Brainology

Transforming Students' Motivation to Learn
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This is an exciting time for our brains. More and more research is showing that our brains change constantly with learning and experience and that this takes place throughout our lives.

Does this have implications for students' motivation and learning? It certainly does. In my research in collaboration with my graduate students, we have shown that what students believe about their brains — whether they see their intelligence as something that's fixed or something that can grow and change — has profound effects on their motivation, learning, and school achievement (Dweck, 2006). These different beliefs, or mindsets, create different psychological worlds: one in which students are afraid of challenges and devastated by setbacks, and one in which students relish challenges and are resilient in the face of setbacks.

How do these mindsets work? How are the mindsets communicated to students? And, most important, can they be changed? As we answer these questions, you will understand why so many students do not achieve to their potential, why so many bright students stop working when school becomes challenging, and why stereotypes have such profound effects on students' achievement. You will also learn how praise can have a negative effect on students' mindsets, harming their motivation to learn.

Mindsets and Achievement
Many students believe that intelligence is fixed, that each person has a certain amount and that's that. We call this a *fixed mindset*, and, as you will see, students with this mindset worry about how much of this fixed intelligence they possess. A fixed mindset makes challenges threatening for students (because they believe that their fixed ability may not be up to the task) and it makes mistakes and failures demoralizing (because they believe that such setbacks reflect badly on their level of fixed intelligence).

Other students believe that intelligence is something that can be cultivated through effort and education. They don't necessarily believe that everyone has the same abilities or that anyone can be as smart as Einstein, but they do believe that everyone can improve their abilities. And they understand that even Einstein wasn't Einstein until he put in years of focused hard work. In short, students with this *growth mindset* believe that intelligence is a potential that can be realized through learning. As a result, confronting challenges, profiting from mistakes, and persevering in the face of setbacks become ways of getting smarter.

To understand the different worlds these mindsets create, we followed several hundred students across a difficult school transition — the transition to seventh grade. This is when the academic work often gets much harder, the grading gets stricter, and the school environment gets less personalized with students moving from class to class. As the students entered seventh grade, we measured their mindsets (along with a number of other things) and then we monitored their grades over the next two years.

The first thing we found was that students with different mindsets cared about different things in school. Those with a growth mindset were much more interested in learning than in just looking smart in school. This was not the case for students with a fixed mindset. In fact, in many of our studies with students from preschool age to college age, we find that students with a fixed mindset care so much about how smart they will appear that they often reject learning opportunities — even ones that are critical to their success (Cimpian, *et al*., 2007; Hong, *et al*., 1999; Nussbaum and Dweck, 2008; Mangels, *et al*., 2006).

Next, we found that students with the two mindsets had radically different beliefs about effort. Those with a growth mindset had a very straightforward (and correct) idea of effort — the idea that the harder you work, the more your ability will grow and that even geniuses have had to work hard for their accomplishments. In contrast, the students with the fixed mindset believed that if you worked hard it meant that you didn't have ability, and that things would just come naturally to you if you did. This means that every time something is hard for them and requires effort, it's both a threat and a bind. If they work hard at it that means that they aren't good at it, but if they don't work hard they won't do well. Clearly, since just about every worthwhile pursuit involves effort over a long period of time, this is a potentially crippling belief, not only in school but also in life.

Students with different mindsets also had very different reactions to setbacks. Those with growth mindsets reported that, after a setback in school, they would simply study more or study differently the next time. But those with fixed mindsets were more likely to say that they would feel dumb, study *less* the next time, and seriously consider cheating. If you feel dumb — permanently dumb — in an academic area, there is no good way to bounce back and be successful in the future. In a growth mindset, however, you can make a plan of positive action that can remedy a deficiency. (Hong. *et al*., 1999; Nussbaum and Dweck, 2008; Heyman, *et al*., 1992)

Finally, when we looked at the math grades they went on to earn, we found that the students with a growth mindset had pulled ahead. Although both groups had started seventh grade with equivalent achievement test scores, a growth mindset quickly propelled students ahead of their fixed-mindset peers, and this gap only increased over the two years of the study.

In short, the belief that intelligence is fixed dampened students' motivation to learn, made them afraid of effort, and made them want to quit after a setback. This is why so many bright students stop working when school becomes hard. Many bright students find grade school easy and coast to success early on. But later on, when they are challenged, they struggle. They don't want to make mistakes and feel dumb — and, most of all, they don't want to work hard and feel dumb. So they simply retire.

