Classrooms that are truly rooted in student-centered learning are communities where students take control of their own learning by taking risks, thinking flexibly, and critiquing their own and others' ideas. In order for students to thrive successfully, the classroom culture must be one that fosters a deep level of respect from and for all learners.

**Respect: Why It Matters**

When a respectful atmosphere exists in the classroom, students feel more comfortable sharing their mathematical thinking with one another, taking risks, and tackling new ideas. All learners feel that they and their ideas are important.

The first step to building a respectful community of learners is to develop positive relationships between students as well as with the teacher. This can be accomplished in the beginning of the year through the careful use of relationship-building activities (see more below). Spending time getting to know your kids, their families, and their interests also helps form these valuable relationships. Showing interest in our students lets them know that we value them as individuals; it sets up an atmosphere in which students feel respected and cared for when they come to school.

Clear expectations are also essential in building a respectful community. These expectations should be created with the students. When students have a say in creating the expectations, they are more likely to internalize them. It requires time, effort,
and lots of practice to set up and reinforce these expectations, but the time invested is more than made up for throughout the year. When expectations are clear and well established, you can focus more on increasing the depth of learning than on managing student misbehaviors.

Respect comes down to two core beliefs that both we and our students need to internalize: everyone has the right to learn, and we should all respect the ideas of others. In this chapter, we'll look at ways to build and reinforce both these beliefs.

**Encouraging Respect Within the Classroom**

In our classrooms, respect is the foundation by which we develop trust and a sense of safety both with our students and between our students. When we are all able to show respect for one another as learners, including the teacher, students feel safe and feel empowered to make decisions about their own learning. They feel free to take the kind of risks needed in order to deeply understand mathematical concepts.

Respect must be directly taught to students and needs to be reinforced throughout the year. We teach respect specifically through modeling and targeted praise. We show students that we respect them by providing them with opportunities to make their own decisions and honoring the decisions they make. In our classrooms, respect is at the heart of every interaction we have with students and is the undercurrent through which we manage our classrooms.

**USING READ-ALOUDS**

Although the term respect is familiar to most people, we can't assume that students know what it means to be respectful to teachers and classmates. Before introducing and teaching our specific classroom beliefs about respectful learning, it is important to ensure that all the students in your classroom understand what it means to be respectful. Read-alouds are a helpful tool for discussing ideas and concepts related to respect.

One book we often use is *Chrysanthemum*, by Kevin Henkes. This is a story about a young mouse who loves her unique name, Chrysanthemum. Her feelings change when she attends school and all her classmates begin to make fun of her long, unusual name. Throughout the story, Chrysanthemum shows us what it feels like to be on the receiving end of disrespectful treatment. Chrysanthemum's story is something students can relate
Picture three students as they tackle a challenging math problem. Yolanda finishes quickly with little struggle. Irma tackles the problem several times before finally figuring it out and smiling with pride. Sabrina gets frustrated on the first try, feeling as though she isn’t smart enough to solve the problem. She eventually copies a neighbor, so she can get an answer on her paper.

As you picture these three girls, who would you say learned the most from the problem? Sabrina gave up immediately and just copied an answer. Yolanda finished quickly and got the answer right, but did she learn anything new? What might happen if she was confronted with a problem she didn’t know how to solve—would she persevere or give up when confronted with the new challenge? It’s hard to tell. Now think about Irma, who struggled and persevered until she finally solved the problem. She made a few mistakes along the way but was not discouraged by them and continued working until she figured it out. When we teach math to young children, it is our job to create a classroom community where all our students have mathematical confidence and perseverance.

Mathematical Confidence: Why It Matters

In order for children to make sense of math, they must believe that they are capable of understanding and learning math. There is a pervasive belief in our culture that being good at math is an innate ability. However, researchers like Carol Dweck have worked
hard to disprove this belief. According to Dweck (2006), people with a fixed mindset believe that our abilities and intelligence cannot be changed, while people with a growth mindset believe that our abilities can be changed through study, practice, and hard work. As teachers, we need to reinforce a growth mindset in our students. Mathematical confidence reflects a growth mindset and includes a willingness to persevere, a positive attitude toward mistakes, a willingness to take risks, and self-reliance.

PERSEVERANCE

Children's mathematical confidence affects their approach to challenges and failure. Children with low self-confidence may fail or make a mistake and define themselves by that failure, deciding that they are not smart. When faced with a challenge, these children may get angry and give up because they feel they are not smart enough to figure it out. On the contrary, students who see themselves as "smart" may believe that any struggle means that they are not smart. This may lead them to seek to preserve their sense of "smartness" by avoiding something that might take work.

