

IMPORTANCE OF GROWTH MINDSET IN MATHEMATICS

Teachers greatly influence how students perceive and approach struggle in the mathematics classroom. Even young students can learn to value struggle as an expected and natural part of learning, as demonstrated by the class motto of one first-grade math class: “If you are not struggling, you are not learning” (Carter 2008, p. 136). Teachers must accept that struggle is important to students’ learning of mathematics, convey this message to students, and provide time for them to try to work through their uncertainties. Unfortunately, this may not be enough, since some students will still simply shut down in the face of frustration, proclaim “I don’t know,” and give up. Dweck (2006) has shown that students with a fixed mindset—that is, those who believe that intelligence (especially math ability) is an innate trait—are more likely to give up when they encounter difficulties because they believe that learning mathematics should come naturally. By contrast, students with a growth mindset—that is, those who believe that intelligence can be developed through effort—are likely to persevere through a struggle because they see challenging work as an opportunity to learn and grow. *

The fixed mindset appears to be more prevalent in mathematics than in other subject areas (Dweck 2008). Mindsets, however, can be changed when students realize that they are in control of how they approach and view their own abilities to learn (Blackwell, Trzesniewski, and Dweck 2007). It is important to note that even students who have always gotten good grades may have a fixed mindset. These higher-achieving students are often concerned about how smart they appear to be, so they prefer tasks that they can already do well and try to avoid tasks in which they may make mistakes. Dweck (2008, p. 8) offers important words of caution:

For the last few decades many parents and educators have been more interested in making students feel good about themselves in math and science than in helping them achieve. Sometimes this may take the form of praising their intelligence or talent and sometimes this may take the form of relieving them of the responsibility of doing well, for example, by telling them they are not a “math person.” Both of these strategies can promote a fixed mindset.

A key message from this research is that teachers must acknowledge and value students for their perseverance and effort in reasoning and sense making in mathematics and must provide students with specific descriptive feedback on their progress related to these efforts (Clarke 2003; Hattie and Timperley 2007). This behavior by teachers may include giving feedback to students that values their efforts at trying varied strategies in solving problems, their willingness to ask questions about specific aspects of the task, or their attempts to be precise in explanations and use of mathematical language. For example, if students need to be more precise in their written or verbal explanations, the teacher could provide feedback that details how their explanations either are, or are not, precise. The result will be the development of students who are more likely to embrace difficulties and uncertainties as natural opportunities in solving problems and maintain engagement and persistence in their mathematics learning. (For an example of a warm-up routine that engages students in an eighth-grade classroom in productive struggle, view “My Favorite No: Learning from Mistakes” [<https://www.teachingchannel.org/videos/class-warm-up-routine>].) *