

THE COLLABORATIVE MATH CLASSROOM

A VISION OF TEACHING AND LEARNING MATHEMATICS

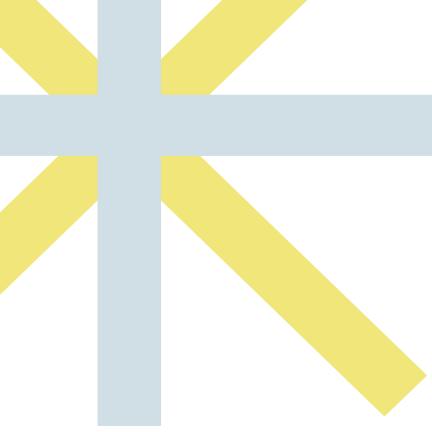
The following is adapted from *The Collaborative Math Classroom* by Jen Munson, Jennifer Garcia de Osuna, Faith Kwon, and Mary Trinkle.

Engaging in mathematical practices as a classroom and making sense of ideas together requires intellectual risk-taking, creativity, and lots of talk. The National Council of Teachers of Mathematics (NCTM) has been calling for just such a vision since 1989, with the Common Core State Standards (CCSS) jumping on board this train in 2010. And yet, moving toward creating math classrooms like this has been slow and difficult work. Shifting instructional practice means shifting our sense of what it means to teach mathematics well. For example, traditionally, the primary role of the teacher is to explain mathematics (Amit and Fried 2005). In the collaborative classroom, the teacher still explains mathematics, but that role becomes a secondary one, used judiciously in service of a new primary role —to cultivate mathematical inquiry and orchestrate mathematical discussions among students themselves (Herbel-Eisenmann, Wagner, and Cortes 2010; Stein, et al. 2008).

When teachers shift roles toward supporting and orchestrating collaborative mathematics experiences among students, they also hand over more of the thinking work to students. Students take on the authority to author and evaluate mathematical ideas. During small group or partner work, students take on even more of the thinking work since they are largely on their own while the teacher moves from group to group. Students also claim greater agency in how they participate in classroom tasks: they think about mathematics problems in different ways and all of these ideas might be at play as students make sense of them together.

A Vision of Teaching and Learning Mathematics

When we imagine a mathematics classroom, certain elements are likely to come to mind: a teacher at the front of the room presenting and explaining procedures, students raising their hands if they have a question or to share the right answer on individual assignments. In *The Collaborative Math Classroom*, we offer an alternative vision for a collaborative mathematics classroom. The role of teacher is not so much to explain as it is to curate and facilitate rich mathematical experiences that students engage in with one another.



Students' mathematical thinking and curiosities drive the day's work; teachers elicit, probe, and help to nudge students' thinking, wonder along with students, and help to create a classroom where students feel seen and heard as mathematical thinkers, learners, and community members. In this vision, the classroom is more than a place where students acquire important content knowledge about mathematics; instead, it is a place of both learning and becoming. Rather than simply learning mathematics, students learn to become young mathematicians together—posing and making sense of problems, directing their work together, and experiencing themselves and one another as mathematical contributors and thinkers.

A collaborative elementary mathematics classroom is an active, lively, and often joyful place marked by particular kinds of social interaction: children move about the room, finding and using the tools they need to make sense of the ideas at play, whether counting cubes, rulers, base ten blocks, or just paper and markers. Students sit in twos, threes, and fours at tables or sprawled on the rug, discussing strategies for solving problems. You might find it hard to spot the teacher; she's kneeling next to a pair of students as they build ten-sticks with cubes and talking with them about their work, clarifying and nudging their thinking forward.

