

Equity-Based Mathematics Teaching Practices

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The 2013 book *The Impact of Identity in K-8 Mathematics Teaching: Rethinking Equity-Based Practices* by Julia Aguirre, Karen Mayfield-Ingram, and Danny Bernard Martin, focuses on teacher reflection and practice in the context of student learning and the development of students' mathematical identities. Part 1 of the book focuses on learning and identities, Part 2 describes five equity-based instructional practices, and Part 3 focuses on engaging families and communities as partners in learning and identity development. The five practices described below have many similarities with NCTM's eight effective mathematics teaching practices, but some key differences that make them equally worthy of being used to frame what good mathematics instruction should look like.

The five Equity-Based Mathematics Teaching Practices come from *The Impact of Identity in K-8 Mathematics Teaching: Rethinking Equity-Based Practices* (2013) by Julia Aguirre, Karen Mayfield-Ingram, and Danny Bernard Martin.

1. Going deep with mathematics
2. Leveraging multiple mathematical competencies
3. Affirming mathematics learners' identities
4. Challenging spaces of marginality
5. Drawing on multiple resources of knowledge

Going Deep With Mathematics

Shallow mathematics instruction that focuses on “the basics” is one of the primary ways students receive inequitable instruction. This problem is well-documented among students from underrepresented populations (TNTP, 2018).

The Practice in Action

A representative lesson

- Supports students in analyzing, comparing, justifying, and proving their solutions.
- Engages students in frequent debates.
- Presents tasks that have high cognitive demand and include multiple solution strategies and representations.

A non-representative lesson

- Promotes memorization without examination.
- Encourages students to follow procedures step by step.
- Presents tasks that have low cognitive demand and emphasize one solution strategy.

Assessment considerations

- A task:
 - Requires demonstration of multiple strategies or representations.
 - Involves analysis and justification.
- Communication:
 - Offers meaningful feedback that draws students' attention to "making sense" of the mathematics.
 - Focuses on moving students' thinking forward.

Questions for reflection

- How does my lesson promote mathematical analysis?
 - How do I support students in closely examining the math concept?
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Leveraging Multiple Mathematical Competencies

Leveraging multiple mathematical competencies is an equity-based teaching practice that requires effort both in instructional policy and practice. On the policy side, teachers and schools must work to resist efforts to track students by ability, whether that be broad, multi-course tracks for so-called "high" and "low" students, or within-class tracking in which students are placed in groups by ability (NCTM, 2018). On the practice side, the selection of high-quality tasks is again key. While some teachers may assume that struggling students would struggle most with tasks requiring high cognitive demand, they may be surprised to find that such tasks--which distinguish themselves because no prescribed procedure or strategy is provided--actually give struggling students opportunities to creatively leverage their skills and knowledge as they engage with the problem.

The Practice in Action

Aguirre, Mayfield-Ingram, and Martin (2013, pp. 43-48) summarize the practice of *going deep with mathematics* by describing what it does and doesn't look like in a lesson, considerations for assessment, and questions for teacher reflection.

A representative lesson

- Structures student collaboration to use varying math knowledge and skills to solve complex problems.
- Presents tasks that offer multiple entry points, allowing students with varying skills, knowledge, and levels of confidence to engage with the problem and make valuable contributions.

A non-representative lesson

- Promotes individual progress at specific, predetermined levels of ability.
- Often structures group work by ability.
- Presents tasks that are rigid and highly sequenced.

- Requires students to show mastery of skills prior to engaging in more complex problem solving.

Assessment considerations

Assessing a task:

- Calls for a diversified rubric and an answer key that includes math practices such as examining patterns, generalizing, abstracting, making comparisons, and specifying conditions.
- Requires looking for multiple ways that students demonstrate their knowledge, such as through the use of language, gestures, pictures, physical models, and concrete objects.

Questions for reflection

- How do I identify and support mathematical contributions from students with different strengths and levels of confidence?

Affirming Mathematics Learners' Identities

Much of this equity-based practice relies on the relationships between teachers and students and the support and acceptance they show each other during instruction. These relationships and exchanges shape the collective understanding of what it means to do mathematics, and what it means to be good at mathematics.

The Practice in Action

A representative lesson

- Is structured to promote student persistence and reasoning during problem solving.
- Encourages students to see themselves as confident problem solvers who can make valuable mathematical contributions.
- Assumes that mistakes and incorrect answers are sources of learning.
- Explicitly validates students' knowledge and experiences as math learners.
- Recognizes mathematical identities as multifaceted, with contributions of various kinds illustrating competence.

A non-representative lesson

- Is structured to emphasize speed and competition.
- Connects mathematical identity solely with correct answers and quickness.
- Explicitly discourages mistakes and immediately corrects them, often without constructive feedback.
- Gives ambivalent value to flexibility, reasoning, and persistence.

