Intelligence as a Malleable Construct

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Introduction

The academic debate about the nature of intelligence resonates broadly not only with educational practitioners and policy makers but also with the general public. Most people think they know what intelligence is and that they know it when they see it. But what do people mean when they talk about being smart, brilliant, or clever? And why does it matter so much?

In this chapter, we focus on research showing how the way that people think about intellectual ability drives the choices they make and the outcomes they achieve, sometimes in counterintuitive ways. We show how a person's concept of intelligence can impact both their performance on cognitive tasks in the short run and their achievement over the longer term, and why this is so. We review the evidence from cognitive neuroscience for these different conceptions of intelligence. Finally, we discuss how such concepts can be influenced and changed and the practical implications of this research for educational policy and practice.

Why do people care so much about the nature of intelligence? Traditionally, particularly in western cultures, intelligence has been seen as the golden ticket to success. If you had a good amount of it, you would be rewarded with educational, professional, and financial success, and those with a great deal—the geniuses among us—would attain eminence and make a mark on posterity. Implicit in this view is the idea that intelligence is a "gift"—an innate attribute that one possesses in a relatively fixed quantity, for better or worse. Historically, the relatively high stability in individual performance on intellectual assessments over time and across tasks has led many to assume that this view of intelligence as fixed is correct (see, e.g., Bartels et al. 2002; Canivez and Watkins 1998; Herrnstein and Murray 1994; Hertzog and Schaie 1986), despite the strong dissent of original developers of the first IQ test, Alfred Binet and Theodore Simon (Binet 1975; Wolf 1973).

Unfortunately, in this case, believing may make it so. Because our society has presumed that intellectual gifts are innate and could be measured accurately, our education system has traditionally been structured to identify those students with apparent above-average intelligence, enrich their instruction, and track them into ever-greater opportunities, while those with presumed below-average ability were channeled into programs that

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would prepare them for lower-skilled jobs (Borland 2003, 2005; Borland and Wright 2001; Darling-Hammond 1994, 1995; Kaufman 2013; Nisbett 2009). The result is that those who score well on performance measures early on are in fact generally offered more opportunities to cultivate their intellectual ability than those who do not and, at least partly as a result, often do become more skilled and successful, reinforcing our common paradigm of innate ability.

It turns out that something similar happens in the psychology of the individual as well. Our research, and that of many colleagues, shows that people's "theory" of intelligence—whether they believe it to be fixed or a malleable quality—influences the learning opportunities they will pursue, the effort they will invest, and their resulting growth. It can even impact how their brains function.

Mindsets About Intelligence

In a ***fixed mindset*** (often referred to as an ***entity theory*** in the research literature), people believe that their intelligence is relatively fixed, and there is not much that they can do to develop it. They agree with statements such as "you can learn new things, but you cannot really change your basic amount of intelligence." In contrast, in a ***growth mindset*** (also known as an ***incremental theory***), people believe that their intelligence is something they can change and develop incrementally over time. They agree with statements such as "you can always greatly change how intelligent you are" (Dweck 1999). As we will show, these different mindsets about intelligence drive the goals that people hold, the challenges they will tackle, the effort they will expend, their persistence in the face of difficulty, and, as a result, their performance and achievement over time (Blackwell et al. 2007; Dweck 1999; Dweck and Leggett 1988; Henderson and Dweck 1990).

Mindsets and Motivation

Over the past few decades, a wealth of research shows that, even when people demonstrate equal intellectual ability and skill, their beliefs about intelligence shape their responses to intellectual challenge. For those who hold a fixed mindset, the conception of intelligence as a fixed, uncontrollable quantity (of which they may have a lot or a little) orients them toward measuring and obtaining a positive evaluation of their ability. Thus, their primary goal is usually to perform well in order to appear smart—or at least to avoid performing poorly and looking dumb (Blackwell et al. 2007; Dweck and Leggett 1988). They tend to think that things come easily if one is smart and that effort is both a sign of low ability and relatively ineffective in overcoming it (e.g., Blackwell et al. 2007; Hong et al. 1999). When they experience a setback or failure, they are likely to attribute it to low ability rather than effort (e.g., Henderson and Dweck 1990), doubt their ability to recover, and manifest a "helpless" response, withdrawing effort and giving up rather than risking further exposure as unintelligent or untalented (e.g., Robins and Pals 2002).

On the other hand, those who hold a growth mindset, in which intelligence is a malleable quality that can be cultivated, are more focused on learning (thus increasing their ability) as a goal, even if it requires effort, struggle, and errors along the way (Dweck 1999; Dweck and Leggett 1988). They consider effort to be a pathway to development (e.g., Hong et al. 1999), and when they experience setbacks, they attribute them to lack of sufficient effort and in turn adopt a mastery-oriented approach, increasing their effort and taking on new study strategies (e.g., Robins and Pals 2002).

Thus, the different mindsets about intelligence set up different frameworks or "meaning systems" (Hong et al. 1999) for interpreting situations that involve learning, effort, challenge, and evaluation. Furthermore, it is when making a transition to a situation that poses ongoing, increasing challenge (where success is more difficult and less certain) that these mindsets have the greatest impact on behavior and achievement.

In a comprehensive longitudinal study with urban, largely minority students, we examined how students' mindsets set up contrasting motivational frameworks and academic outcomes as they made their way through a challenging transition to junior high school (Blackwell et al. 2007).

We studied three waves of students over three successive years, assessing their mindsets at the beginning of their seventh grade year and then following each wave as they made their way through the following two years of school. First, we examined how their mindsets were related to their goals in school, their attitudes toward effort, and their responses to failure. Analyses showed that, as found in prior studies, students with a growth mindset had stronger learning goals than the fixed mindset students—for example, they said that "It's much more important for me to learn things in my classes than it is to get the best grades"—and had much more positive attitudes toward effort, agreeing that "when something is hard, it just makes me want to work more on it, not less." Students with a fixed mindset, on the other hand, were more likely to say that "If you're not good at a subject, working hard won't make you good at it," and "When I work hard at something, it makes me feel like I'm not very smart."

How did these two groups of students feel about failure? These mindsets, goals, and beliefs about effort in turn predicted how students said they would respond to a poor grade on a quiz: the growth mindset students showed a clear mastery-oriented response, saying that they would "work harder in this class from now on" and "would spend more time studying for the next test." In contrast, many of the students with a fixed mindset had a helpless response—for example, saying they would "spend less time on this subject from now on," with some even admitting that they "would try to cheat on the next test" rather than risk another failure!

Mindsets and Achievement

How did these different mindset frameworks impact achievement over this challenging transition? Based on their prior sixth grade test scores, when they were in the less-challenging elementary school environment, the fixed and growth mindset students had similar levels of math skills upon entry into junior high school. But by the end of the first term, they began to pull apart, with the growth mindset students performing better, and these diverging trajectories continued over the next two years, widening the gap between the two groups each term (Fig. 18.1).

We examined the pathway from mindset to achievement outcomes using hierarchical linear modeling and found that the beliefs, goals, and attitudes that led to different patterns of behavior were responsible for the diverging trajectories of grades. The increasing challenge level, particularly in the math curriculum of a health science-focused school, spurred the students with a growth mindset to focus on learning, work harder, and use positive strategies when they encountered difficulty, with the result that they mastered the curriculum better than those who entered with a fixed mindset, despite the fact that both groups began with similar skills (Fig. 18.2).

What do these mindsets sound like in the words of real students? A rising eighth grader with a growth mindset explained how he thought about intelligence as a product of one's choices and behaviors, inextricably tied to learning and effort:

> Well, you can change it [your intelligence] because people are different. One year they can be lazy in school and the other year they're like, "All right, I've got to step it up because I want to get into college." … What makes me feel smart is participating and doing my homework and everything, because then I know that I'm doing my best.

Asked whether he liked schoolwork that made him think hard, he emphasized the value of challenge to his growth:

> Yes, I do, because it gives me a challenge and also it'll help me a lot and I can do better with it and everything.

