

# How to Integrate Growth Mindset Messages Into Every Part of Math Class

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Catherine Good has experienced stereotype threat herself, although she didn't know it at the time. She started her academic career in pure math, expecting to get a Ph.D. But somewhere along the way she started to feel like it just wasn't for her, even though she was doing well in all her classes. Thinking that she'd just chosen the wrong application for her love of math, Good switched to math education, where she first encountered the idea of stereotype threat from a guest psychology speaker.

"As he talked about students feeling that they don't really belong, I had an epiphany," Good said. She realized the discomfort she'd felt studying mathematics had nothing to do with her ability or qualifications and everything to do with a vague sense that she didn't belong in a field dominated by men. [Stereotype threat](#) is a term coined by psychologists Joshua Aronson and Claude Steele. They found that pervasive cultural stereotypes that marginalize groups, like "girls aren't good at math," create a threatening environment and affects academic achievement.

Good was so fascinated by how powerful psychological forces can be on learning, including her own, that she switched fields again to study social psychology, and she ended up working closely with Carol Dweck for several years when Dweck's growth mindset work was in its early stages and not yet well-known among educators. Good now works at a psychology professor at [Baruch College](#). Originally, Dweck and Good hypothesized that believing intelligence is flexible — what we now call a growth mindset — could [protect students from stereotype threat](#), an inherently fixed idea.

"If students are first really encouraged and taught to believe in brain plasticity, our hypothesis was that they could be protected," Good said. While that hypothesis was shown to be true, Dweck and Good also began to uncover forces that seemed to undermine individual mindsets.

"What we found was that students' perception of what's going on in their learning environments are often more important than their own beliefs," Good said. In other words, if a classroom climate is one of fixed ability, it will override a student's own beliefs about his brain plasticity. This effect was even more pronounced when stereotype threat was present. Students were less likely to feel belonging and were less likely to engage with content. That, in turn, led to lower achievement and lower grades.

"When you are looking at a long-term trajectory that's when the culture really becomes much more important," Good said — especially in certain fields of study, like math and science, where stereotype threat exists and traditional classroom structures favor a laddered approach to learning that screens out the unworthy and is inherently sending fixed mindset messages.

## APPLYING GROWTH MINDSET

A recent [Education Week Research Center survey](#) of 600 K-12 teachers nationwide found that over three-quarters of respondents felt "familiar" or "very familiar" with growth mindset as a concept, and nearly all reported feeling it

had a positive potential for teaching and learning. A large portion of respondents also connected growth mindset with a range of positive outcomes and behaviors, but only 20 percent felt strongly that they themselves were good at cultivating a growth mindset in their students. Still fewer had confidence in their colleagues and administrators.

The gap between awareness of growth mindset as a good thing to incorporate into the classroom and the confidence to actually do so, especially in specific courses, may be why [Carol Dweck and others are warning that growth mindset has been misinterpreted](#), sometimes to ill effect.

“People are much more likely to fall back on negative stereotypes with a naive understanding [of growth mindset],” Good said. She described a study one of her graduate students recently completed that tested teachers’ perspectives on student success. The graduate student gave one group of teachers an article to read that could be described as a “pop culture” understanding of growth mindset. The other group read a paper explaining that the most important way to increase student learning is for teachers to be reflective on their own pedagogical practices. Then that group reflected on new approaches they might try to help a struggling student.

Teachers who received only a broad brush understanding of growth mindset were less likely to reflect on their practice and more likely to shift blame back onto the struggling student for not having a growth mindset. Author, and critic of many traditional education practices like grades and standardized testing, [Alfie Kohn has also written](#) about this danger.

Often teachers take away two messages from growth mindset articles or trainings: Effort is important and mistakes should be celebrated. But when applied simplistically, both these takeaways can be damaging. For example, for a student who is trying hard, but not achieving success, being told to try harder could be demoralizing. And celebrating mistakes without taking time to reflect on new strategies to try again doesn’t lead to the same learning gains.

[Confusion about growth mindset](#) and traditional structure of many classrooms are particularly apparent in math class, and to some extent science as well. As a former mathematician turned social psychologist with a deep interest in helping marginalized groups succeed and feel welcome in science, technology, engineering and math fields, Good has some specific ideas about how growth mindset could be incorporated into the fabric of math class.