Realizing this vision of a collaborative classroom might seem overwhelmingly complex at first glance, but we can break this vision down in terms of specific kinds of important social interactions. Social interactions are the building blocks of human activity, including the doing and learning of math. How students interact with the classroom space (the environment), with one another, and with mathematics defines the classroom community and each person's part in it. Rather than a classroom made up of students working on individual assignments or listening to a teacher's explanation, a collaborative classroom involves a variety of peer interactions, including asking questions, explaining ideas, expressing and resolving disagreements, gaining attention, making decisions together, and many more. In other words, unlike a traditional mathematics classroom, a collaborative classroom involves dialogue. Opportunities for making sense of mathematics, as well as for identifying positively as a young mathematician, emerge through that dialogue, both in the whole class and small groups. In this sense, collaborative mathematics classrooms can be thought of in terms of particular kinds of social interactions that support student-directed mathematical explorations and dialogue. In this book, we break down collaborative classrooms into their component building blocks and offer detailed and actionable goals to support you in creating such a classroom for you and your students. First, we'll identify some underlying principles to guide our work.

Seven Principles of a Collaborative Mathematics Classroom

We've identified seven principles to guide a collaborative mathematics classroom.

1. Teachers trust students and themselves. Students trust themselves, each other, and the teacher.

A thriving and productive collaborative classroom is fundamentally built on trust. Teachers must trust that students are earnest in their efforts to engage

with the environment, each other, and mathematics. And teachers must also learn to trust themselves by leaning into their curiosity, getting to know their students, responding to students' ideas, and recognizing that not everything needs to go perfectly each day. Students must be able to trust that their teacher will both accept them as they are and guide them in learning how to participate in community with others, that they do have ideas that are worth bringing to their classroom community, and that their peers will respond to their ideas in ways that make them feel seen and heard.

2. Students feel safe to bring their whole selves to doing and learning mathematics.

Trust begets both a sense of agency and a sense of safety. Students feel they can bring their whole selves, including their interests, ideas, curiosities, and experiences, to investigating mathematics with their peers. Sharing one's thinking and wonderings with others takes vulnerability, and, in a space of safety, such willingness to share and contribute fosters rich, productive discussions about the big ideas of mathematics.

3. All student voices are worthy.

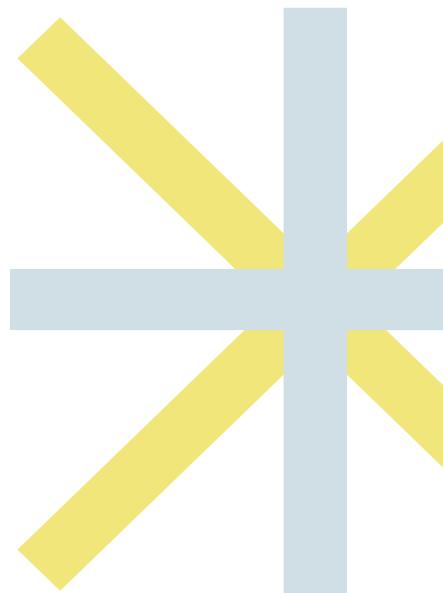
A collaborative classroom needs diverse ideas to promote the authentic explorations, discussions, debates, and dilemmas that promote deep understanding. Even incorrect ideas can spark aha moments when students wrestle with them while considering other ideas. Further, classrooms, when seen as spaces of becoming, require students to learn to use their voice, to explore and practice voicing their own ideas, and to know that their ideas are always worth considering.

4. Teachers center the needs and voices of vulnerable students.

To have authentic dialogue, students must learn to share intellectual authority to voice and discuss mathematical ideas jointly. Particular students might struggle to be seen and heard in the classroom for a variety of reasons, ranging from issues of status to cultural and social identities to challenges related to attention deficit hyperactivity disorder, autism spectrum disorder, or trauma. By centering the needs and voices of vulnerable students, the classroom creates the space for more inclusive dynamics that ultimately support richer mathematical dialogue.