Contemplating the prospect of failing a test, he immediately began seeking solutions based on effort:

> I would feel really bad, but at the same time I wouldn't be surprised because maybe the year before that you did really good, and then you know like you just put that same amount of effort. But like that year, the new year, it gets harder and everything… Maybe there was some notes that you could write down but you didn't bother because you already knew them. Maybe you didn't have it all memorized, so you forget some of the stuff. I guess what I would do was maybe work harder,

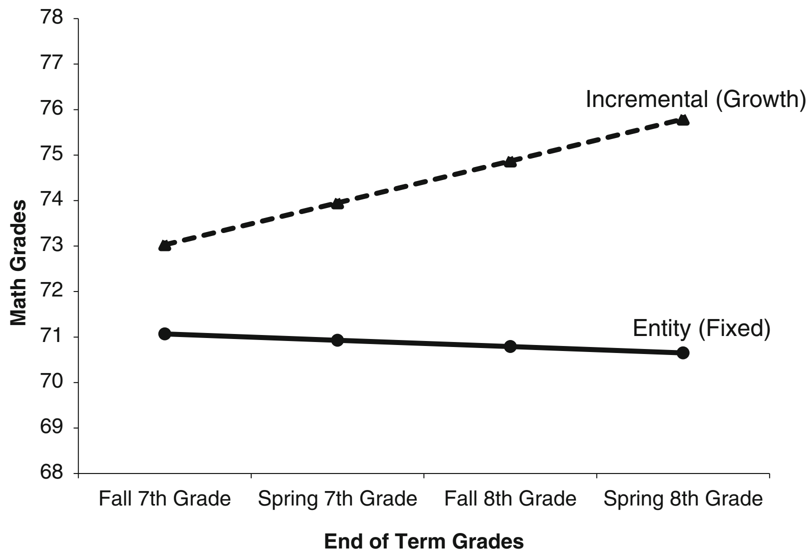

Fig. 18.1 Trajectory of middle school achievement as a function of student mindset in Study 1 (Notes: Growth and fixed mindset groups entered seventh grade with equal math achievement based on sixth grade test scores (not shown). They began to diverge by the end of the fall term of seventh grade (mid-year). By the end of eighth grade, the achievement gap was 10 % of the total grade points that differentiate a failing grade (60 %) from a perfect score (100 %). Reprinted from Blackwell et al. 2007, p. 251. Reprinted with permission. Copyright 2007 from Society for Research in Child Development, Inc.)

> and start thinking, Oh, wow. Okay, so I didn't do so good but maybe this time I can do good.

In contrast, his classmate laboring under a fixed mindset talked about her uncertainty about her ability to learn and how it made her feel helpless:

> Well I'm going to have to probably agree [that you can't change your intelligence] because sometimes– well for me there's limits on what I can learn and what I can't… I tend to space out a lot. And when I space out it's like the teacher will ask me a question and I have no idea what she's saying. And so I just have to sit in silence until she gives up and picks somebody else.

When asked what made her feel smart, she looked to external validation through getting the "right answer" and admitted that she preferred things she could do easily versus challenging work:

> Like say I got a question right in front of the whole class, then that makes me feel like kind of smart and special … I think it's so much easier and quicker if you know it by heart and you just do it right away and get it over with … Over-thinking sometimes can just really frustrate me. What I've done is I would just give up and my friends would sometimes give the answers to me.

When contemplating failure, she shared a recent incident and her collapse in the face of challenge:

> I was doing my test and what happened is I was reading this question that I really didn't know … from there on I just circled randomly and I just completely gave up on them, even like trying on the test.

The motivational implications of these two different frameworks, and their resulting impact on performance and achievement, have been demonstrated in many studies spanning kindergarten through graduate school (Aronson et al. 2002; Blackwell et al. 2007; Dweck and Leggett 1998; Good et al. 2003; Heyman et al. 2003; Kray and Haselhuhn 2007; Smiley and Dweck 1994; Yeager et al. 2013). Over and over again, researchers have shown that the way people think about their intelligence can become a self-fulfilling prophecy, expanding or limiting their motivation, growth, achievement, and, ultimately, their ability.

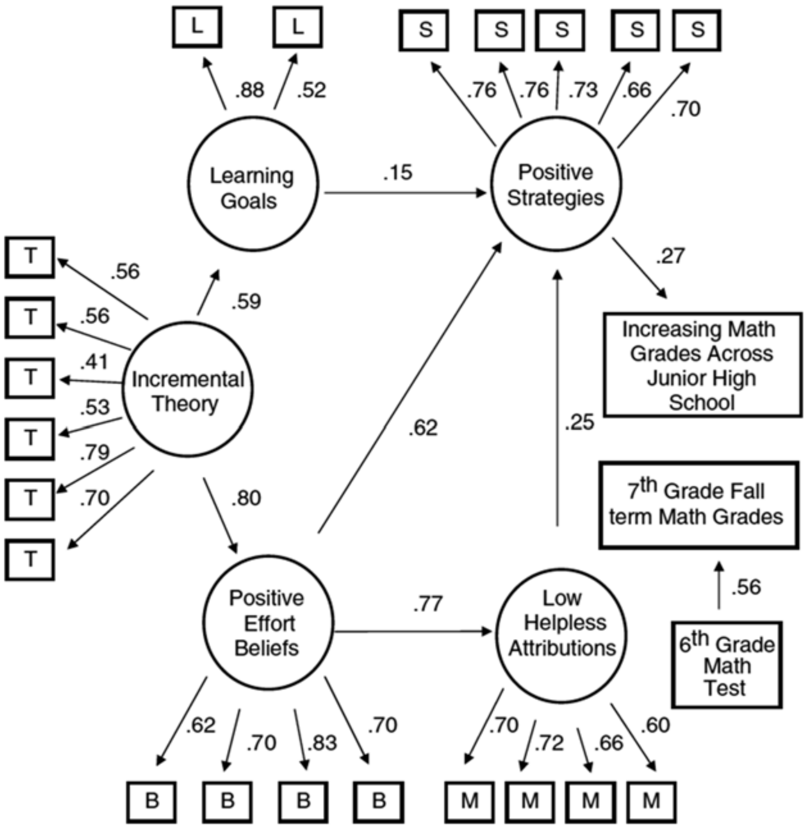

Fig. 18.2 Process model depicting the relations between student mindset, other beliefs and behaviors, and achievement in Study 1 (Notes: The more firmly students held a growth mindset (incremental theory), the more they endorsed learning goals and positive beliefs about effort. These goals and beliefs were associated with positive learning strategies and resilient responses to challenge, which in turn predicted greater math achievement gains. Reprinted from Blackwell et al. 2007, p. 253. Reprinted with permission. Copyright 2007 from Society for Research in Child Development, Inc.)

How Malleable Is Intelligence Really?

Without doubt, people can gain knowledge and skills through learning, but can they really develop their intelligence as we understand it? A robust debate about the true nature of intelligence continues (see, e.g., Kaufman 2013; Nisbett 2009), but most people think of intelligence as a generalized capacity for learning and reasoning that can be assessed by instruments such as IQ tests. Without weighing in on that complex question, we can agree that the version of intelligence measured by standard IQ tests is the result of combining scores from various subtests that measure a wide variety of knowledge and cognitive processes that are highly intercorrelated, such that if you score well on one, chances are that you will also score well on another. James Flynn (2007) explained this calculation with a clever analogy comparing it to measuring performance in a decathlon, where performance is computed from 10 events that each assess a different ability. For example, strength can be calculated from performance on throwing events, while speed can be assessed through sprinting events. Similarly, different subtests of intelligence assessments measure cognitive factors such as our ability to maintain and manipulate information in mind (working memory), integrate features of and consider relationships between stimuli (reasoning), and process information fluidly (processing speed), among others. A portion of these subtests may also measure the accumulation of knowledge about the meaning of words or arithmetic rules (Naglieri and Goldstein 2009). Intuitively, one can suspect that what we do or are exposed to in our daily life could influence how well we score on one or many of these different subtests and subsequently affect how *intelligent* we are deemed to be. However, for a long time, it was believed that intelligence was something we inherited and could not do much to change (see, e.g., Herrnstein and Murray 1994).