## CULTURE

The first big obstacle is embedded in American culture. Somehow it has become acceptable to brag about not being “[a math person](#).” Good says that has to stop, especially when that type of [math anxiety](#) is coming from teachers and parents. “It’s almost like an infection model where the class fixates on that anxiety and is infected as well,” Good said.

## PROBLEMS WITH ERRORS

One concrete mathematical teaching strategy that inherently promotes a growth mindset is to present students with worked-out problems that have errors. Students follow the thinking in the problem, identify the mistakes and rework them. “Embedded in that worked example is a lovely opportunity to talk about growth mindset and mistakes and process,” Good said.

## THINK LIKE A MATHEMATICIAN

School math has become almost entirely about demonstrating how to solve a problem, rather than actually engaging in [the kind of problem-solving](#) that is at the heart of what professional mathematicians do. In other subject

areas teachers encourage students to “think like historians” or to become writers. In those disciplines students create their own variations on expert texts and are encouraged to become practitioners. Not so in math. Good said the discussion around math should be about pushing through challenge, the same way real mathematicians do every day.

## RETHINK ASSESSMENTS

One of the biggest ways math teachers can embed a growth mindset into the structure and environment of class is to change the role of assessment. Rather than taking tests whose scores accumulate into a final grade, students should get credit for [returning to problems they didn't get right](#), recognizing their mistakes and reworking the problems. Growth over the course of the year should be rewarded. Students shouldn't be penalized in their final grade for doing poorly at the beginning of the year if they worked hard to learn the material over time. Assessments send very clear mindset messages that are far more powerful than anything a teacher says about growth mindset.

“Yes, we have to give assessments,” Good said, “Yes, we have to give grades. But when teachers say this grade doesn't mark you or indicate what you are capable of in the long term, it shifts the whole meaning of the assessment for students,” Good said.

She favors a [mastery approach](#) that allows students to go back, relearn concepts that they got wrong and earn points for that work in part because it ensures students actually learn the material before moving on, but also because it is important for teaching a growth mindset. It shows the teacher has high expectations, but believes the students can succeed and will provide support as they work to understand.

“This is where assessment can drive learning, but only if you go back and look at what you did and learn from it,” Good said.

## HELPFUL FEEDBACK

Feedback is one of the most effective ways to help a student grow, but teachers must be mindful that students will always receive critical feedback through the lens of their stereotype threat. Human brains are also wired to [pay more attention to negative inputs](#) than positive ones. When teachers couch feedback with assurances that they will continue to hold the student to high standards and that they know he can get there, it helps protect him from the stereotype.

On the flip side, teachers who have fixed mindsets themselves are more likely to give comforting feedback meant to make the student feel better. Comments like, “It's OK, let's look at where you do have strengths,” are meant well, but communicate a fixed mindset to the student. “Things we do for students to boost their self-esteem actually have these ironic effects of making students feel you don't believe in them,” Good said.

## RETHINK ADVANCEMENT

Good sees the current practice of looking at math learning as a ladder with progressively more difficult rungs as a detrimental approach. It encourages teachers to [act as gatekeepers to higher-level classes](#), funneling the “smart” kids into advanced courses and keeping out those who struggle. That in turn communicates low expectations and a fixed mindset about students' abilities. Good said there should be multiple entry points, as opposed to a linear progression.

## PREPARE EVERYONE

Growth mindsets are often discussed in relationship to kids who struggle, but the concept is just as [relevant to kids](#)

[who breeze through the material](#). Telling those kids they are smart is not setting them up for success later when they do struggle. For Good, that struggle didn't come until graduate school, but she distinctly remembers feeling "not smart anymore" because she was struggling. Math teachers need to give high achievers opportunities to struggle and persevere early and often so the experience is not foreign to them.

Embedded in all of this growth mindset work is a general culture shift around how math is taught and who can excel at it. It's no surprise that teachers are struggling to integrate growth mindset into their teaching practice because every child is different. When it comes to perceptions of intelligence, belonging and whether a teacher cares, many factors come into play. Most teachers were educated in math classrooms with fixed mindset messages, as were [most parents](#), so [shifting the culture of classrooms and schools](#) is work that takes time and incremental changes. But when [teachers commit to that work](#), the shift is possible.