *Cultivating Genius*, p. 61.
2. **Start with essential questions.** Frame the unit with a few big, open-ended driving questions that have both math and social justice components.\(^{10}\) It is important that these questions relate to students’ lives in ways that they can see.

For example, in teaching ratios and proportions: Which neighborhoods in our city have the highest concentration of grocery stores, and how do their demographics (income level, race, etc.) compare to other neighborhoods? Or in teaching measurement and geometry: How does the number of students per square footage of space compare between different schools in our city, and how do student demographics compare? Why do we go to lunch at different times of day? How is class size determined? Why are our classes larger than other schools’ classes?

Exploring these questions should help students understand the ultimate question: *Why are we learning this?* These questions can also serve to prompt students in building classroom culture through sociocultural dialogue.

3. **Represent math and engage students with math in diverse ways.** While it may be difficult to identify and incorporate activities that both incorporate non-Eurocentric methods of doing math and meet standards in the constraints of math class, it is important to relate to students the rich diverse historical development of mathematics and its development across cultures. Math development as a solution to problems in diverse societies should also be stressed whenever possible.

Most importantly, we must make sure that math is accessible to all students by demonstrating and engaging students in different ways of doing math. For example, you might use tables, fractions, or manipulatives to teach proportions; or origami, quilts, and number sequences to teach patterns. You should provide opportunities for students to work both independently and collaboratively. Finally, students should also have the opportunity to demonstrate their understanding of math concepts in different ways.

4. **End with a student-directed project.** This project should interweave a larger social justice issue (exemplified by the essential questions), math, and students’ everyday life and context. To ensure that the project addresses this last criteria, prompt students to choose their own topic of interest. Teachers can create an interest survey or questionnaire to allow students to poll certain topics. We suggest allowing students to work collaboratively on projects, if they choose, to facilitate the communal sharing of ideas and understanding. They should also have choice in the format in which they represent their understanding, because students are diverse learners.

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with diverse learning styles. This project should allow you to assess your students’ understanding of the math concepts and their application to real societal issues.

For each of the 10 math topics in this collection, we will offer a unit guide that includes the following: self-reflection questions for the teacher before entering a unit; suggested social justice essential questions that can be explored using the math topic; discussion questions to create a community of learners who engage in shared dialogue; historical background on the math, including the various ways in which different cultures and peoples contributed to and do math; examples of multiple ways of representing and doing the math; and starter ideas for potential Math-That-Matters projects, which can be used to anchor and assess learning throughout a unit.

**Suggested Reading for Teachers**

The development of this framing and the domain guides was informed by the body of research and best practices to which many brilliant people have contributed. If you are interested in learning more about culturally responsive math instruction, we suggest you read the following:

- *Culturally Responsive Teaching and the Brain*, by Zaretta Hammond
- *Cultivating Genius: An Equity Framework for Culturally and Historically Responsive Literacy*, by Gholdy Muhammad
- *Bringing a Culturally Responsive Lens to Math Class*, by Kwame Sarfo-Mensah

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