The evidence for the primacy of innate ability has not been well supported by accounts measuring population changes in IQ performance since the inception of the Weschsler Intelligence Scale, one of the main measures of intelligence. The well-documented Flynn effect (Flynn 2007) describes how IQ scores on multiple well-established assessments of intelligence have been on the rise—in some instances, dramatically—from generation to generation, even on assessments that are deemed to be largely "culture-free." A compelling interpretation is that the performance capacities measured by these tests function as skills that can be improved and shaped by experience and schooling and that these experiences have shifted over time in a way that has changed how and what is learned by the majority of the population (Flynn 2007; Nisbett 2009).

In fact, over the past century, various studies conducted all over the world have documented the role that schooling plays in cultivating students' intelligence. If intelligence is a fixed ability, environmental experiences, such as educational enrichment, should not alter it. Yet, countless examples confirm the finding that, relative to children who remain in school, those who are denied educational experiences often display a gradual but persistent decline in performance on intelligence measures—as much as 6 IQ point decrements for every year of schooling lost (see Ceci 1991; Nisbett 2009 for a review). Similarly, related environmental factors such as socioeconomic status have been found to predict individual change in IQ, with low-SES children showing a decrease in IQ over time (Breslau et al. 2001).

To what extent are scores on assessments of these sorts malleable, and how does experience and learning impact performance on them? Over the last few years, research aimed at answering this question has provided strong evidence suggesting that cognitive skills such as those tested by intelligence tests can in fact improve with practice.

In one study, elementary school children at a low SES school played with one of two sets of board games and video games for 8 weeks (Mackey et al. 2011). In the first group, children played with games that engaged their reasoning ability, such as games that asked them to consider and integrate multiple rules or complete patterns of shapes. A second group of children played with games that involved processing speed, which required them to make motor responses to visual cues as fast as possible following simple game rules. At the beginning and again at the end of the 8 weeks, tests in relevant areas pertaining to either reasoning ability or processing speed were administered. The results were striking. Children who had played with the reasoning games increased their nonverbal reasoning by 32 %, which translates roughly to a 10-point increase in IQ. On the other hand, those who had played with the processing speed-focused games increased their processing speed by 27 %, but not their reasoning skills. These results demonstrate not only that IQ scores can change significantly in a short period of time but, more importantly, that targeted interventions can improve performance on the cognitive processes assessed in intelligence measures, contradicting the belief that our intelligence is fixed.

Studies examining other cognitive functions measured by intelligence tests have shown converging evidence that speaks to the malleability of these constructs. For example, Brehmer et al. (2012) asked a group of adults to use an adaptive computerized program to train working memory and compared them to a control group that used a nonadaptive, low difficulty working memory training. Before and after the training period, participants completed assessments of working

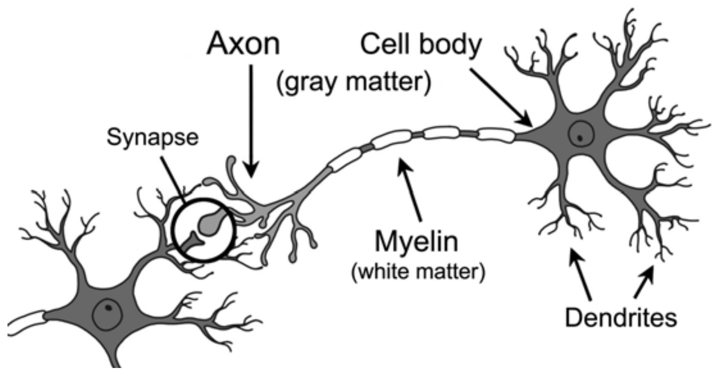

Fig. 18.3 Illustration of neuron with connections (Copyright 2013 from Mindset Works, Inc.)

memory, which were the same as those administered as part of the Weschsler Intelligence Scale. As part of the training, participants practiced maintaining in mind over short periods of time multiple bits of information (words or locations of objects in space). They also sequenced these items in a particular order according to the exercise's instructions. For those in the adaptive training program, the quantity of information that needed to be held or manipulated in working memory changed depending on their performance, increasing (and therefore becoming more difficult) as participants became more proficient. After five weeks of training, participants in this adaptive training group showed significant improvements in their working memory performance. These improvements were greater compared to the group that did not receive an adaptive training, even though both groups began their training with similar scores. Interestingly, in a follow-up assessment, researchers found that the performance gains made by the adaptive training group were maintained three months after the training period. These findings are especially impressive given the brief nature of the intervention.

In sum, these examples support the idea that the cognitive skills measured in intelligence tests can be improved and maintained by targeted training using increasing demands (challenge). The significance of the flexibility of these cognitive functions extends beyond improvements in a test score—they speak to our capacity to continue to adapt to new cognitive demands imposed by our environment.

Neuroplasticity and Brain Function

How do learning-based gains in cognitive performance relate to the modifiability of neural structures in the brain? Research in the neuroscience of learning demonstrates significant plasticity in brain structure and function and shows that these changes are highly dependent on both behavior and environment.

The brain is composed of billions of specialized cells known as neurons (see Fig. 18.3). Neurons form part of the body's communication hub, processing, sending, and receiving vital information through an interconnected network. Surrounding a neuron's center are a series of extending branches known as dendrites that oversee and transport the collection of chemical messages received from other neurons. Collected information is eventually converted into an electrical impulse that travels down a long channel known as the neuron's axon. This axon branches out into smaller axon channels that each culminate in a small bulb that forms part of a structure called a synapse. It is at a synapse where the impulse triggers the release of chemical substances, or neurotransmitters, from the neuron. These neurotransmitters then enter the receiving neuron through receptors of the receiving neuron.

Although brain plasticity may not be specific to neural changes, much of the research has focused on how the connectivity between neurons can change with experience. Studies on animals have informed us about the changes that occur at a cellular level that may modify the connection of neurons within and between brain regions. Based on those findings, Zatorre et al. (2012) discuss some of the changes that may happen at the cellular level and underlie plasticity in the human brain. For example, axons can become insulated with myelin, a fatty tissue that makes up the "white matter" of the brain and speeds the transmission of electrical impulses, or their existing myelin covering can become thicker. Also, groups of axons projecting between brain regions can become more organized, thus improving their connectivity. In humans, one or many of these transformations may reflect changes in the integrity of the microstructure of the brain's white matter, which contains groups of myelinated axons whose cell bodies form the brain's gray matter. In addition to speeding up their transmission, neurons can improve their connectivity by increasing their surface area of connections through the creation of new neurons and synapses or branching of dendrites. These events may be reflected in the structural and functional changes of the gray matter after repeated practice of a physical or mental skill.

An example of our brain's ability to adapt to slight modifications to our daily activities can be seen in a seminal study where a group of individuals with no juggling experience were taught how to juggle over a period of three months. In comparison to their own brain scans taken at the beginning of the study and also to those of a group of individuals who were not taught how to juggle, the post-training brain scans of the jugglers showed an increase in the gray matter thickness of brain regions that support the ability to perceive motion and anticipate where objects will be in space (Draganski et al. 2004).

