Growth Mindset Programs Can Improve Outcomes of Previously Low-Achieving Students at Scale

BY EILEEN HORNG

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This Research Brief presents findings from the first year pilot of the National Mindset Study, conducted by members of the Mindset Scholars Network and colleagues.

Past research revealed that students benefit when they learn that intelligence is a malleable quality—what has been called a "growth mindset"—because it helps them see their challenges in school as opportunities to learn rather than signs that they lack ability. However, it was not clear whether a growth mindset program could be implemented for entire cohorts of students—for instance, all 9th graders entering regular public high schools.

This research brief documents (1) how an online growth mindset program was revised to make it more effective for 9th graders at scale; (2) the effect of this second generation growth mindset program on student achievement.

Researchers found that the second generation growth mindset program led students to be more willing to take on challenges. It also reduced the proportion of students with D or F averages in 9th grade by 4 percentage points in the full sample, and improved the GPA of previously low-performing students by 0.14 grade points over one semester, as compared to the control group. Now that the researchers have developed a program that can raise student achievement when delivered at full scale under routine conditions, they are prepared to study the conditions under which the growth mindset program is most or least effective—through a nationally representative evaluation called the National Mindset Study.

Key Points

- User research informed the design of a second generation online growth mindset program.
- In a study of over 7,500 high school students, this program outperformed the first generation program.
- In a study of over 3,000 students, the second generation program significantly improved core course GPA for previously low-performing students, as compared to a placebo control group.
- The program also significantly increased challenge-seeking among all students.
- Now that the second generation online growth mindset program has been tested, it is ready for wider-scale use.
- An upcoming nationally representative evaluation of the program will provide insight as to the specific school contexts in which the program can be used to greatest effect.

Featured Article: Yeager, D. S., Romero, C. L., Paunesku, D., Hulleman, C., Schneider, B., Hinojosa, C., Lee, H. Y., O'Brien, J., Flint, K., Roberts, A., Trott, J., Walton, G., & Dweck, C. S. (2015). Designing social-psychological interventions to solve policy problems at scale: The case of a growth mindset during the transition to high school. *Journal of Educational Psychology*.

MINDSET SCHOLARS NETWORK

Hosted at the Center for Advanced Study in the Behavioral Sciences at Stanford University, 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.

For more information, please contact Dr. David Yeager at dyeager@utexas.edu.

Context for the Current Study: Translating Insights from Early Growth Mindset Studies into a Scalable Online Program

The growth mindset program tested in this study emerged from four decades of research exploring how students' beliefs about the nature of ability affect their motivation and achievement in school (see inset). When students believe their intelligence is fixed at birth, they are more likely to avoid challenges, see effort as a sign of low ability, and be less resilient in the face of failure. In contrast, students who believe they can grow their intelligence persist when struggling with a new task and try different strategies, relishing the challenge as an opportunity to learn something new.

Early growth mindset programs

In the initial growth mindset programs, students first learned scientific facts about the brain: that it is like a muscle that grows when it works on challenging tasks. Next, they were asked to convey these ideas, along with examples from their own lives, to other students through various means, such as letters, websites, and taped speeches. Participants encouraged these other students to remember that the brain is like a muscle that can grow with effort over time. [1,2,3]

Early growth mindset programs were carried out in person, face-to-face. But recently, scholars

Mindsets about the nature of ability shape students' motivation, challenge seeking, and resilience

A fixed mindset is the idea that your intelligence is a fixed quantity—something that you only have a certain amount of. In contrast, a growth mindset is the idea that your intelligence has the potential to grow and improve in response to effort, strategies, and help from others.[5,6] When students hold a fixed mindset, academic challenges are threats to be avoided at all costs. In contrast, students who hold a growth mindset perceive challenges not as evidence of a lack of raw ability, but rather, opportunities for learning and improvement.[7]

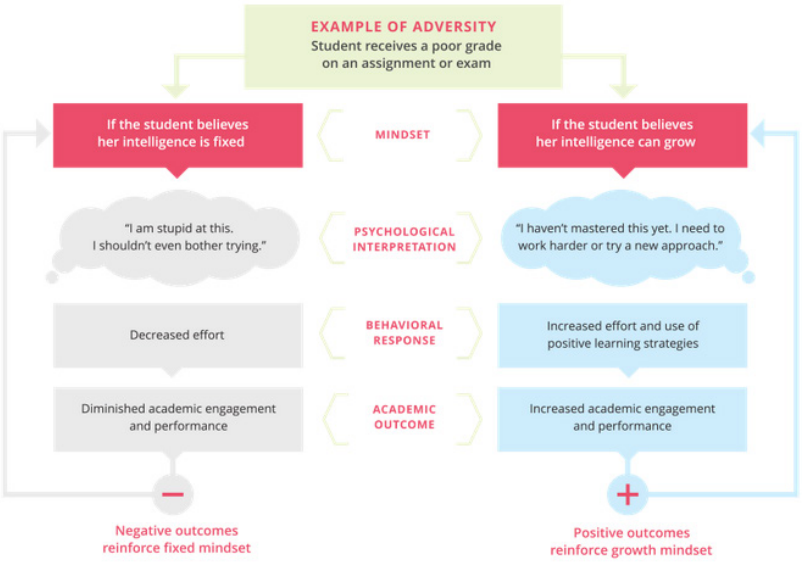
In both controlled laboratory experiments and longitudinal studies in schools, researchers have found that students with a fixed mindset tend to avoid challenges; develop unproductive beliefs about effort; and be less resilient in the face of failure. [1,7,8,9] In contrast, when students with a growth mindset face a problem they can't solve, they are more likely to be resilient and to seek appropriate help or switch strategies, rather than hiding their confusion.[8,10]