5. Mathematics focuses on reasoning, sensemaking, and big mathematical ideas.

Students in collaborative math classrooms make sense of mathematics. By exploring and investigating big ideas, such as place value, addition and subtraction, fractions, or shapes, students have the opportunity to reason with one another and develop conceptual understanding. For example, students might add two numbers by first representing by building ten-sticks out of linking cubes and discuss what happens when the remaining ones of each addend are joined together, creating a new ten-stick. These students have the opportunity to not simply memorize addition facts but to explore what place value is by constructing tens out of ones and reasoning about what it means to join two quantities through the mathematical act of addition. Students are able to see addition, investigate quantity, and make sense of place value.

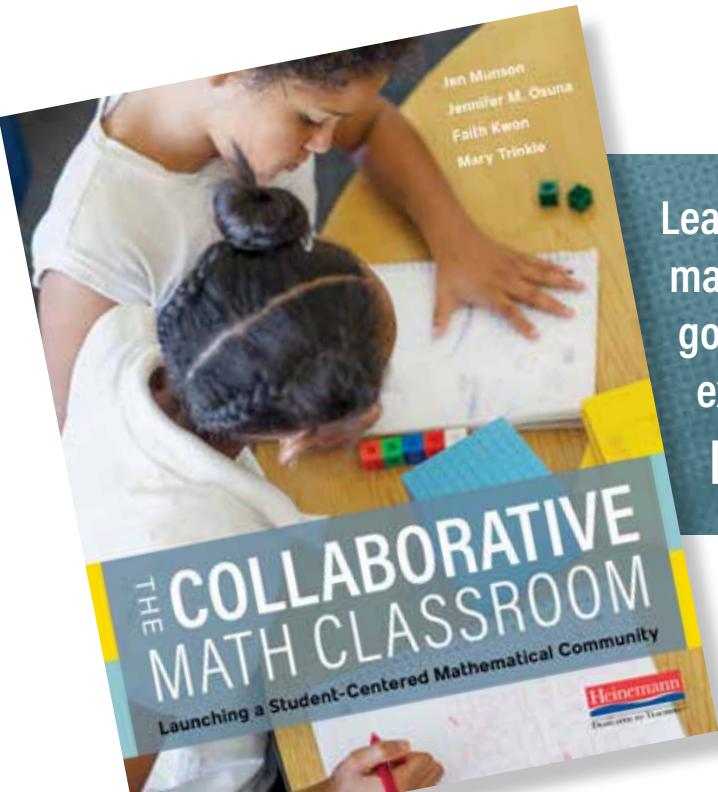


6. Mathematical tasks invite and value multiple voices, conceptions, and strategies.

Because a collaborative mathematics classroom is based on exploration and dialogue, it matters that multiple ideas are at play. Simple, procedural questions meant to practice a single traditional algorithm provide little to discuss beyond how to do the procedure. Open tasks in a collaborative classroom enable discussion of multiple strategies. For example, even a simple addition expression like $32 + 67$ can invite multiple ideas when students are encouraged to solve it in whatever way makes sense to them. One student might share that they imagined the problem as $30 + 60$ and then $2 + 7$, while another student might say that they imagined the problem as $32 + 70$ and then removed the extra 3. Sharing why their strategies make sense and lead to the same answer provides rich opportunities for students to dig more deeply into numbers and also allows them to experience themselves, and others, as mathematical thinkers, learners, and community members.

7. The physical environment is designed to serve students and their work with one another and mathematics.

A collaborative mathematics classroom is active, hands-on, and student led. The physical environment must be conducive to collaboration, exploration, and even a bit of a break when needed. This means that students need table arrangements that facilitate conversation and pathways around the classroom that allow them to get up, choose needed materials, and find spaces in the room where they can investigate their ideas. A collaborative classroom can get somewhat noisy and students, especially those sensitive to stimulation, may also need a quiet corner to take a moment to think on their own before rejoining their group.



Learn more about how to launch a collaborative math classroom with structures, suggestions, goals, and answers drawn from classroom experience and backed by research.

Hein.pub/CollaborativeMath