Changes in the brain are not limited to developing a new visual-motor skill. Exciting findings from studies where participants practiced a cognitive process have revealed the brain's ability to adapt to different cognitive demands. Using functional magnetic resonance imaging (fMRI), which measures changes in blood oxygenation and flow in the brain associated with neural activity, Mackey et al. (2013) measured the neural effects of intensive reasoning training in young adults. After a three-month law school admission exam (LSAT) preparation course, in which a little over 60 h were devoted to practicing problems that relied heavily on reasoning, the fMRI scans showed changes in the intrinsic connectivity of the student's brains. The measure of intrinsic connectivity, known as resting-state fMRI, is thought to reflect repeated history of synchronized activity between regions, since the scan is captured at resting state, when a person is asked not to engage in any task. The group of individuals who underwent the reasoning training showed greater intrinsic connectivity between areas involved in reasoning skills compared to their well-matched controls, and a specific pattern of these connections was related to greater improvements in their LSAT scores.

In addition, these researchers also examined the changes in white matter microstructure resulting from this training program (Mackey et al. 2012). They found an increase in the coherence of white matter tracts connecting regions of the brain that support reasoning skills, reflecting the integrity of the structure of white matter discussed earlier. Although the specific mechanisms behind these changes are unknown, they are, nonetheless, thought to reflect strengthening of the connectivity between brain regions brought on by experience or development.

The brain's malleability also makes it susceptible to negative factors, such as stress or unstable home environments (see, e.g., Erikson et al. 2003; Hackman and Farah 2009; Lupien et al. 2009). To counteract this, Neville and colleagues (2013) developed an 8-week intervention targeting selective attention, the ability to control where our focus is directed, in part aimed at increasing school readiness for preschoolers of low socioeconomic status. They reasoned that because a stressful environment and more inconsistent parenting practices are often more prevalent in low-SES compared to higher-SES households, training preschoolers' primary caregivers might also be beneficial. Thus, they compared three groups of children. One received their preschool education as usual. A second group received attention exercises only. A third group of children also received attention exercises, and their parents received training in a curriculum targeted to develop family stress regulation and other strategies aimed at improving the way parents interacted with, disciplined, and facilitated their children's attention. To explore the impact of the training on cognitive functioning, researchers used electroencephalography (EEG)—a noninvasive measure with excellent temporal sensitivity that can be used to capture changes in electrical potentials occurring within the brain that are elicited from the scalp. The signal embedded in this EEG, known as event-related potentials (ERPs), can map out attentional and conceptual processes that emerge in response to specific task-related events, such as hearing a particular sound. In a test where children were asked to focus their attention on only one of two stories played simultaneously, early attention ERP components related to probes embedded in the stories showed that children who received the family-based intervention were more successful at focusing their attention on the story they were instructed to attend. Additionally, this group also improved in measures of nonverbal IQ, while their parents showed lower levels of stress.

Together, these studies suggest that experience and learning can result in tangible, measurable impacts on the brain and in turn on a variety of cognitive functions. This is especially promising because these brain changes are seen in response to small changes in the experiences a person engages with, such as practicing a specific skill over a short period of time. Given these findings, we can anticipate that, as they continue to work and study, virtually all students can continue to develop their abilities over time through positive behaviors like effort and practice, in a way that would ultimately be evidenced by changes to brain structures and activity.

The evidence of performance improvement and neuroplasticity seen in these studies lends support to the concept of malleable intelligence that underlies a growth mindset. Further, the fact that such changes are the result of behaviors such as deliberate practice and engaging with increasingly difficult tasks helps illuminate why the increased effort, challenge seeking, and persistence associated with a growth mindset would result in higher achievement. Intelligence can be developed—but only if it is exercised. But our colleagues and we wondered whether engaging in overt behaviors, such as practicing and tackling more challenging tasks, were the only way that mindsets could impact learning—or whether the beliefs and goals that make up the different mindsets might directly influence the way the brain processes information.

The Neuroscience of Mindsets

What is happening in the brain when people are laboring under the different mindsets? Researchers have begun to explore some of the neural mechanisms underlying a growth and fixed mindset.

A fascinating series of studies looking at brain activity in relation to mindset and different performance conditions showed that mindsets can lead to different patterns of observed activity in the brain, with consequences for cognitive functioning. Moser et al. (2011), for example, tracked how students allocated their attention while completing a task that required continuous monitoring and responding to a target displayed on a computer screen. How did students with different mindsets react, especially after making a mistake? To explore this question, researchers looked at specific ERPs that have been previously mapped to attention and awareness to errors. They found that individuals with a growth mindset were more likely to attend to the errors they made than those with a fixed mindset and were also more likely to improve their accuracy on the next trial.

Interestingly, additional analyses revealed that their attentional response mediated their performance. In other words, it was *because* participants with a growth mindset oriented their attention to errors that they did better on the task. These findings showed that people with a growth mindset were more successful at reorienting their attention to the task at hand and suggest that they were not discouraged by errors but responded in an adaptive way that allowed them to persist and improve.

Individuals with a fixed mindset may also orient attention to errors when there is salient negative feedback, but may do so in a way that ultimately undermines learning (Mangels et al.

2006). An ERP study by Jennifer Mangels and her colleagues found that individuals with a fixed mindset showed an enhanced awareness of and orientation towards errors made on a challenging general knowledge question task, in which individuals received accuracy feedback (whether their response was correct or incorrect) followed by learning feedback (the correct answer) after each question. However, unlike the growth mindset group in the previous study, this orienting did not aid their performance. Fixed mindset participants showed a neural response to learning feedback that was indicative of lower success at encoding the correct answer or storing and committing the information to memory. In fact, in a surprise retest of all the items that they had previously answered incorrectly, fixed mindset participants corrected fewer items than their growth mindset counterparts.

These findings illustrate how people's mindsets may differentially impact their attentional response, particularly following challenge. On one hand, individuals harboring fixed mindset thinking may inadvertently set themselves up for failure by directing their attention to their performance and discounting an opportunity to learn from their mistakes, whereas this does not seem to be the case for those with a growth mindset.

As previously discussed, students with a fixed mindset often hold a performance focus in which they are particularly concerned with the goal of proving their abilities and achieving highly, especially in comparison to others, whereas those with a growth mindset typically endorse goals of learning and mastery (Blackwell et al. 2007; Dweck and Leggett 1988; Dweck 1999). What happens when students find themselves in academic contexts that promote either a performance or mastery goal? As students navigate from one academic context to the other, it is very possible that they may be receiving different messages from their environment about what is valued in each domain, potentially impacting how and what they learn.

In support of this possibility, recent ERP research finds that students do indeed have very different neural experiences when they encounter a mastery- versus performance-based context (Rodriguez et al. 2014). We recruited undergraduates to complete a challenging general knowledge task drawn from Mangels et al. (2006). The task, which contained two blocks of questions, prompted students to complete all questions in a block before being presented with the second block. Importantly, as students were presented with a block, they first read task instructions that differentially framed it. In the *performance* frame, students read instructions that oriented their focus on their accuracy and how their performance would be compared to that of other university students. However, in the *mastery* frame, these same students were instead asked to focus on those questions that they found most interesting and learned the best from rather than on their performance. How would students respond to these two different but comparably challenging situations?

When task instructions emphasized performance and proving one's ability relative to others, students completing the difficult task displayed a neural response to corrective information (i.e., the correct answer) following an error that was consistent with processes related to superficial encoding of that information. However, these very same students, when completing a task that instead emphasized learning and mastery, experienced a neural response to the correct answer (after an error) that was consistent with processes that reflect deeper encoding of that information.

This work suggests that although learning may occur in both mastery- and performance-based contexts, the nature of that learning may be very different. In a performance environment, students may attend to problem solving only insofar as it allows them to get the right answer, understanding it only at its surface, whereas in a learning environment, students may not be solely focused on their outcomes and instead orient their efforts to understanding the content in a manner that may ultimately contribute to longer-term retention. These findings are especially intriguing since these different neural processes, which are suggestive of qualitatively different kinds of learning, emerged within person after just brief exposures to each frame. Thus, they provide continued support for students' sensitivity and differential response to input from their learning environment. As we will see, messages conveyed to students through their interpersonal experiences with others can also powerfully shape their beliefs and behaviors in both the short and long term.