	FIXED MINDSET	GROWTH MINDSET
Definition	Belief that ability is a *fixed* trait that cannot change	Belief that ability is *malleable* and can be developed
Interpretation of effort	Effort is *bad;* if you're smart, you shouldn't have to work hard	Effort is *good;* it's how you get better
Motivation in school	What matters is looking smart, so you can *prove* your ability	What matters is learning, so you can *improve* your ability
Behavioral response to academic setbacks	*Helplessness;* setback is a sign that you don't have what it takes	*Resilience;* setback is a sign that you need to work harder or try a new strategy
Meaning of failure	Failure is the *end of the story:* time to give up	Failure is the *beginning of the story:* time to try again

Source: Table adapted from Master, A. *Praise that Makes Learners More Resilient*, Mindset Scholars Network, 2015.

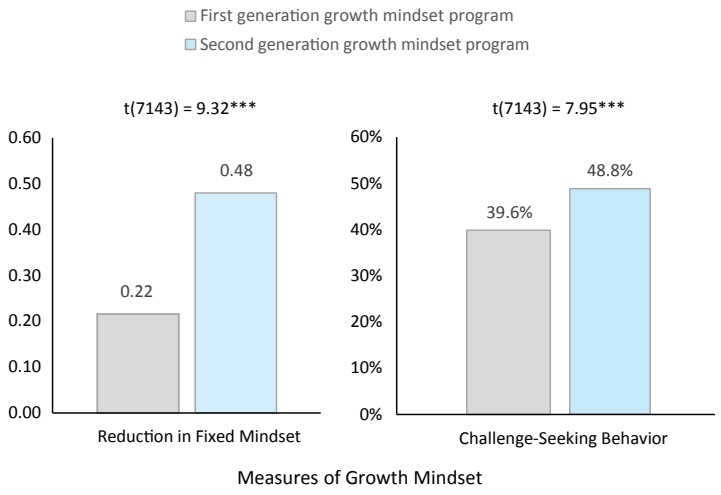
Mindset programs change students' interpretations of adversity in ways that interrupt negative self-reinforcing cycles and set in motion a positive cycle that increases their achievement

Adolescents receive many messages during the day, from many sources, and many are rejected and appear to have little or no effect on their behavior at the moment, let alone many weeks later. It is difficult to imagine that a brief message given to students in a study could have long-term effects on their academic outcomes. However, many studies of social psychological programs show they can cause lasting improvements in student achievement. This is possible because these programs change students' interpretations of themselves and school—how students make sense of their experiences in school, their relationships with peers and teachers, and their learning tasks. These interpretations can influence students' motivation and achievement far into the future because they set in motion recursive cycles which are reinforced by the self and the environment, which compounds their impact over time.



have found that an online growth mindset program amazingly still had the desired effect on students. This innovation meant that growth mindset programs that had previously been delivered by researchers under careful, precise conditions in laboratory-like settings could now be delivered inexpensively in real-world classroom settings with an unusually high degree of fidelity—the make or break factor in scaling effective programs in education.

Figure 1. Average effects of first generation vs. second generation growth mindset programs on students' growth mindsets



Note: T-tests comparing original and revised mindset treatments significant at p<.001*** p<.01**

Trials with this "first generation" online growth mindset program showed promising results. Most recently, researchers conducted a double-blind, randomized experimental evaluation of this program with over 1,500 high school students. The researchers found that the grades of previously low-performing students improved after participating in this first generation online growth mindset program, and these students were less likely to receive D and F grades in core classes (English, math, and science) compared to the control group.[4]

The Next Step: Studying Full-Scale Implementation

While demonstrating that it was possible to deliver these messages online to a large number of students at multiple schools was an important first step, it was essential to show that they could be implemented effectively school-wide. This was the mandate for the present study.

