

Going Deep with Mathematics

Research shows that students who are empowered to think mathematically, develop reasoning skills, and communicate about math, learn to become better problem- solvers and critical thinkers. Our job as teachers is to help students develop these practices to become effective mathematicians. *–the 8 mathematical practices, ncsos*

The 5 Equity-Based Practices

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| 1. Going Deep With Mathematics | 4. Challenging Spaces of Marginality |
| 2. Leveraging Multiple Mathematical Competencies | 5. Drawing on Multiple Resources of Knowledge |
| 3. Affirming Mathematics Learners' Identities | Aguirre, et all, 2013 |



The “How!”

Teachers help students understand how to listen to each other, ask questions, and offer their own thinking. Rather than memorizing a set of steps prepared by the teacher, we solve problems by talking about math together. Students think independently and then strategize with classmates and come to solutions on their own, with teacher support. Students use a variety of ways to come at the problem — a graph, a table, an equation — and then they explain their thinking to their peers. Once the group listens to every approach, they come up with one common strategy, which they share with the rest of the class to compare, contrast, and work together as a class to determine the best way forward.



What Does This Look Like?

- teachers plan for tasks with
 - various entry points
 - multiple solution strategies
 - problems that require high cognitive demand
- tasks are implemented so that
 - students analyze, compare, and justify solutions
 - students communicate their thinking to others
 - rigorous questioning can occur
- [Going Deep with Mathematics Quick Look](#)

Planning with Your PLC

Questions to Consider:

- Does this lesson include tasks that are high in cognitive demand, encourage multiple solution strategies, and deemphasize step by step procedures?
- Does this lesson promote mathematical analysis and reasoning?
- How can this task be implemented so that students communicate with one another and justify their solutions?
- Does the assessment allow for teacher feedback that will move students' thinking forward?



The Importance of PLCs And PLTs

Professional Learning Communities (PLCs) or Teams (PLTs) allow teachers to share best practices and brainstorm innovative ways to improve learning and drive student achievement.





By integrating equity practices into the mathematics classroom, educators can contribute to a more inclusive learning environment where every student has the opportunity to succeed and develop a positive attitude towards mathematics.



How Depth in Math is Connected to Equity

Students are not passive receivers of knowledge. They take new ideas and build connections to what they already know (Kamii, 1984). By incorporating various strategies to engage students of diverse backgrounds and learning preferences, teachers can ensure that students with different strengths and preferences have equal opportunities to build connections and understand mathematics. This levels the playing field by catering to various learning needs. Teaching that focuses on student thinking aligns with modern educational principles that prioritize inclusivity and student-centered learning. Incorporating real-world problems resonates with students' cultural backgrounds and experiences.

First, teachers provide opportunities for **collaborative learning**, which foster a sense of **community** and **support**. This creates an environment where all students, regardless of their background or abilities, can contribute and benefit from teamwork, promoting equity in participation and success.

Second, by incorporating real-world **tasks** into the curriculum, teachers can help students see the relevance of mathematical concepts in their daily lives. Tasks can be tailored to connect with different cultural backgrounds, making the learning experience more relatable. Not only can we diversify tasks, but teachers can also offer students an alternative way to demonstrate their understanding of concepts. Teachers recognize that traditional **assessments** may not capture the full range of students' abilities and provide alternative avenues for creativity and individual expression for demonstrating mastery.

Third, implementing tasks so that students can share and justify their ideas builds students' **academic autonomy**. When students implement an algorithm are they showing understanding or compliance? Having students explain a strategy better demonstrates understanding, showing teachers what students do know and do not know.

Tasks that Can Be Used to Delve Deep Into Mathematics

- [NC2ML Tasks](#)
- [The Math Assessment](#)
- [Project 3-Act Math Tasks](#)
- [Estimation 180](#)
- [Inside Problem Solving](#)
- [Math Milestones](#)



Want to Learn More?

NCTM Principles to Actions https://www.nctm.org/uploadedFiles/Standards_and_Positions/PtAExecutiveSummary.pdf

Equity-Based Practices <https://www.cde.state.co.us/comath/equitybasedmathteachingpractices>

Kamii, C. (1984). Autonomy: The Aim of Education Envisioned by Piaget. *The Phi Delta Kappan*, 65(6), 410–415.



Educators who actively identify and support underrepresented students in advanced mathematics programs are addressing systematic inequalities. Their actions challenge the historical disparities in access for each and every student to advanced math coursework.

Adapted from: Aguirre, J., Mayfield-Ingram, K., & Bernard Martin, D. (2013). *The Impact of Identity in K-8 Mathematics*. NCTM. <https://www.nctm.org/Store/Products/The-Impact-of-Identity-in-K-8-Mathematics-Rethinking-Equity-Based-Practices>