Mindsets and the Influence of Others

As we have seen, the mindsets that individuals carry with them affect their goals, cognitive functioning, motivation-related behavior, and academic outcomes. However, these mindsets themselves are not fixed. The messages that people get from others in their environment can influence their mindsets and impact motivation and performance in immediate, powerful, and often surprising ways. In fact, it turns out that the very messages that one might think would be most encouraging—such as praise for intelligence—can actually undermine performance on intellectual tasks.

A pioneering series of studies by Claudia Mueller and Carol Dweck (1998) examined the impact of praise on fifth graders' challenge seeking and performance. Mueller and Dweck had the children complete a set of puzzles drawn from Raven's Progressive Matrices (a common measure of nonverbal reasoning). Initially, they gave them problems matched to their grade level and children solved most of them successfully. Then the researchers praised the students for their performance. They told one group of randomly chosen children, "Wow, that's a really good score. You must be smart at this" (***intelligence praise*** condition). A second group was told, "Wow, that's a really good score. You must have worked hard at this" (***effort/process praise*** condition). (Process praise can refer to anything about the process the child engaged in: their strategy, focus, effort, choices, or perseverance.) Then they looked at how these different kinds of praise would affect the students' behavior and performance. First, they asked them which type of puzzle they would prefer to do next: an easy one, like the ones they had done, on which they would perform well, or more difficult ones, from which they would learn. While the children praised for process overwhelmingly chose the more difficult ones, the majority of children praised for intelligence chose to repeat the same easy puzzles! Rather than giving children the confidence to tackle a challenge, praise for intelligence had actually made them want to stay in their safe zone, even though it meant that they would learn nothing new.

Clearly, over the longer term, sacrificing such learning opportunities could have a negative impact on skill development. But strikingly, the praise also had an immediate effect on the children's intellectual performance. To test the impact of praise on the children's performance and resilience following challenge, the researchers next had the students work on more difficult puzzles, on which all the students struggled. They then gave them another easier set, similar to the first. How would they perform? The differences were telling. The students praised for effort improved significantly on the easy puzzles over their performance on the first trial (perhaps honing their skills on the more difficult problems). But those who had been praised for intelligence performed *worse* on the second attempt—they had lost confidence that they were smart at puzzles, and so they performed poorly. It is particularly notable that the Raven's task is one used to measure "fluid" intelligence (often considered to be an inherent problem-solving ability) and has often been used to assign children to gifted programs, yet it turned out that performance on this test could be undermined (or enhanced) by a single sentence. Intelligence praise activated a fixed mindset framework, along with the goals of looking smart and succeeding without effort, and produced a "helpless" response to challenge and an immediate decrease in apparent ability.

More recent studies have replicated and extended these findings. For example, one study explored how feedback linking success on an upcoming challenging activity to a group's supposed inherent ability impacted kids' performance on that task (Cimpian et al. 2012). The researchers found that when young (4–7-year-old) children were told that either girls or boys were really good at a game, the children, regardless of their gender, underperformed on the game, especially on more difficult items, relative to children who were provided with other kinds of instructions that did not suggest the inherent ability of groups. Cimpian and his colleagues argue that this occurred because children came to attribute their performance on the task as being innately linked to something out of their control—a "fixed" aspect of their identity, which in turn led to their underperformance.

Since the Mueller and Dweck (1998) studies, other researchers have investigated the impact of praise in real-world contexts on mindsets and performance over longer periods of time. They have found that parents can play a significant role in formulating their children's beliefs about their ability, sometimes with long-term effects. One longitudinal study found that children whose mothers gave them more process praise at 14–38 months were more likely to display a growth mindset and a greater desire for challenge at 7–8 years old (Gunderson et al. 2013). In a similar study with older children, 8–12-year-olds whose mothers praised them for ability were more likely to exhibit fixed mindset thinking and a reduced desire for challenge six months later (Pomerantz and Kemper 2013).

As the praise studies suggest, teachers too are in a position to influence their students' mindsets. For example, just as praise for intelligence can backfire, the way that we console children when they struggle may inadvertently trigger the fixed mindset pattern. Aneeta Rattan and her colleagues (Rattan et al. 2012) asked adults (some of whom were math teachers) to imagine a student in their class who had gotten a poor grade on the first math test of the year and to report how they would respond to the student. The adults in a fixed mindset were significantly more likely to try to console the student by saying that not everyone could be good in math—a message that students reported would lead them to conclude that they have low ability and to feel like giving up. However, adults in a growth mindset were more likely to urge students to try harder, and they gave them practical recommendations for strategies to achieve mastery.

In these ways, the mindsets that adults hold can be a factor in students' success. Indeed, a study looking at the impact of teacher mindsets on student achievement found that when teachers had a fixed mindset, students who had entered their class as low achievers remained so. In contrast, when teachers had a growth mindset, many of the students who had started the year as low achievers showed remarkable progress (Rheinberg et al. 2000). Thus, for the fixed mindset teachers, their experience confirmed their beliefs, as their students' relative status remained unchanged, whereas the growth mindset teachers saw their confidence in students' ability to grow realized. Once again, the mindsets that people hold can become self-reinforcing.

Crucially, a growth mindset is not the same as self-confidence or drive to achieve. In fact, as we saw in the praise studies, successful students who derive much of their self-esteem from performing well can be vulnerable when they encounter challenge or difficulty—particularly if they are in an evaluative context. Here, a young student about to begin middle school seems to have a robust sense of self-confidence as he explains his relish for a challenge—but his primary goal is to demonstrate his ability, rather than to learn:

> Right now my favorite subject is math because I'm really good at it – my grades in my report card have been really high in math so that's why I like it … A lot of times kids don't really want to work hard. But if you really want to know something new and really get good at it, you're going to have to work hard. And some kids like working hard. So it's like a challenge, like a puzzle… I like doing stuff that I'm good at and I know I'll get a good grade. And then I like thinking because I like – I'm the type of guy that likes puzzles and I like challenges 'cause it makes you feel like you're up to it and you're showing the person what you can do and it makes you feel good.

This student enjoys a challenge, as long as he can be successful. But in a situation where he may make mistakes in class and lose his status as a top performer in the eyes of others, his motivation takes a nosedive:

> If you're doing it [making mistakes] in front of people? I wouldn't really want to do it because when you make a mistake you kind of tend to get embarrassed and people will say, "No, you're doing it wrong. What are you doing?" and that tends to be

embarrassing … Like if you're doing a group and there's tons of kids around you, when you ask for help then they know you're not understanding it. And then some people say that's really easy and they're like, "How are you not understanding it?" It makes you feel stupid, and then you get embarrassed.

Thus, as we saw in both the study of students making the transition to junior high school and in the praise studies, a fixed mindset framework may not hurt performance in conditions of relatively low challenge, where students' skills exceed the demands of the task and success is readily obtainable. But when the possibility of failure looms in a situation where ability may be evaluated, mindset makes all the difference in whether the student will be resilient and bounce back from difficulty or become helpless and founder (Blackwell et al. 2007; Mueller and Dweck 1998).

Changing Mindsets

Given that mindsets are influenced by messages from others, we wondered whether it would be possible to teach a growth mindset and improve students' motivation and performance as a result. To do this, we developed an eight-session workshop to teach students a growth mindset by teaching them about the brain and how it develops and grows stronger through learning. The workshop included an article, "You Can Grow Your Intelligence," images and explanations of how the brain works, and discussions about learning and growth, along with lessons on study skills. We randomly assigned seventh grade students in an urban middle school to either this growth mindset workshop or an alternative version that taught students about the brain and study skills, but without the information and activities focused on the malleable brain and developing intelligence. Both workshops were taught in the students' advisory sections by separate teams of researchers.