Creating the "second generation" online growth mindset program with input from users

In preparation for the current study, researchers worked with educators and students to create a revised version of the online growth mindset program. This "second generation" program was developed using a rigorous R&D approach that combined insights from psychological theory with user-centered product design.

Table 1. Summary of insights learned about how better to teach a growth mindset to students

Emphasizing "strategies," not just "hard work." For many students, just working harder with ineffective strategies will not lead to increased learning which could, in turn, reinforce a fixed mindset. Consequently, a mindset treatment is more effective when it emphasizes using the right strategies, not just increasing effort (i.e., removing any stigma associated with asking for help or switching approaches).
Addressing a culture of independence. For some students, communal / interdependent values are more important than personal gain. Consequently, a mindset treatment is more effective when it also emphasizes prosocial, beyond-the-self motives for adopting and using a growth mindset (e.g., using a growth mindset to give back to the community and make a difference in the world).
Harnessing descriptive norms. A mindset treatment is more effective when a descriptive norm is created around the adoption and use of a growth mindset – for example, by presenting quotes from other students who endorse the growth mindset concepts and explaining how they use them in practice.
Harnessing reactance. Adolescents tend to reject mainstream or external pressure to change their personal choices. Consequently, a mindset treatment for adolescents is more effective if the mindset message is framed as a reaction to adult control.
Role models. A mindset treatment is more effective if role models (i.e., well-known adults) are described using a growth mindset. This adds to the norm of using a growth mindset as well as provides the students with exemplars for how it can be used to great effect.
The power of self-persuasion. A mindset treatment is more effective if there are more opportunities for the students to internalize the message by writing their own opinions and stories. These exercises allow the students to customize the message and make it their own.

Pilot testing showed that the second generation online growth mindset program was an improvement over the first generation program

The first stage of the present study was to assess whether the second generation online growth mindset program was actually an improvement over the original. The researchers conducted a preliminary trial with over 7,500 9th grade students in 69 high schools. Similar to previous studies, schools were recruited via advertisements in prominent educational publications, through social media (e.g., Twitter), and through talks to school districts and other school administrators. Every participating student received a version of the online growth mindset program: half received the first generation version of the program used in previous studies and half received the second generation version. Analyses showed that the second generation program was more effective at teaching a growth mindset (i.e., reducing a fixed mindset) than the first generation program (see Figure 1, previous page).

Additionally, the study showed that students who received the second generation program were more likely to seek out challenging math problems than those who received the first generation program (see Figure 1, previous page).

Key Study Features

- **Generalizability**
  Over 95% of students in 10 schools participated under routine conditions.
- **Data integrity**
  All data were collected by a third-party firm.
- **Transparency**
  Data were independently analyzed by experts from multiple institutions.
- **Accountability**
  Data analysis plan was pre-registered on the Open Science Framework.

Pilot testing also revealed valuable insights about how best to teach growth mindsets to students

In the process of developing the new version of the program, the researchers uncovered a series of insights about how best to teach a growth mindset to high school students (see Table 1, previous page).

The Present Study: Assessing the Effect of the Second Generation Online Growth Mindset Program on Student Outcomes

After piloting the second generation growth mindset program, the researchers took the program into the field again to evaluate its effect on students' beliefs, behaviors, and course grades.

Using a gold standard study design to isolate the effect of the second generation online growth mindset program

The researchers used a gold standard design for this study, similar to those used to assess the effectiveness of new medicines: an individual-level, randomized, placebo-controlled double-blind experiment. The study included entire cohorts of 9th grade students attending ten schools across the country. Since the treatment and control groups in these types of studies are identical in all regards except for the content of the program they receive, this means that any difference observed in outcomes between the groups can be attributed to the program itself. For students to participate, they simply logged in to a website, and the computer randomly assigned them to either the growth mindset program or a control activity. The series of exercises completed by the treatment and control groups were designed to be nearly identical, except that the treatment program conveyed a lesson about growth mindset, while the placebo control version did not. Teachers at the school were not told students' treatment or control conditions and were not given access to the treatment materials, nor were they aware of the researchers' interest in growth mindset. Thus the experiment simply consisted of two web-based sessions with no reinforcement from teachers. Did it make grades go up?

Assessing the effect of the program on 9th grade fall grades

Similar to prior research, this study found that an online growth mindset program did indeed improve the grade point average (GPA) of lower-achieving students. The bottom 20 percent of students showed a statistically significant increase of 0.14 grade points due to receiving the growth mindset program (see Figure 2, next page). There was no effect of the program on grades for previously high-achieving students. This could be because of a "ceiling effect" where it's impossible for them to get higher grades, or because students began to choose harder problems where they learned more but got fewer "easy As."