Children who possess mathematical confidence look at challenging math problems in a completely different way. Failure is a chance to learn and grow. It is a chance to reflect and think, "What can I do better next time?" Common Core Mathematical Practice Standard 1 asks children to "make sense of math problems and persevere in solving them" (CCSSO 2010). Children with mathematical confidence are able to persevere through challenging problems, trying and trying again until they figure them out. It is our job as teachers to help them gain this perseverance.

VALUING MISTAKES

Fear of making mistakes, and being labeled as "wrong" or "failing," is one of the greatest obstacles to perseverance and to mathematical confidence. When students fear mistakes, it halts their ability to truly problem-solve. They are hesitant to try a strategy because they don't know for sure that it will get them the right answer. Children who have strong math confidence are unafraid to make mistakes. They know that mistakes are stepping-stones that help us learn. Jo Boaler, in her book Mathematical Mindsets, discusses brain research that shows how our brain grows and develops each time we make a mistake. When students solve a problem and get the answer right, no new neural
pathways are formed. However, when a student makes a mistake, synapses in the brain fire, forming new pathways and connections. Most surprisingly, new brain pathways are formed from making mistakes even when we don't know we are making them (Boaler 2016). Boaler’s research shows us that children and adults learn most when they are challenged and make mistakes. In a math classroom, mistakes should be celebrated as “great mistakes!” and learning opportunities, not looked at as simply wrong answers.

**TAKING RISKS**
To be successful mathematicians, young children also need to learn to be brave with new ideas. They need to feel confident enough to take risks, try new strategies, and share their thinking even when it contradicts that of others. When students believe in themselves enough to take mathematical risks, they know that if one strategy doesn’t work, they can always try another. They feel confident that if they don’t get it right the first time, they’ll be able to figure out a way to solve the problem eventually. When a new, unfamiliar strategy is suggested, they are willing to give it a go. Helping students develop the confidence they need in math will allow them to take the risks necessary to truly make sense of mathematics.

**SELF-RELIANCE**
When students feel brave as mathematicians, they do not rely on the teacher to tell them what to do or how to solve a problem. They do not look for confirmation of their answers but instead check their own work and justify their thinking. We need to help them develop the mathematical confidence to persevere through tough problems, embrace productive mistakes, and challenge themselves by trying new strategies and ideas without constantly looking to the teacher for the answers.

**Encouraging Mathematical Confidence**
It is our responsibility as teachers to help set up a classroom environment that allows students to feel confident in their mathematical abilities as they persevere, make mistakes, and take risks with new ideas. When students possess this confidence, little stands in the way of their mathematical development. Below are some ways to begin building this environment for your students.
One of the biggest challenges in implementing a problem-solving-based classroom is the belief that there is only one right way to do math. For many years, math has been a procedural subject: learn the algorithm, memorize the facts, follow the steps, and get the answer. Sense making has played a very small role. Math, however, isn't just calculation; it is a balance of procedural fluency, conceptual understanding, and problem-solving (including strategic competence, adaptive reasoning, and productive disposition) (NCTM 2014). For years, we’ve emphasized the importance of computation and procedure while ignoring conceptual understanding, problem-solving, and a student’s general mindset about math.

By encouraging students to flexibly use a variety of strategies when problem-solving, we help them develop the skills and confidence necessary to choose and use an appropriate strategy given the context of a particular problem. Students can then gain a deeper understanding of numbers and mathematical concepts by explaining their thinking and making sense of the problem on their own. Those who can clearly communicate and reason about mathematics have a greater potential for understanding the concepts that underlie the problems.
Multiple Strategies and Justification: Why They Matter

To change the way we and our students think about math, it is important to emphasize two key beliefs:

- There are different strategies to solve a problem, and students should be flexible in using a variety of strategies.
- While finding the answer is the end goal, it's more important to be able to explain how we got there.

When students are able to explain their thinking and have freedom to pick a strategy that works for them, they are able to create meaning around mathematical concepts.

MULTIPLE STRATEGIES

Students deepen their conceptual understanding by seeing and using a variety of strategies. When exposed to many strategies and representations, students learn to pick the strategy that not only makes the most sense but is also the most efficient given a particular problem. Students also need to spend time comparing different strategies and making connections between multiple representations of a problem, strengthening their mathematical understanding as they do. As teachers, we must create a classroom culture that empowers students to try new strategies and bravely compare those strategies with those of their classmates.