After the workshops, we asked the students' teachers, who were blind to the workshop condition of the students, to identify and describe those who had improved in motivation over the course of the year. Fully three-fourths of the students their teachers identified were from the growth mindset workshop group—a significant difference. Here is a typical comment a teacher made about the observed changes:

> Your workshop has already had an effect. L., who never puts in any extra effort and often doesn't turn in homework on time, actually stayed up late working for hours to finish an assignment early so I could review it and give him a chance to revise it. He earned a B+ on the assignment (he had been getting C's and lower).

We examined the students' performance in math over the course of the study. Prior to the intervention, the grades of students in both groups had very similar trajectories: they were declining from those obtained in sixth grade (the previous year) in the same school as the challenge level in the curriculum increased. And indeed, in the term following the intervention, the grades of the students in the control group continued to decline, but the grades of students in the growth mindset workshop reversed course, erasing the downturn (see Fig. 18.4) (Blackwell et al. 2007). Thus, the students who received instruction in the malleable brain and developing ability not only became more motivated, their math performance rebounded even as the curriculum continued to become more difficult over the course of seventh grade.

We have since developed and tested a blended-learning curriculum, *Brainology*®, based on this workshop, Brainology, and found that it promoted a similar shift in mindset, motivation, and performance. Here is how middle school students who completed this curriculum described the impact of learning about the malleable brain on their view of intelligence, effort, and challenge:

> You're not born dumb or born smart … Once you know how your brain works, it's much easier to control it—once you develop more neurons and connections, it's much easier to approach something that's harder for you.
>
> Probability, I was just like, "I don't get this at all. But I was just like, okay, I'm going to do this … I want to do this since it's so hard. I'm going to be like, Brain, you cannot just run away from this. I'm going to do this!

Other studies, with participants from middle school to college, have shown similar impacts

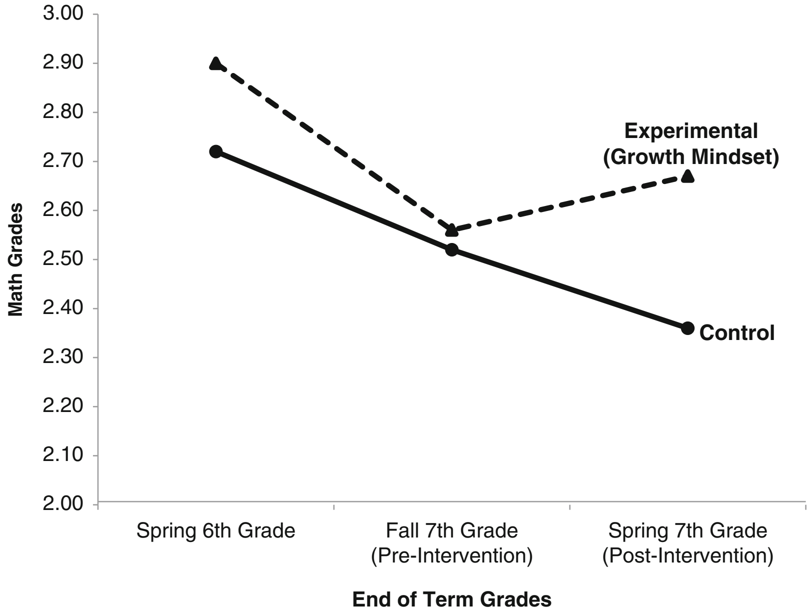

Fig. 18.4 Student achievement as a function of workshop group in Study 2 (Notes: All students' math grades had declined from the end of sixth grade to the end of the fall term in seventh grade, and there was no statistically significant difference between the two groups at either time point. Following the workshop (end of Spring seventh grade term), students in the intervention group (who learned about the malleable brain) rebounded, while the grades of students in the control group continued to decline ($p < .05$). Reprinted from Blackwell et al. 2007, p. 257. Reprinted with permission. Copyright 2007 from Society for Research in Child Development, Inc.)

of teaching a growth mindset on motivation and performance (e.g., Aronson et al. 2002; Good et al. 2003; Yeager et al. 2013). A series of new studies by David Yeager, David Paunesku, and their colleagues, for example, have found that even brief, one-time mindset interventions delivered online can lead to significant gains in achievement, including among students from traditionally underrepresented groups (Yeager et al. 2013). Thus, mindsets can be changed and motivation and achievement improved as a result.

Mindsets and the Achievement Gap

A particularly striking way that the social context can impact mindset and performance is embodied in the phenomenon of stereotype threat. Originally identified by Claude Steele and Joshua Aronson (Steele and Aronson 1995), stereotype threat occurs when students from a negatively stereotyped group (e.g., Black and Latino students in academics or female students in math and science) encounter a situation that puts them at risk of being judged in light of that stereotype and, potentially, of confirming it in the eyes of others. This concern with confirming a negative stereotype can interfere with thinking and motivation and, therefore, performance. For example, a female student taking a test of math ability given by a male administrator may worry that if she doesn't perform well, it will be seen as confirmation that females are not good at math, or a students of color taking the SAT may anticipate that their performance will be seen as reflecting on the intelligence of their race if they perform poorly.

The anticipation of such group-based negative evaluation can lead to a host of detrimental consequences, including negative thoughts (Cadinu et al. 2005; Keller and Dauenheimer 2003), anxiety (Marx and Stapel 2006), and physiological arousal that can reduce cognitive functioning (Blascovich et al. 2001; Krendl et al. 2008;

Osborne 2006, 2007; Vick et al. 2008), including working memory (Beilock et al. 2007; Schmader and Johns 2003) and attentional and behavioral control (Inzlicht et al. 2006; Smith and White 2002), especially on a challenging task (O'Brien and Crandall 2003; Stone and McWhinnie 2008), all of which can result in reduced performance and widening achievement gaps between groups (Beilock et al. 2007; Brown and Day 2006; Cadinu et al. 2005; Keller and Dauenheimer 2003; O'Brien and Crandall 2003; Schmader and Johns 2003; Steele and Aronson 1995). Thus, the preoccupation with ability and performance induced by stereotype threat can actually reduce both (at least temporarily) for students in contexts where the stereotype is relevant. However, when the task is defined as non-diagnostic of ability, the performance gap is narrowed (Aronson et al. 1999; Steele and Aronson 1995).

The negative effects of stereotype threat emerge for children as young as seven. In one set of studies (Hartley and Sutton 2013), boys underperformed on math, reading, and writing assessments when they held the belief that boys were "inferior at academics" and also when they were explicitly provided this message prior to working on the assessments. Interestingly, these effects disappeared when boys were instead told that there were no real differences in abilities between boys and girls.

Aronson and colleagues (2002) noted that the impact of stereotype threat on students—preoccupation with evaluation, anxiety during assessments, lower performance, and disidentification with academics—looked similar to the pattern observed in people with a fixed mindset concept of intelligence under conditions of challenge. Perhaps, they reasoned, teaching students to think of their abilities as malleable could buffer them against the negative effects of stereotype threat: knowing that they could always develop their ability, they would be less worried about whether they scored well on a particular test (Aronson et al. 2002). To test this, they taught students that their intelligence was malleable and then looked at their performance under conditions of stereotype threat. Teaching malleable intelligence was successful in increasing enjoyment and valuing of academics and academic performance, including GPA, among Black college students (Aronson et al. 2002). Similarly, in a study with middle school minority students, teaching about malleable intelligence raised achievement test scores in both reading and math and narrowed the achievement gap between male and female students (Good et al. 2003). Finally, explaining gender differences in math performance as the result of genetic factors rather than experience (Dar-Nimrod and Heine 2006) or effort (Thoman et al. 2008) reduced the performance of females on a math test consistent with the notion that malleable, experiential-based explanations of ability buffer students from the negative effects of stereotype threat.

These sets of studies highlight the powerful role that the psychological experience and context plays in shaping students' motivation, learning, and performance. In sum, the evidence strongly suggests that cognitive performance is the product of a synergistic relationship between individual aptitudes, beliefs, and preferences and influences from the environment, and that mindsets about intelligence are a critical part of this relationship.