Assessment considerations

Communication:

- Focuses feedback on making sense of the mathematical idea rather than on the ratio of correct answers to the total possible.
- Focuses on strengths and improvements needed.
- Points out what is productive or problematic about a students' chosen strategy.

Questions for reflection

- How do I structure my interactions with students to promote persistence with complex math problems?
- How do I discourage my students from linking speed with math "smartness"?

Challenging Spaces of Marginality

In the book *The Impact of Identity in K-8 Mathematics* (2013), the authors use two examples to highlight what they think it means to challenge spaces of marginality. In the first example, students make the accusation that Mexican students are disciplined unfairly at their school, and the teacher guides them to explore this claim mathematically. Students' lived experiences with racism and discrimination are typically marginalized in mathematics instruction, and the teacher challenges that space in this example by empowering students to use mathematics to address what they believe is an injustice in their school. In the second example, a teacher in a high-poverty school receives a student transferring from another class who has struggled under traditional mathematics instruction that values memorizing multiplication facts and penalizes students who like to talk and draw. Students who struggle under this kind of instruction are often meant to feel marginalized and unsuccessful, but the new teacher challenges this space by structuring student participation and work that promotes student discussion and use of drawings and multiple representations to express mathematical thinking. Although these examples are quite different, they both position students as sources of expertise and leverages what makes students feel like outsiders into resources for mathematical learning.

The Practice in Action

A representative lesson

- Centers student authentic experiences and knowledge as legitimate intellectual spaces for investigation of mathematical ideas.
- Positions students as sources of expertise for solving complex mathematical problems and generating math-based questions to probe a specific issue or situation.
- Distributes mathematics authority and presents it as interconnected among students, teacher, and text.
- Encourages student-to-student interaction and broad-based participation.

A non-representative lesson

- Disconnects student experiences and knowledge from the mathematics lesson or presupposes that student's knowledge and experiences are inconsequential to learning rigorous mathematics.
- Ascribes mathematics authority to the teacher or the text.

- Relegates complex problem solving to the end of lessons or reserves it for “more advanced” students.
- Segregates specific students (for example, those viewed as “low ability” or labeled as “English language learners”) from the main activities.
- Restricts student “voice” to a few (often privileged) students.

Assessment considerations

A task:

- Emphasizes public discussion of mathematical ideas (whole-class, small-group, pair-share).
- Requires reasoning behind correct and incorrect solutions.

Questions for reflection

- How do I connect my students’ knowledge (in school and outside school) with the main math concept of this lesson?
- How do I structure a task to maximize student-generated math questions?
- How do I make sure that all students have opportunities to demonstrate their mathematics knowledge during a lesson?

Drawing on Multiple Resources of Knowledge

Mathematics learning and performance can be highly dependent on context and a substantial body of research has provided examples of students and adults who exhibit mathematical thinking in reasoning in their everyday lives yet struggle when given the same mathematics outside of that context, like in a mathematics classroom. These findings reveal to us how important it is to not only connect students’ experiences to classroom learning, but to value students’ experiences and spaces as legitimate resources for mathematical study and understanding.

The Practice in Action

A representative lesson

- Makes intentional connections to multiple knowledge resources to support mathematics learning.
- Uses previous mathematics knowledge as a bridge to promote new mathematics understanding.
- Taps mathematics knowledge and experiences related to students’ culture, community, family, and history as resources.
- Recognizes and strengthens multiple language forms, including connections between math language and everyday language.
- Affirms and supports multilingualism.

A non-representative lesson

- Treats previous math knowledge as irrelevant or problematic (assuming, for example, “They lack skills,” or “They don’t know any math”).
- Builds on negative stereotypes of the culture, community, or family, preventing math lessons that connect with authentic knowledge and experiences of students. (Such negative stereotypes include notions like, “Many parents are laborers--they can’t help their children with math,” “Asian families support mathematics--that’s why Asian students are so good and so quiet,” and “That is not how we do division in the United States.”)
- Discourages mathematics discourse because it is deemed too difficult for students who have not mastered standard English.
- Supports English as the only language spoken in the classroom.

Assessment considerations

- A task involves the creation of stories of situations to solve or represent the problem
- Communication offers connections to mathematical ideas that students may know but did not use in their solution or explanation.

Questions for reflection

- How do I make connections with students’ previous math knowledge?
- How do I get to know my students’ backgrounds and experiences to support math learning in my classroom?
- How do I affirm some of my students’ multilingual abilities to help them learn math?
- What impact have race and racism had on my mathematics lessons?
- How can I learn from family and community members to support my students’ mathematical confidence and learning?
- How can I effectively communicate with families the strengths and needs of students to affirm their math identities and promote math learning?

Resources

- The Impact of Identity in K-8 Mathematics: Rethinking Equity-Based Practices by Aguirre, Mayfield-Ingram, & Martin (2013)