It is the belief that intelligence can be developed that opens students to a love of learning, a belief in the power of effort and constructive, determined reactions to setbacks.

How Do Students Learn These Mindsets?

In the 1990s, parents and schools decided that the most important thing for kids to have was self-esteem. If children felt good about themselves, people believed, they would be set for life. In some quarters, self-esteem in math seemed to become more important than knowing math, and self-esteem in English seemed to become more important than reading and writing. But the biggest mistake was the belief that you could simply hand children self-esteem by telling them how smart and talented they are. Even though this is such an intuitively appealing idea, and even though it was exceedingly well-intentioned, I believe it has had disastrous effects.

In the 1990s, we took a poll among parents and found that almost 85 percent endorsed the notion that it was *necessary* to praise their children's abilities to give them confidence and help them achieve. Their children are

now in the workforce and we are told that young workers cannot last through the day without being propped up by praise, rewards, and recognition. Coaches are asking me where all the coachable athletes have gone. Parents ask me why their children won't work hard in school.

Could all of this come from well-meant praise? Well, we were suspicious of the praise movement at the time. We had already seen in our research that it was the most vulnerable children who were already obsessed with their intelligence and chronically worried about how smart they were. What if praising intelligence made all children concerned about their intelligence? This kind of praise might tell them that having high intelligence and talent is the most important thing and is what makes you valuable. It might tell them that intelligence is just something you have and not something you develop. It might deny the role of effort and dedication in achievement. In short, it might promote a fixed mindset with all of its vulnerabilities.

The wonderful thing about research is that you can put questions like this to the test — and we did (Kamins and Dweck, 1999; Mueller and Dweck, 1998). We gave two groups of children problems from an IQ test, and we praised them. We praised the children in one group for their intelligence, telling them, "Wow, that's a really good score. You must be smart at this." We praised the children in another group for their effort: "Wow, that's a really good score. You must have worked really hard." That's all we did, but the results were dramatic. We did studies like this with children of different ages and ethnicities from around the country, and the results were the same.

Here is what happened with fifth graders. The children praised for their intelligence did not want to learn. When we offered them a challenging task that they could learn from, the majority opted for an easier one, one on which they could avoid making mistakes. The children praised for their effort wanted the task they could learn from.

The children praised for their intelligence lost their confidence as soon as the problems got more difficult. Now, as a group, they thought they *weren't* smart. They also lost their enjoyment, and, as a result, their performance plummeted. On the other hand, those praised for effort maintained their confidence, their motivation, and their performance. Actually, their performance improved over time such that, by the end, they were performing substantially better than the intelligence-praised children on this IQ test.

Finally, the children who were praised for their intelligence lied about their scores more often than the children who were praised for their effort. We asked children to write something (anonymously) about their experience to a child in another school and we left a little space for them to report their scores. Almost 40 percent of the intelligence-praised children elevated their scores, whereas only 12 or 13 percent of children in the other group did so. To me this suggests that, after students are praised for their intelligence, it's too humiliating for them to admit mistakes.

The results were so striking that we repeated the study five times just to be sure, and each time roughly the same things happened. Intelligence praise, compared to effort (or "process") praise, put children into a fixed mindset. Instead of giving them confidence, it made them fragile, so much so that a brush with difficulty erased their confidence, their enjoyment, and their good performance, and made them ashamed of their work. This can hardly be the self-esteem that parents and educators have been aiming for.

Often, when children stop working in school, parents deal with this by reassuring their children how smart they are. We can now see that this simply fans the flames. It confirms the fixed mindset and makes kids all the more certain that they don't want to try something difficult — something that could lose them their parents' high regard.

How *should* we praise our students? How *should* we reassure them? By focusing them on the process they engaged in — their effort, their strategies, their concentration, their perseverance, or their improvement.

"You really stuck to that until you got it. That's wonderful!"

"It was a hard project, but you did it one step at a time and it turned out great!"

"I like how you chose the tough problems to solve. You're really going to stretch yourself and learn new things."

"I know that school used to be a snap for you. What a waste that was. Now you really have an opportunity to develop your abilities."

