

What We Know About Learning Mindsets from Scientific Research

BY LISA QUAY & CARISSA ROMERO

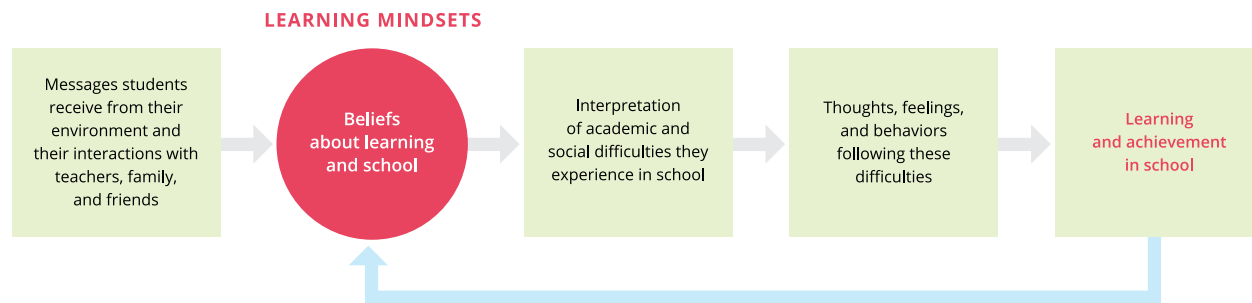
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LEARNING MINDSETS

Mindsets are students' beliefs about learning and school. Students who hold learning mindsets are more motivated to take on challenging work, persist in the face of setbacks, and achieve at higher levels. Research shows that the following learning mindsets play a role in students' educational outcomes.

- **Growth Mindset:** The belief that intelligence can be developed
- **Belonging:** The belief that one is respected and valued by teachers and peers, and fits in culturally in one's learning environment
- **Purpose & Relevance:** The belief that one's school work is valuable because it is personally relevant and/or connected to a larger purpose

The role of learning mindsets in shaping academic outcomes



CHALLENGES ARE AN IMPORTANT PART OF THE LEARNING PROCESS

Research tells us that we enhance our learning when we persist through intellectual challenges.^{1,2}

Neuroscientists have shown that our brains operate like a muscle. When we go to the gym, we do exercises that make our muscles struggle—because that's what will make them stronger. The same is true of our brains. Research demonstrates that our

brains benefit when we get to work through challenges, like learning a new skill,³ or when we make mistakes.⁴

LEARNING MINDSETS AFFECT STUDENTS' INTERPRETATIONS OF CHALLENGES

Learning mindsets affect whether or not students engage with challenges because they affect the way in which students make meaning of those challenges. More broadly, mindsets are

¹ Bjork, E. L., & Bjork, R. A. (2014). Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. In M. A. Gernsbacher and J. Pomerantz (Eds.), *Psychology and the real world: Essays illustrating fundamental contributions to society* (2nd edition), (pp. 59-68). New York: Worth.

² Yeager, D.S., et al. (2014). Boring but important: A self-transcendent purpose for learning fosters academic self-regulation. *Journal of Personality and Social Psychology*, 107, 559-580.

³ Driemeyer J, Boyke J, Gaser C, Büchel C, May A (2008). Changes in Gray Matter Induced by Learning—Revisited. *PLoS ONE* 3(7): e2669.

⁴ Yeung, N., & Summerfield, C. (2012). Metacognition in human decision-making: confidence and error monitoring. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, 367(1594), 1310–1321. <https://doi.org/10.1098/rstb.2011.0416>

MINDSET SCHOLARS NETWORK

The Mindset Scholars Network is a group of leading social scientists dedicated to improving student outcomes and expanding educational opportunity by advancing our scientific understanding of students' mindsets about learning and school.

How we interpret challenges affects our motivation to remain engaged with them, and this is where learning mindsets come in. If we don't remain engaged, we lose out on the cognitive benefits of productive struggle.

the lenses through which students interpret their day-to-day experiences in school, particularly experiences of challenge and uncertainty.

For example, different students receiving the same exact low score on an assignment early in the term may have very different responses depending on the mindsets they hold. If a student is uncertain whether they belong in the class, does not see the larger purpose or personal relevance of the work, or does not believe they can grow their intelligence, that student may interpret the low score as a confirmation of their beliefs, withdrawing effort and steering clear of future challenges.

In contrast, a student who feels respected and valued in class, has had the opportunity to connect the work to their life or a larger purpose, and knows that intelligence is malleable may see the test score as an indication that they simply haven't mastered the material yet.