The growth mindset program also had the effect of reducing rates of poor performance (D or F averages). This is a critical outcome because failure of core courses in 9th grade is one of the strongest predictors of high school dropout. For the full sample, the second generation online growth mindset program increased the rate of students' receiving A, B, or C averages (i.e., reduced the rate of poor performance) by a statistically significant 4 percentage points (see Figure 2, next page). And similar to the trend observed with GPA, those students in the bottom quintile of prior achievement showed a significant 8 percentage point reduction in poor performance rates, while those in the top quintile showed a non-significant 1 percentage point difference.

Assessing the effect of the program on students' mindsets and challenge-seeking behavior

The growth mindset program had a significant effect on students' mindsets about ability and their challenge-seeking behavior. Students answered questions designed to assess the extent to which they held a fixed mindset both before and after completing the module. The program had a significant positive effect in terms of increasing growth mindset beliefs (see Figure 2, next page).

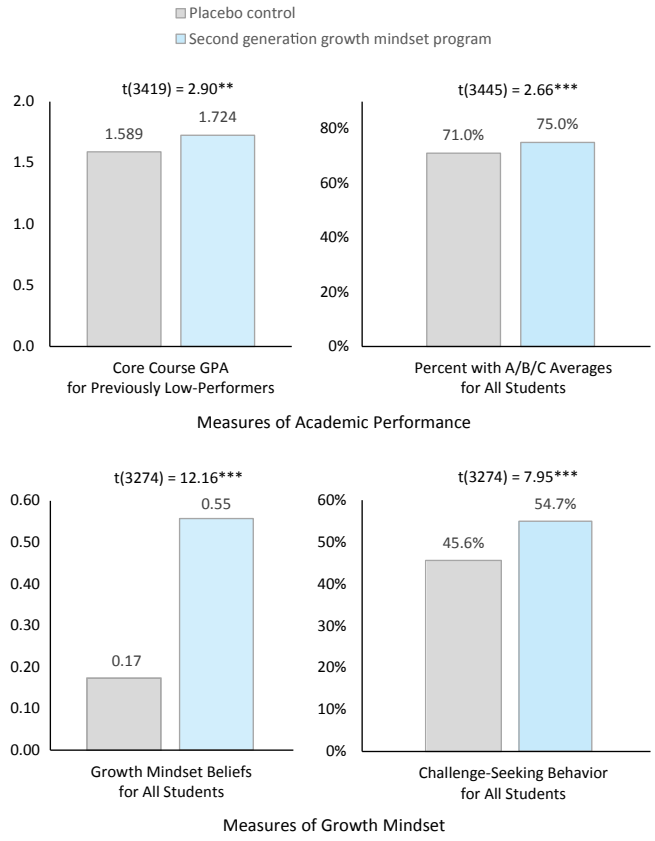
To assess challenge seeking behavior, the study also asked students whether they would hypothetically choose an "easy" math assignment on which they would likely get a high score, or a "hard" assignment on which they might get a low score. The online growth mindset program increased students' self-reported challenge seeking: 46 percent of students in the control group selected the hard math assignment over the easy one, compared to 55 percent of those who had received the mindset program (see Figure 2).

In sum, the second generation online growth mindset program:

- Improved students' grades several weeks and months after the treatment;
- Reduced poor performance among previously low-achieving students;
- Increased students' growth mindset beliefs; and,
- Increased students' challenge-seeking behaviors.

These results indicate that a brief growth mindset program may be administered to entire high schools by school staff who are not psychologists and raise the grades of the lowest performers, while increasing the challenge-seeking behavior of all students.

Figure 2. Average effects of second generation growth mindset program vs. placebo control on academic performance and growth mindsets



Note: T-tests comparing mindset treatment and placebo control significant at p<.001*** p<.01**

A Final Step To Scaling Up: A Nationally Representative Experimental Study

No program works for all people, in all circumstances, all of the time. Our next step is to understand for whom and in what contexts this online growth mindset program is most effective.

Launching the National Mindset Study

In Fall 2015, the same online growth mindset program that was assessed in this study will be tested using a double-blind experimental design with entire cohorts of 9th grade students attending 60 to 100 high schools nationwide. This study will include a total of 15,000 to 25,000 students. Unlike the study described in this brief, which used a convenience sample of ten high schools, the National Mindset Study is using a national probability sample of regular U.S. high schools. That is, the schools invited to participate in the National Mindset Study were randomly selected from among all public high schools in the nation. The results of this next trial will be generalizable to the entire population of 9th grade students enrolled in regular high schools in the U.S.

Insights will inform where and how online growth mindset programs can be used to the greatest effect

The key outcome of the National Mindset Study will be to reveal how much these effects vary across high schools and the extent to which these effects are influenced by characteristics of students and schools. As a result, the findings of this study will enable us to say with great certainty where and how this online growth mindset program should be spread to high schools throughout the country.

This brief was edited by Lisa Quay, Managing Director of the Mindset Scholars Network, and David Yeager, Co-Chair of the Mindset Scholars Network.

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