Implications for Future Research

Many questions still remain to be answered regarding the interplay of mindsets and intellectual achievement. From a developmental perspective, we know too little about how early experience forges mindsets and the impact that it has on the development of talent and skills over a child's early years. In particular, research showing the emergence of the characteristic mindset patterns in young children, even before they develop a differentiated concept of intelligence, suggests that parental influence needs more investigation (Giles and Heyman 2003; Heyman et al. 2003; Smiley and Dweck 1994). The more general nature of these early mindsets raises a question of whether a more global growth or fixed mindset lies behind the much-investigated concept of ability: perhaps some children come to believe early on that people are generally fixed in their attributes, and this paradigm is later populated by more specific concepts such as intelligence, character, and the like.

How susceptible are mindsets to enduring change, and what is the minimum required intervention to drive meaningful change? Can lasting change be achieved through single point, targeted interventions teaching a growth mindset to students, or does it require a combination of malleable intelligence instruction with ongoing reinforcement through implicit messages, such as process praise? How much should we make these frameworks explicit and examined in order to transform them? Many studies indicate short-term effects of even brief growth mindset interventions (see, e.g., Yeager et al. 2013), but we do not yet know what it takes to achieve a permanent shift.

How complex and context dependent are mindsets? Note that, in much of the research literature, mindset has been treated as a global and categorical variable, contrasting fixed versus growth mindsets about general intelligence. However, it is possible to have different mindsets about different kinds of ability. For example, as shown in the studies using mindset interventions to reduce stereotype threat, some groups are vulnerable in specific subject areas, despite superior academic performance overall (e.g., females in math and science; Good et al. 2012). In addition, as we have seen, messages received from the learning environment, including our interactions with others, can impact mindset-related behavior significantly (Blackwell et al. 2007; Mueller and Dweck 1998) and can shape the neural underpinnings of the learning experience (e.g., Rodriguez et al. 2014). These findings suggest that many people may harbor mixed or flexible mindsets and rely on environmental cues to activate the one deemed most appropriate to the situation. Further research to learn more about the contextual factors that can activate different mindsets would be helpful in designing interventions and educational programs to support struggling learners.

Finally, what are the long-term consequences of holding a growth mindset for the development of one's abilities and talents? Walter Michel's impactful work has demonstrated how the tendency to delay immediate gratification during the preschool years is correlated with positive events across the lifespan (cf. Mischel et al. 2011). How does holding a growth mindset impact people over a lifetime? Research in the workplace, for example, finds that growth mindset in leadership roles ("leaders are made") can contribute to greater confidence and positive affect (Hoyt et al. 2012). Future research should continue to explore this possibility.

Implications for Educational Practice

Closing the Achievement Gap

While the debate over the nature of intelligence continues, our educational system, from K-12 to college, is grappling with the application of these concepts and measures to policy and practice, with often unintended consequences. In many schools, students are still ranked and tracked by ability based on prior achievement or their scores on assessments, exposing them to differing curricula and standards. Standing on achievement tests can be misapplied in practice as ability labels that lead both students and teachers to adopt a fixed mindset and lower expectations, which can then become a self-fulfilling prophecy. This emphasis on normative assessments and grading practices can make achievement appear to be a zero-sum game, with enormous implications due to competitive access to schools and higher education opportunities. The persistent achievement gap due to unequal educational opportunities and the psychological burden imposed by societal stereotypes for African American and Latino students and for females in math, science, and engineering still signal that a large number of our young people are laboring under identity-based fixed mindset conceptions of their ability that limit them in fulfilling their potential.

Indeed, even among individuals with both high math and verbal ability, women are less likely to pursue careers in science, technology, engineering, or math (e.g., Wang et al. 2013). These findings are especially striking because women in the Wang et al. (2003) study represented a greater percentage of those individuals with high scores on both math and verbal assessments. Recruiting students into these fields may pose challenges for additional reasons, one of these arising from the way in which these abilities are portrayed in popular media. For example, when students were presented with a (fictitious) newspaper articles conveying the biological "nature" of gender differences, readers were more likely to agree with gender stereotypes, whereas the opposite was true when social explanations were used to describe differences (Brescoll and LaFrance 2004). Explanations for group differences that rest upon biology implicitly convey a fixed mindset conception of ability and reinforce the stereotypes that can undermine motivation and achievement. Thus, both academic practices and their reflection in the popular culture can inadvertently constrain the performance of vulnerable students.

Educational Systems and Structures

The research shows that messages that highlight a person's ability, rather than their effort and process, reinforce a fixed mindset and often precipitate a helpless pattern when the person encounters difficulty. However, while individual teachers can change the way they praise and criticize students in their classroom, they also operate within a larger context of assessment and incentives that are not informed by this research. For example, most schools and districts still adhere to one-size-fits all curricula and standards with age and grade-level expectations, grade students in comparison to their peers on a rigid timeline, and rely on a small number of high-stakes tests to measure student and school success and to select students for access to future learning opportunities. For students who initially lack foundational skills and learning strategies, these policies may virtually ensure failure and undermine the focus on process and growth that are critical to promoting positive motivation.

Recent research suggests that motivation-related behaviors, such as "grit" and perseverance in pursuing goals, may be more predictive of success than IQ; for example, Angela Duckworth and colleagues have found that students who exhibited greater self-control earned higher grades, whereas students' IQ scores were not related to achievement (Duckworth and Seligman 2005). We know from a large body of research that teaching content in the absence of positive academic mindsets and basic learning skills often falls short and that programs aimed at changing students' learning behavior directly are less effective than interventions that change their mindsets. (See Farrington et al. 2012 for a review.) Yet the vast majority of our educational efforts are devoted to core subject curriculum and assessment, sometimes at the expense of teaching academic mindsets and foundational learning skills.

The evidence shows that intellectual development and performance are highly dependent on the interaction of environmental supports and individual effort and active engagement—and that practices that instill and nurture a growth mindset also promote and sustain effort, engagement, and achievement. What could we achieve if, rather than measuring and comparing students with one another, we focused on providing them with a solid foundation of self-efficacy and skills and then on creating opportunities for them to grow? With the knowledge we have gained from decades of research in the role of mindsets in achievement, we have the opportunity to provide the current generation of learners—and their teachers—with a solid foundation for future growth.

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EDUCATION WEEK

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COMMENTARY

Carol Dweck Revisits the 'Growth Mindset'

By Carol Dweck

Back to Story

For many years, I secretly worked on my research. I say “secretly” because, once upon a time, researchers simply published their research in professional journals—and there it stayed.

However, my colleagues and I learned things we thought people needed to know. We found that students’ mindsets—how they perceive their abilities—played a key role in their motivation and achievement, and we found that if we changed students’ mindsets, we could boost their achievement. More precisely, students who believed their intelligence could be developed (a growth mindset) outperformed those who believed their intelligence was fixed (a fixed mindset). And when students learned through a structured program that they could “grow their brains” and increase their intellectual abilities, they did better. Finally, we found that having children focus on the process that leads to learning (like hard work or trying new strategies) could foster a growth mindset and its benefits.

So a few years back, I published my book *Mindset: The New Psychology of Success* to share these discoveries with educators. And many educators have applied the mindset principles in spectacular ways with tremendously gratifying results.

This is wonderful, and the good word continues to spread. But as we’ve watched the growth mindset become more popular, we’ve become much wiser about how to implement it. This learning—the common pitfalls, the misunderstandings, and what to do about them—is what I’d like to share with you, so that we can maximize the benefits for our students.

—Jori Bolton for Education Week

A growth mindset isn’t just about effort. Perhaps the most common misconception is simply equating the growth mindset with effort. Certainly, effort is key for students’ achievement, but it’s not the only thing. Students need to try new strategies and seek input from others when they’re stuck. They need this repertoire of approaches—not just sheer effort—to learn and improve.