JUSTIFICATION

Teaching students to focus not just on the answer but on the process of getting to the answer (and the need to be able to explain that process to others) helps students clarify their thinking, communicate it to others, and make connections between their own thinking and the thinking of others. John A. Van de Walle et al. (2014, 6) say that when students focus on the process, they “develop their understanding of mathematics because they are at the center of explaining, providing evidence or justification, finding or creating examples, generalizing, analyzing, making predictions, applying concepts, representing
ideas in different ways, and articulating connections or relationships between the given topic and other ideas." Students gain a deeper understanding of numbers and mathematical concepts through the act of explaining their thinking because they are able to make sense of the problem on their own.

Teachers can also use these representations and justifications for assessment purposes. When we look at students' representations of their thinking, we can see the students' level of understanding as well as any areas where students have misconceptions.

**Encouraging Multiple Strategies and Justification**

Teaching students to make use of multiple strategies and to represent and justify their thinking instead of just writing an answer can be challenging and takes time. It requires constant reinforcement, along with questioning from the teacher and other students as their skills develop. At the beginning of the year, students realize quickly that they are not going to be able to put down an answer and be done with math for the day. From there, the hard work begins. It is our job to encourage students to believe in themselves as mathematicians so they feel comfortable sharing, discussing, and explaining strategies.

**CLASSROOM STRUCTURES**

In the first days of school, we see students who write down one giant number for their answer and with a grin from ear to ear drop their pencil and say, "I'm done!" The grin soon disappears when you ask, "How do you know?" Many students, especially students who are used to always getting the right answer and being praised for it, freeze when you ask them how they got their answer. There are several things teachers can do to reinforce the importance of multiple strategies and justification.

**Tasks That Elicit Thinking**

In order to elicit valuable student explanation in math, the tasks or problems we give children have to be meaningful. John A. Van de Walle et al. (2014, 18) say that it is the teacher's responsibility to expose children to problems that "support the development of the mathematical ideas you want children to learn." Students will develop deeper understanding of a concept by applying it to a relevant, real-world context.
As teachers, we encourage students to think deeply as they read, questioning an author's reasoning and motivations. We must encourage them to do the same with math. The Common Core State Standards for Mathematical Practice encourage students to provide evidence of their thinking and evaluate the evidence provided by others. One of the best ways to help students accomplish these goals is through deliberate and direct questioning, both from the teacher and by the students themselves.

**Questioning: Why It Matters**

Being able to ask specific, targeted questions is a skill that must be learned and practiced by both the teacher and the students. When we as teachers question students, we must learn how to ask the specific types of questions that pull out the information we are looking for from our students. As we question our students, we are also modeling effective questioning techniques. Students will learn to ask the same types of targeted questions of each other as they learn to analyze and compare their classmates' mathematical reasoning. Questioning is crucial to our math instruction.

**TYPES OF QUESTIONS**

Questions are one of the most valuable tools we have as teachers. Strategic, deliberate questions can push student thinking to deeper levels and open up opportunities for quick formative assessment. With every math problem we give our students, we think about
which questions will allow us to formatively assess student understandings and/or misconceptions. We think about which questions will push students’ thinking, allowing them to extend their understanding of mathematical concepts and ideas. As students answer questions and discuss mathematical concepts and ideas, they are able to develop a metacognitive awareness of their own understanding and thought processes.

It is also important for us as teachers to be flexible with our questioning. Even with the best-planned lesson, we can never quite know which direction a conversation may flow. Teachers must be able to adapt their questioning to the conversation as it happens. Doing this requires us to truly listen to our students and be responsive to where they are in their understanding. It requires patience and practice to become artful, thoughtful questioners.

Teacher questions generally fit into three categories:

1. questions that clarify and probe for justification
2. questions that guide, challenge, and extend thinking
3. questions that assess understanding

You will notice that these question types often overlap, but here we will explain the general purpose for asking each type of question. Skilled teachers must be able to choose which questions to use based on the students they are working with. In one conversation, a teacher may fluidly move back and forth between all three question purposes and types, and an individual question may address two or more purposes at once.

Questions That Clarify and Probe Thinking

Clarification questions help students understand a task, make sense of a problem, and explain their thinking more clearly. Clarification may be necessary as they solve a problem or share their thinking with others. When introducing a problem task or new idea, we use clarification questions to ensure that students understand the problem, or to help them visualize the context of the problem and help them see what the problem is asking them to figure out. Clarifying questions can also help highlight and define any new or unfamiliar vocabulary that may interfere with student understanding. Finally, clarifying questions can help ensure that the rest of the class is following along with the presenter’s line of thinking during a share.