Mindsets about learning and school that are maladaptive can set in motion a negative, self-reinforcing cycle

A student who is questioning their belonging, the purpose and relevance of their schoolwork, or their ability to grow their intelligence may see the poor grade as an indication that they can't "cut it" or may write off the class as not worth their time.

In turn, these beliefs can sap motivation and create distractions, which may lead to further low scores, confirming the student's original hypotheses. This student can thus get caught in a negative, self-reinforcing cycle: the worse they do, the more they withdraw, and the more they confirm these beliefs.

Learning mindsets can spark a positive, self-reinforcing cycle

In contrast, a student who believes it's possible to develop their intelligence may interpret the poor grade as a sign that they need to work harder, use different strategies, or ask for help. A student confident in their belonging may think that challenges are typical, especially when trying something new, and will not worry that their low grade is a sign they don't belong in the class. A student who perceives the material to be personally relevant and purposeful may sustain their effort in the work, even if the content is challenging, because they see its value.

When these students perform better because they are more deeply engaged and can sustain their focus on the learning at hand, this can trigger a positive cycle: better performance

provides more evidence for their adaptive beliefs, and the more they are motivated to remain invested and engaged in class.

STUDENTS' INTERPRETATIONS OF CHALLENGES ARE SHAPED BY THEIR DAY-TO-DAY EXPERIENCES, INTERACTIONS, AND OBSERVATIONS

Mindsets are not fixed traits. They come from messages students pick up from society, their interactions with others, and their experiences in school.⁵

Even when students receive the same curriculum and the same instruction from the same teacher, their personal experience of that classroom differs depending on their beliefs about the nature of ability, their belonging in that context, and the purpose and relevance of their schoolwork. These beliefs are rational responses to a student's prior observations and interactions. They are context-dependent, and are shaped by the interaction of a person's identities with a given context.

When a student is told "it's okay, some people just aren't 'math people'", they may come to believe that mathematics ability is something you are born with. They may withdraw effort or worry about how to avoid "looking dumb".

Aware of the stereotypes that mathematics professors may have about women, a mathematics major may question whether she is respected and valued, and may be on the alert for cues that others think she doesn't belong—particularly people with status and power in that context.

And when the connection between a student's daily schoolwork and their life or a larger purpose isn't clear, they understandably have little incentive to remain engaged when the work is tedious, frustrating, or challenging.

STUDENTS CAN ADOPT LEARNING MINDSETS WHEN THEY RECEIVE DIFFERENT MESSAGES

The good news is that mindsets can be transformed. Studies have shown that students can adopt learning mindsets when the messages they receive from their learning environments reinforce adaptive beliefs.⁶ This can happen either through institutional policies and practices, through what others in the environment communicate, or through targeted psychological exercises. Changes in mindsets can alter students' academic behaviors in ways that can lead to sustained improvements in performance.

⁵ For a synthesis of the ways in which the learning environment shapes students' mindsets, see the Mindset Scholars Network brief entitled "[Leveraging Mindset Science to Design Educational Environments that Nurture People's Natural Drive to Learn.](#)"

⁶ For more information about messages that reinforce adaptive beliefs, see the Mindset Scholars Network research summary entitled, "[The science of "wise interventions": Applying a social psychological perspective to address problems and help people flourish.](#)"

Altering the environment in which students learn changes the messages they receive

Students constantly receive cues and messages from the environment—from the content of curricula and how educators introduce learning tasks to grading policies and how students are tracked into different course pathways and degree programs. Studies suggest that it is possible to change messages students receive from the environment in ways that encourage a sense of belonging, purpose and relevance, and growth mindset.

Students can also receive new messages through carefully-targeted exercises

Research has also shown that it is possible to deliver new messages directly to students through brief exercises.⁷ When students receive well-crafted messages that target specific beliefs, they can come to adopt learning mindsets that affect their academic performance—for example, improving their persistence and grades in the first year of college⁸ or their mathematics course-taking and grades in the first two years of high school.⁹

Understanding variation in the effects of these exercises (for whom they are effective, in what specific contexts, and under what conditions) can also inform efforts to change the messages students receive on a day-to-day basis from the world around them. Ultimately, system- and institution-level policies, structures and norms in society, and daily educational practices should all be aligned to foster adaptive beliefs among students.

⁷ Yeager, D.S., Henderson, et al., 2014

⁸ Yeager, D.S., et al. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences*, 113 (24) E3341-E3348.

⁹ Yeager, D.S., Hanselman, P., Walton, G.M. et al. (2019). A national experiment reveals where a growth mindset improves achievement. *Nature*. 573, 364–369.