We also need to remember that effort is a means to an end to the goal of learning and improving. Too often nowadays, praise is given to students who are putting forth effort, but *not learning*, in order to make them feel good in the moment: “Great effort! You tried your best!” It’s good that the students tried, but it’s not good that they’re not learning. The growth-mindset approach helps children feel good in the short *and* long terms, by helping them thrive on challenges and setbacks on their way to learning. When they’re stuck, teachers can appreciate their work so far, but add: “Let’s talk about what you’ve tried, and what you can try next.”

Recently, someone asked what keeps me up at night. It's the fear that the mindset concepts, which grew up to *counter* the failed self-esteem movement, will be used to *perpetuate* that movement. In other words, if you want to make students feel good, even if they're not learning, just praise their effort! Want to hide learning gaps from them? Just tell them, "Everyone is smart!" The growth mindset was intended to help close achievement gaps, not hide them. It is about telling the truth about a student's current achievement and then, together, doing something about it, helping him or her become smarter.

"The growth mindset was intended to help close achievement gaps, not hide them."

I also fear that the mindset work is sometimes used to justify why some students aren't learning: "Oh, he has a *fixed* mindset." We used to blame the child's environment or ability.

Must it always come back to finding a reason why some children just can't learn, as opposed to finding a way to help them learn? Teachers who understand the growth mindset do everything in their power to unlock that learning.

A few years ago, my colleague in Australia, Susan Mackie, detected an outbreak of what she called "false growth mindset." She was seeing educators who claimed to have a growth mindset, but whose words and actions didn't reflect it. At first, I was skeptical. But before long, I saw it, too, and I understood why.

In many quarters, a growth mindset had become the right thing to have, the right way to think. It was as though educators were faced with a choice: Are you an enlightened person who fosters students' well-being? Or are you an unenlightened person, with a fixed mindset, who undermines them? So, of course, many claimed the growth-mindset identity. But the path to a growth mindset is a journey, not a proclamation.

Let's look at what happens when teachers, or parents, claim a growth mindset, but don't follow through. In recent research, Kathy Liu Sun found that there were many math teachers who endorsed a growth mindset and even said the words "growth mindset" in their middle school math classes, but did not follow through in their classroom practices. In these cases, their students tended to endorse more of a fixed mindset about their math ability. My advisee and research collaborator Kyla Haimovitz and I are finding many parents who endorse a growth mindset, but react to their children's mistakes as though they are problematic or harmful, rather than helpful. In these cases, their children develop more of a fixed mindset about their intelligence.

How can we help educators adopt a deeper, true growth mindset, one that will show in their classroom practices? You may be surprised by my answer: Let's legitimize the fixed mindset. Let's acknowledge that (1) we're all a mixture of fixed and growth mindsets, (2) we will probably always be, and (3) if we want to move closer to a growth mindset in our thoughts and practices, we need to stay in touch with our fixed-mindset thoughts and deeds.

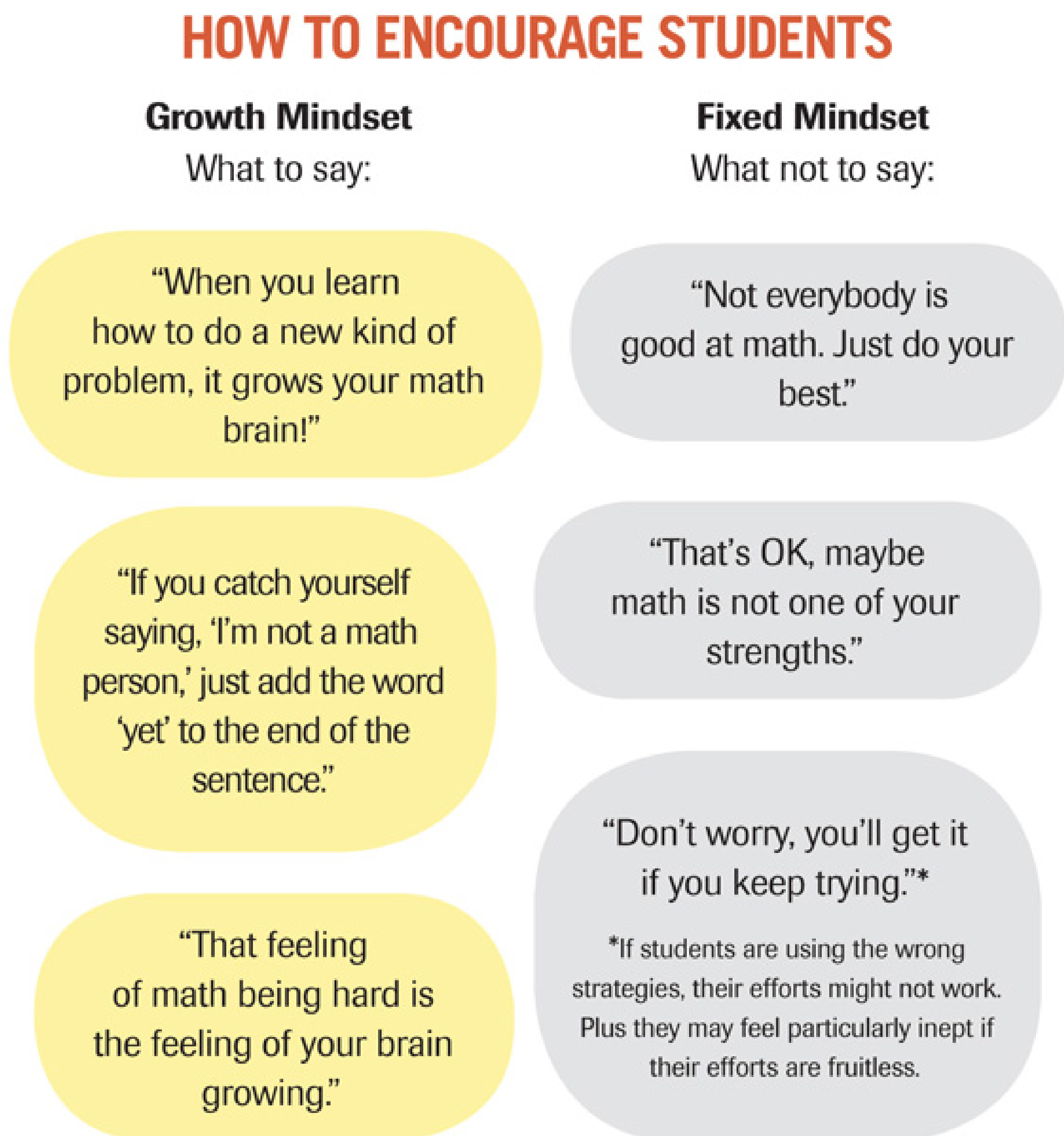
If we "ban" the fixed mindset, we will surely create false growth-mindsets. (By the way, I also fear that if we use mindset measures for accountability, we will create false growth mindsets on an unprecedented scale.) But if we watch carefully for our fixed-mindset triggers, we can begin the true journey to a growth mindset.

What are your triggers?

MORE OPINION

Watch for a fixed-mindset reaction when you face challenges. Do you feel overly anxious, or does a voice in your head warn you away? Watch for it when you face a setback in your teaching, or when students aren't listening or learning. Do you feel incompetent or defeated? Do you look for an excuse? Watch to see whether criticism brings out your fixed mindset. Do you become defensive, angry, or crushed instead of interested in learning from the feedback? Watch what happens when you see an educator who's better than you at something you value. Do you feel envious and threatened, or do you feel eager to learn? Accept those thoughts and feelings and work with and through them. And keep working with and through them.

My colleagues and I are taking a growth-mindset stance toward our message to educators. Maybe we originally put too much emphasis on sheer effort. Maybe we made the development of a growth mindset sound too easy. Maybe we talked too much about people having one mindset or the other, rather than portraying people as mixtures. We are on a growth-mindset journey, too.



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