Brainology

Can a growth mindset be taught directly to kids? If it can be taught, will it enhance their motivation and grades? We set out to answer this question by creating a growth mindset workshop (Blackwell, *et al*., 2007). We took seventh graders and divided them into two groups. Both groups got an eight-session workshop full of great study skills, but the "growth mindset group" also got lessons in the growth mindset — what it was and how to apply it to their schoolwork. Those lessons began with an article called "You Can Grow Your Intelligence: New Research Shows the Brain Can Be Developed Like a Muscle." Students were mesmerized by this article and its message. They loved the idea that the growth of their brains was in their hands.

This article and the lessons that followed changed the terms of engagement for students. Many students had seen school as a place where they performed and were judged, but now they understood that they had an active role to play in the development of their minds. They got to work, and by the end of the semester the growth-mindset group showed a significant increase in their math grades. The control group — the group that had gotten eight sessions of study skills — showed no improvement and continued to decline. Even though they had learned many useful study skills, they did not have the motivation to put them into practice.

The teachers, who didn't even know there *were* two different groups, singled out students in the growth-mindset group as showing clear changes in their motivation. They reported that these students were now far more engaged with their schoolwork and were putting considerably more effort into their classroom learning, homework, and studying.

Joshua Aronson, Catherine Good, and their colleagues had similar findings (Aronson, Fried, and Good, 2002; Good, Aronson, and Inzlicht, 2003). Their studies and ours also found that negatively stereotyped students (such as girls in math, or African-American and Hispanic students in math and verbal areas) showed substantial benefits from being in a growth-mindset workshop. Stereotypes are typically fixed-mindset labels. They imply that the trait or ability in question is fixed and that some groups have it and others don't. Much of the harm that stereotypes do comes from the fixed-mindset message they send. The growth mindset, while not denying that performance differences might exist, portrays abilities as acquirable and sends a particularly encouraging message to students who have been negatively stereotyped — one that they respond to with renewed motivation and engagement.

Inspired by these positive findings, we started to think about how we could make a growth mindset workshop more widely available. To do this, we have begun to develop a computer-based program called "Brainology." In six computer modules, students learn about the brain and how to make it work better. They follow two hip teens through their school day, learn how to confront and solve schoolwork problems, and create study plans. They

visit a state-of-the-art virtual brain lab, do brain experiments, and find out such things as how the brain changes with learning — how it grows new connections every time students learn something new. They also learn how to use this idea in their schoolwork by putting their study skills to work to make themselves smarter.

We pilot-tested Brainology in 20 New York City schools. Virtually all of the students loved it and reported (anonymously) the ways in which they changed their ideas about learning and changed their learning and study habits. Here are some things they said in response to the question, "Did you change your mind about anything?"

I did change my mind about how the brain works…I will try harder because I know that the more you try, the more your brain works.

Yes... I imagine neurons making connections in my brain and I feel like I am learning something.

My favorite thing from Brainology is the neurons part where when u learn something, there are connections and they keep growing. I always picture them when I'm in school.

Teachers also reported changes in their students, saying that they had become more active and eager learners: "They offer to practice, study, take notes, or pay attention to ensure that connections will be made."

What Do We Value?

In our society, we seem to worship talent — and we often portray it as a gift. Now we can see that this is not motivating to our students. Those who think they have this gift expect to sit there with it and be successful. When they aren't successful, they get defensive and demoralized, and often opt out. Those who don't think they have the gift also become defensive and demoralized, and often opt out as well.

We need to correct the harmful idea that people simply have gifts that transport them to success, and to teach our students that no matter how smart or talented someone is — be it Einstein, Mozart, or Michael Jordan — *no one* succeeds in a big way without enormous amounts of dedication and effort. It is through effort that people build their abilities and realize their potential. More and more research is showing there is one thing that sets the great successes apart from their equally talented peers — how hard they've worked (Ericsson, *et al*., 2006).

Next time you're tempted to praise your students' intelligence or talent, restrain yourself. Instead, teach them how much fun a challenging task is, how interesting and informative errors are, and how great it is to struggle with something and make progress. Most of all, teach them that by taking on challenges, making mistakes, and putting forth effort, they are making themselves smarter.

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For a list of references noted in this article, see
http://www.nais.org/ismagazinearticlePrint.cfm?print=Y&ItemNumber=150509

To prepare for our discussion of this article, jot down notes in response to the following questions:

1. How can you tell if someone has a growth mindset?
2. How can you tell if someone has a fixed mindset?
3. According to Dweck, how do we acquire these mindsets?
4. Is it possible to change someone's mindset? If so, give some examples from the article. If not, explain why it is not possible.
5. How does this article relate to your personal experiences in school (or in learning math)?